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Evaluation of income effects of direct support

Final Report




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Abbreviations

AWU	Annual Work Unit
CA	Compensatory Allowance
CAP	Common Agricultural Policy
CATS	Clearance Audit Trail System
CFI	Corrected Factor Income
CFL	Cost of Family Labour
CMO	Common Market Organisation
CNDP	Complementary National Direct Payments
CV	Coefficient of Variation
CW	Contract Work
DP	Direct Payments
EAA	European Accounts for Agriculture
EAGGF	European Agriculture Guidance and Guarantee Fund
EC	European Commission
EQ	Evaluation Question
ESU	European Size Unit
EU	European Union
EU-SILC	European Union Statistics on Income and Living Conditions
FADN	Farm Accountancy Data Network
FWU	Family Annual Work Unit
FBI	Farm Business Income
FFI	Family Farm Income
FFLI	Family Farm Labour Income
FHI	Farm Household Income
FI	Factor Income
FNVA	Farm Net Value Added
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GVA	Gross value Added
ISP	Index of Specialisation
LFA	Less Favoured Area
LIS	Luxembourg Income Study
MPD	Market Price Differential
MPS	Market Price Support
NUTS	Nomenclature of Territorial Units for Statistics
OECD	Organisation for Economic Co-operation and Development

OS	Operating Surplus
PI	Paid Interest
PLI	Price Level Index
PP	Producer Price
PPS	Purchasing Power Standard
PR	Paid Rent
PSE	Producer Support Estimate
PW	Paid Wages
RD	Rural Development
RP	Reference Price
SAPS	Single Area Payment Scheme
SFP	Single Farm Payment
SI	Subsidy Intensity
SPS	Single Payment Scheme
TF	Type of Farming
TO	Total Output
TIAH	Total Income of Agricultural Households
UAA	Utilised Agricultural Area
UNECE	United Nations Economic Commission for Europe
WR	Wage Rate

Glossary

This glossary introduces a number of indicators that are used in this report.

FNVA/AWU	Farm Net Value Added per Annual Work Unit
FNVAndp/AWU	Farm Net Value Added net of direct payments per Annual Work Unit
TO/AWU	Total Output per Annual Work Unit
IC/AWU	Intermediate Consumption per Annual Work Unit
Paid wages(PW)/paid AWU	Average cost of hired labour
FFI/(FFI+PW+CW+PR+PI)	Share of income remunerating family farm labour and entrepreneurial skills
PW/(FFI+PW+CW+PR+PI)	Share of income remunerating hired labour
CW/(FFI+PW+CW+PR+PI)	Share of income remunerating hired contract work
PR/(FFI+PW+CW+PR+PI)	Share of income remunerating land
PI/(FFI+PW+CW+PR+PI)	Share of income remunerating capital
CVa	Coefficient of Variation of the 2001-07 FNVA/AWU series
CVb	Coefficient of Variation of the 2001-07 FNVA net of direct payments/AWU series
CVc	Coefficient of Variation of the 2001-07 FNVA net of direct payments and CMO support /AWU series
CVd	Coefficient of Variation of the 2001-07 FNVA net of direct payments and support provided through rural development measures /AWU series
FHI	Farm household income
FBI	Farm business income
FFI/FWU	Family farm income/family work units
Mou LFA	Farms located in mountain LFA areas
ROI	Return On Investment = EBIT/TA : EBIT = Earnings Before Interest and Taxes; TA = Total Assets
EBIT	Earnings Before Interest and Taxes = FNVA – (WP+ RP + CFL): FNVA = Farm Net Value Added ;WP = Wages paid; RP = Rent paid; CFL= Estimated Value of family labour
ROA	Return On Assets = FNI/TA: FNI = Farm Net Income; TA = Total Assets
FNI	Farm Net Income = FFI – CFL : FFI = Family Farm Income; CFL = estimated value of family labour
ROTO	Return on Total Output = EBIT/TO: TO = total output
CAPITAL ROTATION RATE	= TO/TA: TO = Total output; TA = Total assets

Micro-econometric variables

fnvaa	Farm net value added per agricultural work units (dependent variable)
cmoa	Estimate of the support from CMO measures (excluding direct and other payments)
cdpa	Coupled direct payments
ddpa	Decoupled direct payments
otha	Other payments including RD payments
ecsize	Farm economic size
assa	Unitary value of farm assets
nsm	Dummy variable to identify EU 10 Member States in 2004
constant	Constant of the regression
gdp	Unitary Gross Domestic Product
lfacdpa	The same as cdpa but set to zero in non mountain-LFA farms
lfddpa	The same as ddpa but set to zero in non mountain-LFA farms
spscdpa	The same as cdpa but set to zero in farms in regions where the SAPS is applied
spsddpa	The same as ddpa but set to zero in farms in regions where the SAPS is applied

1. INTRODUCTION

One of the five objectives assigned to the Common Agricultural Policy (CAP) by the EC Treaty is to guarantee the agricultural community a fair standard of living, in particular by increasing the individual earnings of people engaged in agriculture.

This evaluation examined the effects of the direct support schemes laid down in Council Regulation (EC) No 1782/03 (later Council Regulation (EC) No 73/09) on the income of farmers. The effects of direct payments related to other CAP objectives, such as enhancing the competitiveness of the agricultural sector or ensuring sufficient and secure food supply, were not taken into account in the evaluation.

The 2003 reform constituted a fundamental change in the instruments applied in the CAP, with a switch from coupled income support to a single decoupled support. This decoupled aid scheme directly supports the income of farmers, and the major change is that it is not linked to levels or types of production.

The evaluation examined the effectiveness and efficiency of the implementation of direct support with respect to achieving the income objective. The evaluation also examined the coherence of direct payments with measures under the Single Market Organisation (Single CMO) and rural development measures with respect to this objective.

The methodological approach designed for the present evaluation allows to make a clear distinction between the effects of direct payments on the income of farmers and the effects of other policy instruments (.i.e. market developments on the one hand, measures under the Single CMO and rural development measures on the other hand).

The evaluation comprises a macro-economic approach, in which analysis is based on EU regions' agricultural sectors (NUTS II), as well as a micro-economic approach, in which the analysis is based on individual farm data (FADN) and articulated distinguishing various farm typologies. The typologies encompass seven agricultural sectors, the choices of implementation of the direct payment schemes in different Member States/regions, farms' economic size, type of organisation and geographical location.

The evaluation covers the 27 Member States of the EU and the period since 1st January 2005 onwards. However, in order to highlight the transitional effects of policy change and to allow for a clear distinction of income changes due to market developments, some years before the introduction of the reform have been included in the observation period, starting thus from 2001.

2. THE POLICY FRAMEWORK

In 2003, a substantial reform of the Common Agricultural Policy (CAP) was adopted, with the aim of promoting a more market-oriented and competitive agriculture. This reform constituted a fundamental change in the instruments implemented within the CAP, with a switch from coupled income support to decoupled support. This decoupled aid scheme directly supports the income of farmers, and the major change is that it is not linked to levels or types of production.

In this context, Council Regulation (EC) No 1782/2003 of 29 September 2003, establishing common rules for direct support schemes under the common agricultural policy and establishing certain support schemes for farmers, introduced a Single Payment Scheme (SPS). This Regulation has undergone a number of important changes. The main changes have come through the following regulations, whereby the accession of the new Member States and the inclusion of the remaining sectors into the SPS have been covered:

- Council Regulation (EC) No 583/004 of 22 March 2004 following the accession of the Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia to the European Union;
- Council Regulation (EC) No 864/2004 of 29 April 2004, integrating support for cotton, olive oil, raw tobacco and hops into the single payment scheme;
- Council Regulation (EC) No 319/2006 of 20 February 2006 integrating support for sugar beet, cane and chicory used for the production of sugar or inulin syrup into the single payment scheme;
- Council Regulation (EC) No 2013/2006 of 19 December 2006 amending Regulations (EEC) No 404/93, (EC) No 1782/2003 and (EC) No 247/2006 as regards the banana sector;
- Council Regulation (EC) No 1182/2007 of 26 September 2007 decoupling fruit and vegetable payments and introducing temporary coupled area aids for certain products intended for processing, as well as strawberries and raspberries;
- Council Regulation (EC) No 479/2008 of 29 April 2008 on the common organisation of the market in wine, amending Regulations (EC) No 1493/1999, (EC) No 1782/2003, (EC) No 1290/2005, (EC) No 3/2008 and repealing Regulations (EEC) No 2392/86 and (EC) No 1493/1999.

The Single Payment Scheme and other direct support schemes (coupled) have been implemented through three Commission Regulations, which have also been amended a number of times:

- Commission Regulation (EC) No 1973/2004, laying down detailed rules as regards the support schemes provided for in Titles IV and IVa of that Regulation and the use of land set aside for the production of raw materials;
- Commission Regulation (EC) No 795/2004 on the implementation of the single payment scheme;
- Commission Regulation (EC) No 796/2004, laying down detailed rules for the implementation of cross-compliance, modulation and the integrated administration and control system.

Bearing in mind these developments, and in order to add clarity, in January 2009 Regulation 1782/2003 was repealed and replaced by Council Regulation (EC) No 73/2009 of 19 January 2009[1], formalising agreements on the midterm review of the reform process, the so-called Health Check.

[1] OJ L 30, 31.01.2009, p. 16

2.1 Objectives and policy instruments of the 2003 reform

The objectives of the new CAP, specified in the Luxembourg Agreements in 2003 and inserted in the recitals of Council Regulation (EC) No 1782/2003, are as follows:

- ensuring a fair standard of living for the agricultural community
- making agriculture more market-oriented, avoiding distortions of competition and liberalising international agricultural trading;
- meeting the demand of consumers in terms of price, quality and hygiene;
- strengthening rural development;
- supporting sustainable agriculture and protecting the environment;
- making support policies more efficient and controlled, complying with financial rules.

The main change introduced with this reform is the deployment of instruments to achieve these objectives. According to the 2003 reform, the free market determines production levels and the quality of agricultural production. Specific measures are established for aspects that the market is unable to deal with in an optimal manner, in particular income distribution, taking into account non-market effects (both positive and negative) of agricultural activities in order to protect the environment, public health, etc.

This has led to changes to income support instruments: the tools used up until now (price support, per hectare payment, headage payment) have gradually been dropped in favour of a single, lump-sum payment depending on the level of previous aid. This aid is decoupled, since it is not bound to production levels (unlike price support), or to production (unlike the per hectare payment), or to market conditions, and thus the production decisions of farmers (in terms of both output levels and quality) are allowed to be adjusted depending on market demand.

2.2 Implementation of the Single Payment Scheme

Title III of (EC) Regulation no 1782/2003 concerning the Single Payment Scheme (SPS) fixes the reference amount, payment entitlements (according to agricultural surface or special conditions), land use and set-aside rights, as well as principles for its regional and partial implementation.

Aid under the Single Payment Scheme and other direct support schemes (coupled) is subject to usage conditions and the principle of modulation:

- cross compliance is a mechanism that encourages compliance with statutory requirements for farmers receiving direct payments. This mechanism (Title II chapter I of Regulation (EC) No 1782/2003) establishes as from 2005 a reduction or elimination of direct payments if Statutory Management Requirements (SMR) are not met in the spheres of the environment, public, animals and plants health, animal welfare and minimum Good Agricultural and Environmental Conditions (GAEC) needs are not met2;
- the principle of modulation: a percentage of payments, beyond a ceiling fixed by rules, is used to help finance rural development.

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[2] The GAEC rules cover spheres that have not been subject to detailed regulations in the past, such as soil protection and conservation of permanent grassland. They set out to prevent the abandonment or poor upkeep of land in case it is not used cultivation.

The principle for calculating payments to be received under the SPS is that of the number of eligible hectares declared in the first year of the implementation of the SPS multiplied by the value of payment entitlement. The Member States could choose from three basic models of the SPS on how to calculate the reference amount for an individual farm and by that the value of payment entitlements:

- the historic model, in which payments are purely based on historical payments received by individual farms during the reference period from 2000 to 2002;
- a regional model, in which payments are made as flat rate payments per hectare and the level of support thus being the same for all farms within a region;
- a so-called hybrid model, in which a part of the payment is based on historical reference data (2000–2002) and another part on a flat rate payment per hectare.

2.2.1 The Historic model (Title III, Chapters 1 to 4)

The value of payment entitlements per hectare, the number of payment entitlements, the number of eligible hectares are defined for each crop.

Eligible parties (beneficiaries) (article 33) are farmers that were granted payments between 2000 and 2002, or have received a holding (by way of inheritance) that was granted payments in the same period or have received a payment entitlement from the national reserve (especially farmers starting up an agricultural business after the reference period).

The value of the payment entitlement is calculated according to the reference amount divided by the average number of hectares entitling the farmer to the payment during a reference period (the calendar years 2000, 2001 and 2002). The total reference amounts are limited by the member State's national ceiling for the SPS.

The reference amount of a farm is the average payment received during the reference period under one of the following systems: arable crops; potato starch; grain legumes; rice; beef and veal; milk and dairy produce; sheep and goat production; dried fodder; cotton ; olive oil; tobacco; hops; sugar beet, cane and chicory used to produce sugar or insulin syrup, wine, seeds and bananas. These systems have not all been introduced in the SPS at the same time. The number of payment entitlements corresponds to the average number of hectares entitling the farmer to the payment in the reference period, as well as all forage areas and areas for dried fodder, potato starch, seeds, olive groves and tobacco that were granted aid in the reference period.

The number of eligible hectares for allocation and, in subsequent years, activation of entitlements: eligible hectares correspond to the agricultural area occupied by arable land and permanent grassland and subsequently, if chosen by the Member State, also land under permanent crops. Eligible hectares do not include: forests, or land used for non-agricultural activities. On the other hand, agricultural parcels planted with short rotation coppice – *Miscanthus sinensis* and *Phalaris arundicea* – are included, in the same way as land planted with permanent crops subject to an application for aid for energy crops.

Set-aside entitlements: land set aside during the reference period had to remain fallow at least from 15 January to 31 August. Set-aside areas are eligible for the set-aside entitlement. Thus they are not included in the calculation of normal entitlement (article 54, paragraph 3).

The Health Check (Council Regulation (EC) No 73/2009, articles 45-48) gives to Member States that have applied the historic model the opportunity to review their initial choice and change over to a regionalised application of the single payment scheme, similar to the options already provided for in Regulation (EC) No 1782/2003.

2.2.2 The Regional model (Title III, Chapter 5, Section 1)

This corresponds to the regionalised method with total equalization of support between farmers. If the MS decides to regionalise the single payment scheme, the national ceiling is distributed among the regions (according to criteria set by the MS).

Eligible parties (beneficiaries): the regional amount is divided among all eligible hectares declared in the region in the first year of the application of the SPS, also by farmers who were not granted payments between 2000 and 2002. For this reason, the MS can divide all or a part of this amount by the number of hectares of arable land and permanent grassland in the region in order to differentiate the value of payment enititlements for grassland and for other land.

The value of the payment entitlement corresponds to the regional ceiling divided by the number of declared eligible hectares. The MS may also distinguish values of payment entitlements for grassland and arable land. The value for one type of entitlement is thus the same for all farmers in a given region. Farmer aid thus depends on the number of entitlements.

The number of payment entitlements corresponds to the number of hectares eligible for aid during the first year of application of the Regulation.

Eligible hectares for allocation and activation of payment entitlements are arable land and permanent grassland, as used in the historical calculation.

Set-aside entitlements: land set aside during the reference period had to remain fallow at least from 15 January to 31 August. Set-aside areas entitlements are the same as those for the classic entitlements. The number of set-aside entitlements is defined by a set-aside rate that corresponds to the mandatory set-aside percentage (10%), multiplied by the arable crops surface area (granted per hectare payments) during the reference period.

2.2.3 The Hybrid model (Title III, Chapter 5, Section 2)

The hybrid model is similar to the regional model, but the MS decides on the degree of equalisation. Member States may apply adequate calculation systems for each region and may also calculate SPS payments (the value of payment entitlements) on the basis of a part-historical and part-flat rate approach.

There are two sub-types of this model:

- the static hybrid model, in which the split between historic and flat-rate regional component of the payment entitlement remains stable
- the dynamic hybrid model, in which the historic components are gradually reduced in favour of flat-rate regional component of the payment entitlement.

The main difference from the regional model thus relates to the value of the payment entitlement of each farmer, while other rules are applied in the same way. Namely, the value of the entitlement payment comprises two elements: a equalised element (flat-rate) and an element based to individual farmers' reference amount:

- the equalised element is calculated by dividing the portion of the regional ceiling by the surface area of declared eligible land (arable land and permanent grassland);
- the individual reference component of the value of entitlement corresponds to the farmer's reference amount divided by the number of eligible hectares declared during the first year of application of the SPS (or later when relevant sector is integrated into the SPS).

2.2.4 Implementation of support schemes in the new Member States (Title IV A)

New Member States must apply a single payment scheme on a regional basis (article 71f of Regulation (EC) No 1782/2003). However, they also have the possibility, in a transitional period[3], of applying a Single Area Payment Scheme (SAPS) (article 143a). The SAPS is also a decoupled support system (with no obligation to produce), however without payment entitlements. Instead , the SAPS is based on two elements fixed at the national level: a national financial envelope for direct support (the sum of all direct payments that the member State will receive within the framework of «normal» direct payment systems) and a national agricultural surface area, equivalent to the used agricultural area that was in «good agricultural condition» in June 2003. Payments granted within the SAPS are also subject to the cross compliance mechanism, introduced gradually.

New Member States that adopt the SAPS may decide to grant a separate payment for sugar for the years 2006 to 2010, as well as a separate payment and a transitional payment for fruit and vegetables to eligible farmers within the framework of the SAPS (article 143ba and article 143bb).

New member States may grant complementary national direct payments (CNDP), which may be decoupled or coupled, pending the authorisation of the Commission and within given limits.

2.2.5 National reserve and transfer of payment entitlements

In all implementation models of the SPS, a National Reserve and entitlement transfer procedures are established.

National reserve (article 42): the national reserve serves to allocate entitlements to farmers finding themselves in special situations (e.g. newcomers, special conditions due to transition etc). The reserve is formed through a reduction in the national ceiling for the SPS (in case of the old MS it is limited to 3%).

Transfer of entitlements (article 46): transfers may be effected within MSs only, and MSs may decide that payment entitlements may only be transferred within single regions. Transfers may be temporary (lease) or permanent (sale). The sale may be with or without land, while lease of payment entitlements is bound to land. Transfers may be effected by subrogation in cases of mergers, scissions, inheritance (etc.) or contractually. A certain number of clauses limits entitlement transfers.

2.2.6 Partial implementation (Title III, Chapter 5, Section 2)

Regulation (EC) no 1782/2003 introduces the possibility of partial decoupling that may or may not be used by the MS. If partial decoupling is adopted, a percentage of SPS budgets is coupled within the limits of ceilings defined by the Regulation (articles 66 to 68*b* of Regulation (EC) No 1782/2003).

[3] The Health Check extends the transitional period to 2013.

The sectors for which Regulation (EC) No 1782/2003 provides for partial implementation are: arable crops (article 66); sheep and goats (article 67); beef and veal (article 68), hops (article 68a), certain fruit and vegetables (article 68b)[4].

2.2.7 Other aid schemes (Title IV)

Other coupled support schemes (some depending on the choice of the member State whether or not to adopt such schemes, some decided by the Council) have been established or maintained for the following products: durum wheat, protein crops, rice, nuts, energy crops, potato starch, dairy products, seeds, cotton, tobacco, olive groves, grain legumes, separate payment for sugar (only for new member States adopting the SAPS). The year of their integration into the SPS varies.

2.2.8 Payments relative to the application of Art. 69 (Title III)

Member States may grant additional payments to support agricultural activities that encourage the protection or enhancement of the environment or for improving the quality and marketing of agricultural products. Additional payments may use up to 10% of the funds available (under national ceilings) in the SPS, thus reducing the funds available for SPS payments and product specific coupled direct aids.

Additional payments granted under article 69 are coupled, with the provision that they are not granted to all producers of a sector but are based on certain eligibility criteria decided by the MS.

2.2.9 Terms of implementation across the Member States

The implementation of the single payment scheme is not uniform across Member States. The MS have room for manoeuvre in the application of decoupling: choice of the date of introduction of the SPS (2005, 2006 or 2007), choice of the extent of decoupling (partial or total), choice of implementation of article 69 and choice of the SPS model (and by that the extent of redistribution of direct support among farms and thus sectors). The table below provides an overview of the implementation of the 2003 reform and subsequent changes decided by the MS.

[4] According to Council Regulations (EC) No 1782/2003 and No 73/2009, these remaining coupled payments will be decoupled and shifted into the Single Payment Scheme, with the exception of suckler cow premium and sheep and goats payments, for which the Member States may maintain coupled support. For the dates of integration of these schemes into the SPS, please see Annex XI of Council Regulation (EC) No 73/2009.

Tab. 1 - Overview of the implementation of direct payments under the CAP in Member States during the period examined (2005-2009)[5]

Member State	Start SPS/SAPS	Regions	Implementation model	Minimum requirements	Sectors with coupled direct payments	Article 69 measures and part of the ceiling
Austria	2005	-	SPS historic	100 €	Suckler cow premium (100%) Slaughter premium calves (100%) Slaughter premium bovine adults (40%) Hops (25%) Protein crops, Durum Wheat (traditional areas), Nuts, Starch potato, Dried fodder, Flax for fibre	-
Belgium	2005	Flanders + Brussels Wallonia	SPS historic	100 €	Suckler cow premium (100%) Slaughter premium calves (100%) Seeds (some species, 100%) Protein crops, Nuts, Flax for fibre	-
Bulgaria	2007	-	SAPS	0,5 Ha, 100 €	Transitional soft fruit payments (from 2008, 100%)	n.a.
Cyprus	2004	-	SAPS	0,3 Ha	Citrus fruits intended for processing (from 2008, 100%)	n.a.
Czech Republic	2004	-	SAPS	1 Ha	Separate sugar payments (100%) Separate payments for tomatoes intended for processing (100%)	n.a.
Denmark	2005	-	SPS dynamic hybrid[6]	2 Ha 300 €	Special male bovine premium (75%) Sheep and goat premium (50%) Protein crops, Starch potato, Dried fodder, Flax for fibre	-
Estonia	2004	-	SAPS	1 Ha	none	n.a.
Finland	2006	Three regions (based on regional yields)	SPS dynamic hybrid[7]	200 €	Special male bovine premium (75%) Sheep and goat premium (50%) Seeds (timothy seed, 100%) Protein crops, Starch Potato, Dried Fodder, Flax for fibre	2,1% of arable sector 10% of bovine sector

[5] It should be noted that several coupled supports are integrated into the single payment scheme from 2010 (see Annex XI of Regulation (EC) No 73/2009.

[6] Support is provided as a flat-rate payment per hectare, with a supplement for farmers who have been producing beef and milk on historical basis. Aid is being introduced for permanent pasture areas too, increasing over time to reach the same rate as standard entitlements.

[7] The Finnish model comprises a regional flat rate and historical payments, based on the support a farm received during the reference period 2000–2002. Within the SPS, around 86 % of all payments are made as flat rate payments and 14 % of payments are based on historical payments (2006). The dynamic component of the system will lead to a gradual reduction of the historical payments until 2016, starting in 2011.

Member State	Start SPS/SAPS	Regions	Implementation model	Minimum requirements	Sectors with coupled direct payments	Article 69 measures and part of the ceiling
France	2006	-	SPS historic	100 €	Suckler cow premium (100%) Slaughter premium calves (100%) Slaughter premium bovin adults (40%) Sheep and goat premium (50%) Arable crops (25%) Tobacco (60%) Hops (25%) Tomatoes intended for processing (from 2008, 50%) Prunes, peaches and prunes intended for processing (from 2008, 98%) Seeds (some species, 100%) Protein crops, Rice, Durum Wheat (traditional areas), Nuts, Dried fodder, Flax for fibre, Starch Potato	-
Germany	2005	Bundesländer	SPS dynamic hybrid[8]	1 Ha	Tobacco (from 2006, 60%) Hops (25%) Protein crops, Dried fodder, Starch Potato, Nuts, Flax for fibre	-
Greece	2006	-	SPS historic	100 €	Seeds (100%) Citrus fruits intended for processing (from 2008, 60%) Tomatoes intended for processing (from 2008, 30%) Protein Crops, Rice, Durum Wheat (traditional areas), Nuts, Cotton, Dried fodder, Flax for fibre	10% of arable sector 10% of bovine sector 5% of sheep & goat 2% of tobacco sector 4% of olive oil sector 10% of sugar sector
Hungary	2004	-	SAPS	1 Ha or 0,3 Ha orchards and vineyards	Transitional soft fruit payments (from 2008, 100%) Separate sugar payments (100%) Separate F& V payments: tomatoes and other fruits (100%)	n.a.
Ireland	2005	-	SPS historic	100 €	Protein Crops, Dried fodder	-
Italy	2005	-			Tobacco (from 2006, 60% - Apulia, total decoupling) Tomatoes intended for processing (from 2008, 50%) Seeds (100%) Protein Crops, Rice, Durum Wheat (traditional areas), Nuts, Dried fodder, Flax for fibre	8% of arable sector 7% of bovine sector 5% of sheep & goat 8% of sugar sector 8% of energy crops
Latvia	2004	-	SAPS	1 Ha	Transitional soft fruit payments (from 2008, 100%) Separate sugar payments (100%)	n.a.

[8] Germany selected a regionalised dynamic hybrid model, which will evolve to a purely regional model by 2013. The evolution will start in 2010. In 2006, around 69% of the decoupled farm payments were paid as flat-rate regional payments and the remaining 31% were paid through historical payment.

Member State	Start SPS/SAPS	Regions	Implementation model	Minimum requirements	Sectors with coupled direct payments	Article 69 measures and part of the ceiling
Lithuania	2004	-	SAPS	1 Ha	Transitional soft fruit payments (from 2008, 100%) Separate sugar payments (100%)	n.a.
Luxembourg	2005	one region	SPS static hybrid[9]	100 €	Protein Crops, Nuts	-
Malta	2007	one region	SPS regional	0,1 Ha, 100 €	None	-
Netherlands	2006	-	SPS historic	500 €	Slaughter premium calves (100%) Slaughter premium bovine adults (100%) Seeds for fibre flax (100%) Starch Potato, Nuts, Dried fodder, Flax for fibre	-
Poland	2004	-	SAPS	1 Ha	Transitional soft fruit payments (from 2008, 100%) Separate sugar payments (100%) Separate F& V payments: tomatoes (100%)	n.a.
Portugal	2005	-	SPS historic	0,3 Ha	Suckler cow premium (100%) Slaughter premium calves (100%) Slaughter premium bovin adults (40%) Sheep and goat premium (50%) Tobacco (from 2006, 50%) Tomatoes intended for processing (from 2008, 50%) Seeds (100%) Protein Crops, Rice, Durum Wheat (trad. areas), Nuts, Dried fodder, Cotton	1% of arable sector 1% of bovine sector 1% of sheep & goat 10% of sugar sector 10% olive oil sector
Romania	2007	-	SAPS	1 Ha	Separate sugar payments (100%) Separate payments for tomatoes intended for processing (50%)	n.a.
Sweden	2005	Three regions (based on regional yields)	SPS static hybrid[10]	4 Ha, 100 €	Special male bovine premium (74,55%) Protein Crops, Starch Potato, Dried fodder	0,45% all sectors
Slovakia	2004	-	SAPS	1 Ha	Separate sugar payments (100%) Separate transitional payments for tomatoes intended for processing (50%) Separate F&V payments (67%)	n.a.
Slovenia	2007	One region	SPS regional	0,3 Ha / 100 €	Special male bovine premium (75%) Sheep and goat premium (50%) Hops (25%)	10% of bovine sector
Spain	2006	-	SPS historic	100 €	Suckler cow premium (100%) Slaughter premium calves (100%)	7% of bovine sector 10% dairy payments

[9] About 30% based on area and 70% on historical basis.

[10] 80% based on area and 20% on historical basis.

Member State	Start SPS/SAPS	Regions	Implementation model	Minimum requirements	Sectors with coupled direct payments	Article 69 measures and part of the ceiling
					Slaughter premium bovine adults (40%) Sheep and goat premium (50%) Arable crops (25%) Tobacco (60%) Citrus fruits intended for processing (from 2008, 100%) Tomatoes intended for processing (from 2008, 50%) Seeds (100%) Protein Crops, Rice, Durum Wheat (traditional areas), Nuts, Cotton, Dried fodder, Flax for fibre, Starch Potato	5% of tobacco sector 10% of cotton sector 10% of sugar sector
United Kingdom [11]	2005	England	SPS dynamic hybrid[12]	1 Ha, 200 €	Protein crops, Nuts, Dried fodder, Flax for Fibre	-
		Scotland	SPS historic	3 Ha, 100 €	Dried fodder, Flax for Fibre	10% of bovine sector
		Wales	SPS historic	1 Ha, 100 €	Dried fodder, Flax for Fibre	-
		Northern Ireland	SPS static hybrid[13]	100 €	Dried fodder, Flax for Fibre	-

Source: EU-DG AGRI D1

[11] The United Kingdom was the only Member State to implement the scheme separately on a regional basis in England, Scotland, Wales and Northern Ireland.

[12] In England the Single Payment was implemented within three defined regions: moorland within the Severely Disadvantaged Areas (SDA), non-moorland SDA and non SDA, with different flat rates applying in each of the three regions. There is a period of transition which will end in 2012. During this period, entitlements will be based upon a sliding scale of flat rate and historical payments: 2005: 10% Flat rate - 90% Historical; 2006: 15% - 85%; 2007: 30% - 70%; 2008: 45% - 55%; 2009: 60% - 40%; 2010: 75%; 25%; 2011: 90% - 10%; 2012: 100% - 0%.

[13] 20% on area basis, 80% on historical basis.

2.3 The Single Common Market Organisation

Regulation (EC) No. 1234/2007 establishes a legal framework that governs the internal market, trade with non-EU countries and competition rules for agricultural sectors. The «single CMO» Regulation was modified, following the CAP Health Check, by Council Regulation (EC) No 72/2009 of 19th January 2009[14].

The main measures of the Single CMO are:

- Market intervention for the following products: cereals, paddy rice, white and brown sugar, beef and veal, milk, butter, skimmed-milk powder and pig meat15.
- Special measures of an exceptional nature, namely the financing of half of expenses incurred by Member States in the event of animal diseases and loss of consumer confidence. Some sectors (cereals, rice and sugar) benefit from specific measures. In some sectors (in particular nursery plants, beef and veal, pig meat, sheep and goat meats, eggs and poultry), Community measures may be adopted to encourage the adaptation of supply to market needs.
- Quota systems and production potential: sugar, milk and potatoe starch. The Regulation defines the methods for transferring national quotas among holdings and the management of surplus production. This includes, among other things, levies collected from producers by Member States.
- Aid schemes for the following processing and production activities in the following sectors: dried fodder and flax/hemp grown for the production of fibre, production of starch and sugar; milk and dairy products, hops, olive oil and table olives, fruit and vegetables and apiculture products; silk culture, wine; and for tobacco through the Community Tobacco Fund.
- Marketing and production: the Commission may establish marketing rules for the sale of olive oil and table olives, fruit and vegetables, bananas and nursery plants. Specific marketing rules are established for the marketing of fruits and vegetables, some types of beef products and wine. Other specific rules may also be introduced for milk and dairy products, fats, eggs and poultry meat, hops, olive oils and olive cake, cheeses and ethyl alcohol. The Regulation defines the methods of adoption, application and exceptions.
- Producers' and inter-branch organisations may be set up in the hops, olive oil and table olives, fruits and vegetables and silkworms sectors. Inter-branch organisations bringing together representatives of economic activities tied up with production, commerce and/or product processing may be created in the olive oil, table olives, tobacco and wine-growing sectors. Certain conditions must be met before these organisations can be formed.

With regard to trade with non-EU countries, in principle all charges having an effect equivalent to a custom duty and all quantitative restrictions or equivalent measures are prohibited in trading with non-EU countries.

- Imports: the Commission may require the presentation of import certificates for products in certain sectors: cereals, rice, sugar, seeds, olive oil and table olives, flax and hemp, fresh and processed fruit and vegetables, bananas, nursery plants, beef and veal, pig meat, sheep and goat meats, poultry, milk and dairy products, eggs and ethyl alcohol of agricultural origin. Import duties of the common customs tariff apply to products covered by the Single CMO, although special provisions are in place for some products (e.g.cereals, rice, fruit and vegetables). Moreover, in some cases, these duties may be suspended, or additional duties may be applied.

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[14] OJ L 30, 31.01.2009, p. 1

[15] Regulation (EC) no 72/2009 reduces to zero the quantitative ceiling of intervention for durum wheat and rice. Intervention has been stopped in the case of pig meat.

Import tariff quotas are managed by the Commission and administered in such a way as to avoid discrimination and give due weight to supply requirements and the equilibrium of the market.

- Special provisions are applied the classification and the establishment of the import duty for the imports of mixed cereals, rice or cereals and rice. Besides, specific provisions apply for the imports of sugar, and some import conditions are fixed for hemp, hops and wine.
- The Commission may also take further protection measures for imports such as saveguard measures. In some cases, it may also suspend recourse to inward processing for products in the following sectors: cereals, rice, sugar, olive oil and table olives, fresh and processed fruit and vegetables, beef and veal, milk and dairy products, pig meat, sheep and goat meats, eggs, poultry and ethyl alcohol of agricultural origin.

- Exports: the Commission may require the presentation of export certificates for products in certain sectors: cereals, rice, sugar, olive oil and table olives, fresh and processed fruit and vegetables, beef and veal, pig meat, sheep and goat meats, poultry, milk and dairy products, eggs and ethyl alcohol of agricultural origin.
  - The exporting of some products may be supported by export refunds that cover the difference between world market prices and those of the EU. Special provisions govern export refunds for malt in stock, cereals and beef and veal. Pursuant to international commitments, rules on exports are also established.
  - The management of export quotas in the milk and dairy products sector and special import treatment involving export to non-EU countries are also regulated. In some cases the Commission may suspend recourse to inward processing for products in the sectors: cereals, rice, fresh and processed fruit and vegetables, beef and veal, pig meat, sheep and goat meats and poultry.

2.4 EU Rural Development Policy

The 2003 reform of the CAP also brought about a review of the EU rural development policy, which was reinforced and given extra financial resources and new measures designed to promote the environment and animal quality and welfare and help farmers to apply Community production rules as from 2005.

Agenda 2000 had already changed the existing approach and introduced a sustainable integrated rural development policy that guaranteed greater consistency between rural development (the second pillar of the CAP) and price and market policies (first pillar of the CAP). This approach was defined by Council Regulation (EC) No 1257/1999, regulating the programming period 2000-2006[16].

Regulation (EC) No 1257/1999 encompasses nine distinct actions, many of which already performed in the past (the first rural development measures dating back to 1972) and often modified, with a variable percentage of Community funding according to the type of measure and geographic location:

- investments in agricultural holdings;
- setting up aid to facilitate the establishment of young farmers;
- support for vocational training;
- support for early retirement from farming;
- compensation for naturally less favoured areas (LFA) and for areas with environmental restrictions;

[16] This evaluation covers two periods of rural development policy programming: 2000-2006 and 2007-2013.

- support for agricultural production methods designed to protect the environment and to maintain the countryside;
- investments to improve processing and marketing of agricultural products, thereby increasing the competitiveness and added value of such products;
- support for forestry, contributing to maintenance and development of the economic, ecological and social functions of forests in rural areas;
- support aimed at promoting the adaptation and development of rural areas.

Following the regulation of Structural Funds (Regulation (EC) No 1260/1999), the source of Community funding for rural development measures differed according to the concerned geographical areas:

- in objective 1 regions, they were integrated with measures designed to promote regional development, to be financed by the EAGGF – Guidance Section;
- in objective 2 zones, they accompanied support measures and were charged to EAGGF – Guarantee Section;
- in the rest of the territory, they had to be integrated with the programming of rural development plans (except for «accompanying measures», which were financed by the EAGGF – Guarantee Section in the whole of the Community).

Also worthy of mention is the Community initiative Leader +, financed by EAGGF Guidance Section, which encouraged the implementation of integrated local development strategies.

The 2003 reform increased the importance of the role of rural development, conceived as an instrument aimed at the restructuring of the agricultural sector and promotion of diversification and innovation in the rural context. Council Regulation (EC) No 1698/2005 of 20 September 2005 concerning support for rural development by the European Agricultural Fund for Rural Development (EAFRD)[17], following the conclusions of the Council meetings of Göteborg and Lisbon, set in motion the new phase of rural development policy for the period 2007-2013, with the support and integration of market policies and of direct payments under the 1st pillar.

The primary change relates to the strategic approach: according to strategic guidelines drawn up by the Council in Council Decision 2006/144/EC of 20 February 2006, each MS has defined a National Strategic Plan that is the reference instrument for preparing the Rural Development Programme(s).

Regulation (EC) No 1698/2005 requires that Programmes centre on three themes: improving the competitiveness of the agricultural and forestry sector, improving the environment and the countryside, improving the quality of life in rural areas and encouraging diversification of the rural economy (plus a methodological theme dedicated to the Leader initiative).

Following the Health Check, Council Decision 2009/61/EC of 19 January 2009, amending Decision 2006/144/EC, modifies, in view of the new challenges for European agriculture and in accordance with article 16b of Regulation (EC) No 1698/2005, the priorities of the Community on the issues of climate change, renewable energies, water management, biodiversity and the restructuring of the dairy sector.

[17] Lately amended by Council Regulation (EC) No 74/2009 of 19th January 2009 and Council Regulation (EC) No 473/2009 of 25th May 2009.

3. THEORETICAL ANALYSIS

This part of the report presents the theoretical analysis. The main objective of this section is to provide a general theoretical framework useful to analyse the role of direct payments in sustaining and stabilising the income of farmers. This provides the basis on which the empirical assessment and other analytical approaches implemented to provide answers to the evaluation questions are developed. The complexity of the topic requires the analysis to be developed according to various levels that are considered in the following paragraphs.

The next section explores the issue of the rationale for agricultural policy sustaining and stabilising income. This is done considering first the problem of income disparities between farm and non-farm sectors (section 3.1.1) and then the problem of intra-sector income differences (section 3.1.2).

Section 4.2 develops the discussion regarding the impact of direct payments on the level and the stability of farm income and on resource allocation. First, some preliminary notions regarding farm income in different farm types are presented. Second, the discussion about the role of direct payments is developed more formally by considering their effect on income level and on the choices regarding the use of resources. This is done by considering first farm enterprises where most of the work is provided by external labour (i.e. non-family farms). The analysis is then extended to the case of farms where a relatively large amount of labour is supplied by the farm manager and his/her family (i.e. family farms). In this latter case, the analysis relies on a simple household model to explore: a) the role of off-farm labour allocation in the generation of farm household income; b) the relationship between farm household income and resource allocation; c) the causes of income disparities between farm and non-farm households.

The analysis is carried out by assuming certainty. However, some considerations on the role of direct payments under uncertainty are provided in section 3.3.

Section 4.4 introduces another policy relevant topic: the consequences of agricultural policies for income distribution. This refers to the fact that a policy can affect not only the level of farm income, but also the way in which income is distributed among production factors.

Section 4.5 analyses the main criteria that can be used to evaluate the role of direct payments as an instrument to supporting and stabilising income. This is done by considering the concepts of fairness, equity and income transfer efficiency. Potential problems regarding the definition and the measurement of some of these concepts are also considered.

3.1 The rationale for agricultural policy in support of income levels and stability

3.1.1 The « farm problem »

The agricultural sector is described by the literature as affected by the so called “farm problem” (Gardner, 1992), i.e. a situation of low and unstable incomes (Schultz, 1945) and low rates of return on farm resources Tweeten, 1971). The farm problem is identified by two conditions:

1. Limited amount of resources and, in particular, limited endowment of capital: This condition is very common in small family farms and contributes to low income levels (in absolute terms). This situation can be the primary cause for exiting the farming sector. However, another possibility for these farms is to find off-farm sources of income for the available family labour. In this case, the farm household income is generated by both on- and off-farm activities.
2. Low rate of return on farm assets: A low rate of return on farm resources results when the income generated by the farm activities is limited if compared to the amount of available resources. This

result - concerning the relative, rather than the absolute level of income - has been explained by two main reasons (Gardner, 1992):

a) the specific conditions of the markets for farm product;
b) the characteristics of the markets for the factors used by the farm sector.

The market of farm products are often characterised by very inelastic demand and supply. Therefore, any change in supply or demand generate large changes in product prices and, therefore, farm income instability. Furthermore, these markets are characterised by slow demand increases coupled with fast supply increases.

The supply increases are mainly driven by technical changes that have often been strongly orientated towards labour-saving technologies. These phenomena have caused a negative trend in real product price levels and, thus, a negative effect also on farm income. However, this has also generated a strong incentive towards structural adjustment of the farm sector. In terms of labour use, this has driven some farmers to stay on-farm but work also off-farm (part-time farming) or to abandon agriculture. Indeed, the post-war period has witnessed a reduction in the number of farms and in the number of people employed in the farm sector, and an increase of the share of farms managed on a part-time basis (Eurostat, 2007; 2010). The role of off-farm labour in generating farm household income and in modifying resource allocation is analysed in section 3.2.3.2.

The continuous relatively low farm incomes have been traditionally explained by a lack of mobility in the factor markets. This phenomenon has been related to the presence of adjustment costs in labour movements and of fixity and irreversibility of agricultural investment (Gardner, 1992). Adjustment costs in labour movements can be high when the human capital used in agriculture is specific to this sector and it is costly to shift it to other sectors. The fixity and irreversibility of agricultural investment have been explained by the fact that agriculture is characterised by the use of many assets (e.g. specialised machinery), whose disposable value is much lower than the acquisition value. While farmers make the decision to undertake an investment by comparing the expected returns to the cost of acquiring the asset, once the investment is made, they maintain the asset until the expected returns fall to the disposal value. However, while these factors can surely explain a short run disequilibrium in the factor markets, it is still debated if these can also fully explain the continuous relatively lower incomes in the farm sector in comparison to other sectors (Gardner, 1992).

3.1.2 Intra-sector income differences

The problem of low and variable farm incomes has been one of the main reasons for providing public support to the farm sector. The support provided by agricultural policy generally increases the amount of total farm revenues, for example, by enhancing the level of agricultural product prices or by granting direct payments to eligible farmers. However, it is important to underline that income levels differ among individual farms. Empirical evidence shows that farm income level varies widely among EU farms according to: the region in which they are located, their production patterns, farm size, etc (EC, 2006b). This suggests that the need for income support policies is rather differentiated inside the whole farm sector.

Further empirical evidence shows that the distribution of direct payments among EU farmers is relatively concentrated: according to a study carried out by the EC on FADN farms (EC, 2008a), 20% of these farms received 76% of the direct payments recorded in this database in the 2006, whereas around 15% of FADN farms did not benefit from any EU direct payments. Similarly to the case of income levels previously illustrated, the level of direct payment per farm also appears to be influenced by the region where the farm is located, the type of products and the farm size (EC, 2008a).

These two bodies of empirical evidence suggest that there is scope for investigating the role played by direct payments in sustaining farm income. The rationale for evaluating income objectives of EU

agricultural policies has become more and more evident because of two key changes occurred in the last two decades.

On the one hand, because CAP has moved from price support policies to direct payments, the transparency of transfer has dramatically increased. Furthermore, direct payments account for a large share of the CAP overall budget. Therefore direct payments are under the scrutiny of both the general public and taxpayers who are interested to know who receives such payments.

On the other hand, there has been a strong increase in the relative importance of agricultural policy objectives not linked to agricultural production such as, for example, the provision of public goods or the reduction of income inequality. However, the current distribution of direct payments has been strongly affected by the way the support provided by previous policy instruments (e.g. price support) was distributed among EU farms in the past. Therefore, it is relevant to investigate whether the current distribution of direct payments is coherent with the new policy objectives including the reduction of income inequalities in the EU farm sector.

3.2 The effect of direct payments on farm income level and stability and on resource allocation

3.2.1 Farm incomes in different farm types

The level of farm net value added is important because it represents the ability to remunerate all resources used in farm activities. In particular, a high level of value added allows for high remuneration of such resources. However, not all the resources used on a farm are owned by the farm holder because some factors are purchased from the market (i.e. external factors). In this case, the specific farm income refers to the remuneration only of own resources deducting the cost of external factors.

In this respect, the organisational structures of EU farms vary widely, not just in terms of the relative importance of own vs. external production factors, but also in terms of the kind of own production factors used on the farm such as, in particular, labour and capital. An important and currently used distinction is made between family and non-family farms.

The term non-family farms generally refers to farm enterprises where most of the work is provided by external paid labour. In this case, own resources mainly refer to capital and the main focus of the farm management is on the returns on own capital including land. While this group of farm is important in the EU because they account for a relatively large share of EU production, their number is not so large as that of the so called family farms that represent a large share of the EU farms[18].

Family farms can be generally described as farm enterprises where a relatively large amount of work is supplied by the farm manager the and members of his/her family. In this case, the management is focused on the returns on both own labour and own capital. Family farms can be further subdivided into two main types:

- In relatively large family farms, most of the family labour is used on-farm and in this case a large share of farm household income is generated by farm activities. This is typically the situation of full-time/professional family farms.
- In relatively small family farms, only a small share of the labour provided by the farmer and his/her family is used on-farm. In this case, often referred to as part-time farming, the farm household income is generated by both farm and off-farm activities.

[18] The relative importance of family and non-familiy farms varies across EU Member States.

In all types of family farms, the choice regarding the use of own labour is very important as considerations on alternative allocation of working time on- or off-farm are made. The alternative allocation of family labour inputs can be examined by means of household models, as it will discussed in subsequent sections of this chapter.

The following sections analise the role of direct payments on farm income level. Direct payments increase farm returns and, in this way, the remuneration of all factors used on the farm including own resources. The analysis focuses first on non-family farms and then on family-farms.

3.2.2 The role of direct payments in non-family farms

Direct payments increase the returns on all resources used on a farm including own factors. In non-family farms, direct payments increase the returns on own capital. If the flow of revenues generated by direct payments is more stable than the revenues coming from farm sales, direct payments stabilise farm income.

In turn, both effects (i.e. increasing returns and more stable revenues) influence investment decisions, as they provide an incentive to increase on-farm investments, as opposed to a counterfactual situation of absence of direct payments. However, the nature of direct payments affects the way these investments are realised as well as farm production decisions.

When direct payments are coupled to production levels, they provide an incentive to increase the level of production of those activities that receive such payments. This is obtained by increasing the use of resources (e.g. land) in those specific farm activities. In this case, direct payments distort production decisions that are now influenced by the relative level of the unitary coupled direct payments granted to the different activities. The distortionary nature of coupled payments generates some indirect costs for farmers that, in order to receive more direct payments, may forgo some of the income that would otherwise be obtained in the absence of direct payments. This happens for two main reasons:

- direct payments can provide an incentive to use more of the own resources on the farm thus reducing the returns that could be generated by using them in non-farm uses19;
- direct payments linked to a limited group of farm activities provide an incentive to allocate a larger share of the available resources to these activities. This generates a decline in the income generated by other activities.

Note that such a behaviour is fully rational because by behaving in this way, farm managers increase farm income. However, this has negative consequences on the share of net benefits they enjoy due to direct payments: only a share of the received direct payments is transformed in additional income. This topic, that is referred to as the efficiency of transfer from direct payments, is further developed in section 3.5.4.

When direct payments are fully decoupled from production levels, these should not have any impact on farmers behaviour in terms of production choices and on-farm use of resources. However, decoupled payments provide a support for maintaining farm activities that allow the farmers to access the payments. Therefore, decoupled payments may alter the long-term decisions relative to the amount of resources (noticeably capital) to be used on- *vs.* off-farm. This discussion is more articulated in the

[19] When direct payments are granted only for a group of farm activities, it is not possible to identify from a theoretical point of view what their impact on the overall use of resources would be at the whole farm level. In this case the question should be investigated empirically. For example, if coupled payments are granted for relatively less labour-intensive activities, this may lead to a decline in more labour-intensive farm activities. Therefore, the use of labour at the whole farm level could decrease.

case of family farms where decisions also concern labour time allocation between on- and off-farm uses.

3.2.3 The role of direct payments in family farms

This paragraph uses a basic and simplified household model to develop the theoretical analysis. In the first part of the paragraph, this is used to discuss some basic concepts regarding:

- the differences between farm income and farm household income;
- the main determinants of farm household income;
- the possible causes of income disparities between farm and non-farm household income levels;
- the relationship between income and resource allocation in a farm household.

The second part of the paragraph uses the same model to discuss the potential effects of direct payments on both income level and resource allocation. A subsequent section extends the discussion to the role of direct payments under uncertainty conditions.

The analysis is based on a graphical representation of farm household choices in terms of labour allocation (Lee, 1965; Schmitt, 1988) assuming, for the moment, that no policies are in place. First, the case of a farm household where no family members work outside the farm is considered. This can be seen as the case of a farm that, being large enough, is organised as a full-time or professional farm but also the case in which the economic environment and the quality of resources is such as to prevent the use of family labour off-farm. Second, the case of a farm household where family members work both on and off the farm is illustrated. This may happen because the farm is not large enough and it is managed as a part-time farm. Section 3.2.4 explicitly considers the impact of both coupled and decoupled direct payments.

The graphical depiction of the farm household model draws on presentations in articles by Lee (1965), Schmitt (1988) and Dewbre and Mishra (2002). The model is based on the idea that the household makes decisions, as a family, on how much money to spend on consumption and on how much of the total available time has to be spent at work and how much at leisure in order to maximise total household utility. The model has a short-term nature, therefore the structural characteristics of both farm and farm households are maintained constant. Some considerations on the likely effect of policy support on the structural adjustment of the farm sector are also provided in section 3.2.4.

The farm household problem can be simplified as to maximise utility due to income (Y_T) and leisure time (T_L). This is done by selecting the amount of total available time to spend working or not. The utility level increases if income (leisure time) increases keeping leisure time (income) constant. Therefore, higher iso-utility (or indifference) curves refer to higher utility levels (see Fig. 1).

Further assumptions regarding the farm household model used in the analysis

When deciding how to allocate time to on-farm work, off-farm work and leisure, the farm household confronts three kinds of constraints. First, it cannot spend more money on consumption goods than the money income it receives. Second, it cannot spend more time in work and leisure than is available.

Third, it is assumed that farmers confront perfectly competitive output and input markets: in this way neither the price they receive for their output nor the prices they pay for purchased inputs vary with quantities produced or purchased respectively. Fourth, when off-farm labour opportunities are present, off-farm wage earned is independent of the amount of time family members spend in off-farm work. Finally, all values considered in the models are certain, therefore, no risk considerations are relevant. The role of direct payments under uncertainty conditions is developed further in section 3.3.

Note that, while the graphs explicitly depict only family labour allocation, they do implicitly account for changes in the level and composition of farm output (e.g. changes in production patterns) and variable inputs (e.g. changes in hired labour, contract work and intermediate inputs such as fertilizers and water). It can be assumed that the use of variable inputs changes depending on the amount of family time spent on-farm, according to a farm profit-maximizing behaviour. The graphical representation refers only to the use of labour because the use of all other variable inputs (i.e. non-labour inputs) cannot be explicitly represented graphically.

In the first instance, the household model is used to show the generation of income and resource allocation. This is done by considering both the cases of farm households with and without off-farm labour income. Subsequently, the role of direct payments is considered by building on this conceptual framework.

3.2.3.1 No off-farm income – Full time/Professional farms

The graph in Fig. 1 represents the optimal allocation of time, the level of income and utility for a representative farm household. The horizontal axis shows the use of the available time (T) for working (T_W) or for leisure (T_L).

When read from left to right, it measures the amount of time spent working: zero hours on the extreme left to a maximum of T hours on the extreme right. Correspondingly, when read right to left that axis measures time spent at leisure, such that at the extreme left all time is spent in leisure.

The vertical axis refers to total household income (Y_T). Increasing income increases expenditure and, in this way, utility level. The net earnings from farming are represented by the Income Possibility Curve that is dictated by several factors including the relative prices of farm outputs and inputs and the technical relationships embodied in the farm production function. The Income Possibility Curve shows the maximum amount of income that corresponds to a certain level of labour and is strongly affected by diminishing marginal factor productivity of farm household labour. In fact, it increases with the use of labour for on-farm activities but at a declining rate because of declining marginal productivity of labour on-farm. The slope of the Income Possibility Curve is given by the Marginal Value Product of labour on-farm (MVP_F).

The total income (Y_T) is given by the sum of income from farming and non-labour income: $Y_T = Y_F + Y_O$, where

- YF is defined as “Farm labour income” and represents agricultural work carried out on the farm;
- YO is defined as “Non-labour income” and includes retirement income, dividends, interests, rents and the remuneration of family assets used in farm activities.

In the case represented here, the only remunerative activity is farming. In this case:

- farm household income is equal to farm income;
- the choice variable is the amount of time spent working on-farm (TF) with leisure time obtained as a residual (i.e.: TL = TT - TF).

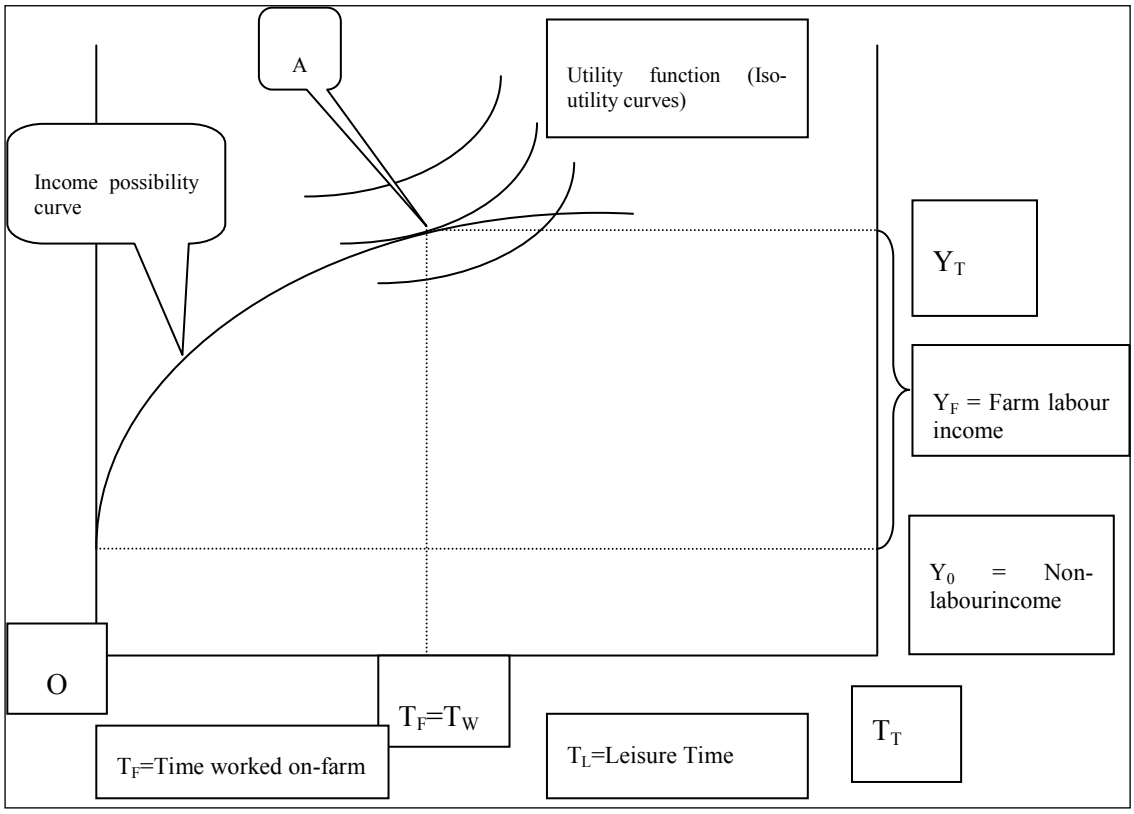
The case represented here (when the only activity considered remunerative is farming) can be generally applied to the case of large professional farms that are able to remunerate all active family resources by using their time just on the farm. In fact, when a family owns a farm that has a large enough endowment of capital (i.e. large farm), the farm Income Possibility Curve is very high. In this case, even if off-farm activities are available, they provide a return that (in the relevant range of time available for working) is always lower than the one earned on-farm. Note that in this case, the income

of the farm household is expected to be higher than a comparable (i.e. same family size and labour skills) non-farm household.

However, a very different situation could occur in a farm with limited endowment of capital (e.g. small farm) where, (for example, because there are no alternative employment opportunities outside the farm), household available time cannot be allocated to off-farm economic activities. In this case, it is very likely that farm-household income will be lower than the one of a comparable (e.g. same family size and labour skills) non-farm household. In such a case it would be very likely to find low rate of return on farm resources.

This situation could be modified if it would be possible to use the available time for both on and off-farm work by managing the farm on a part-time basis. The next section considers this case.

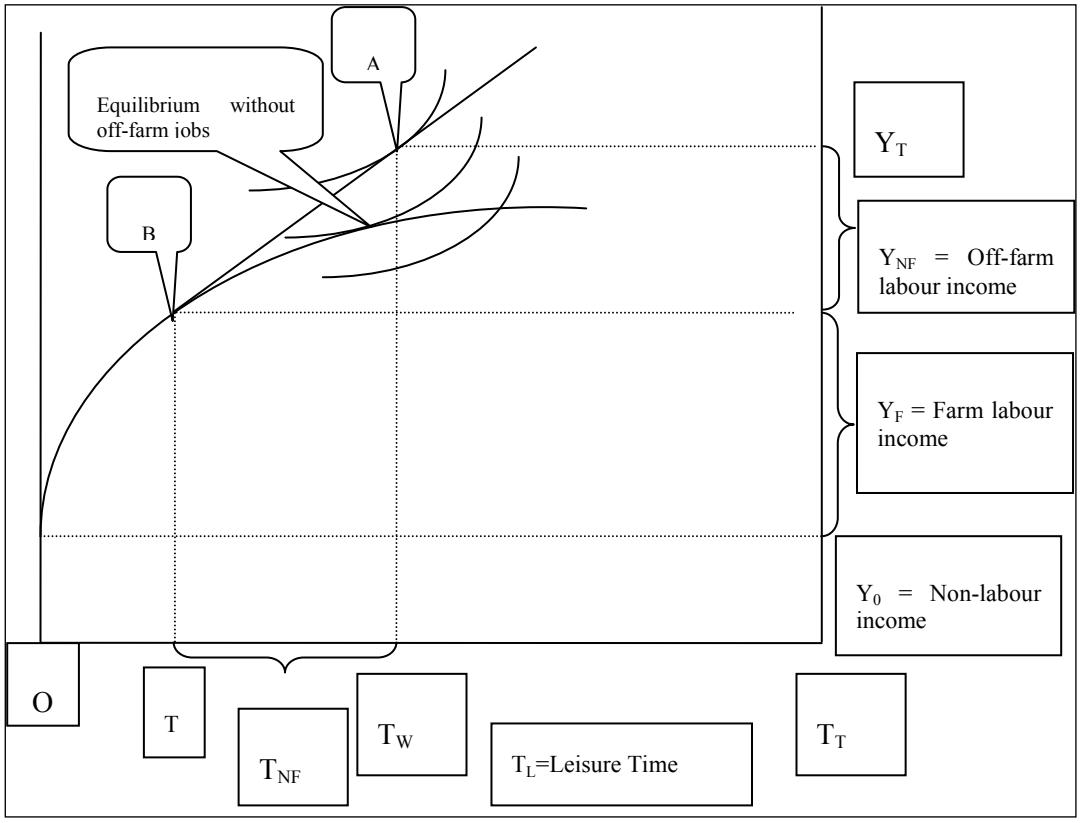
Fig. 1 - Farm household with on-farm labour and income only



3.2.3.2 Off-farm income – Part-time farms

In the graph of Fig.2, the farm household also presents some off-farm labour and income. In this case, labour is used on the farm but also outside the farm (i.e. farm and non-farm activities). Such a situation is similar to the one faced by a typical part-time farm. In this case, the household must also decide how much of the total work time (T_w) to devote to on-farm (T_F) *versus* off-farm work (T_{NF}) on the basis of the following equality: $T_w = T_F + T_{NF}$.

Fig. 2 - Farm household with on- and off-farm labour and income



Comparing this situation (Point A in the graph of Fig. 2 with the one where no off-farm work is considered (Point A in the graph of Fig. 1) shows that less labour is allocated to farming and some of the time is spent on off-farm activities. Each time unit earns a wage rate that determines the slope of the final section of the new income possibility curve. At point A, the Marginal Value Product of labour on-farm is equal to the wage rate (WR) for off-farm activities. From point B, it becomes more convenient to work off the farm because the Marginal Value Product of labour on the farm is lower than the Wage Rate (MVP < WR).

In this case the total income (Y_T) is given by the sum of farm labour income, off-farm labour income and non-labour income ($Y_T = Y_F + Y_{NF} + Y_O$). It is important to note that the opportunity to work off-farm increases the total farm household income and provides a way to reduce income inequalities between farm and non-farm households when they exist, as it is the case mentioned earlier.

This leads us to wonder what can be the reasons causing the income level of farm households being lower than the one of non-farm households. One reason could be found in the fact that the former group can have less off-farm opportunities than the latter group of households. This can be the case when farm families are located in remote and more economically depressed areas than non-farm households or when farm households' labour resources have a low level of skills and, therefore, access to low wage rate employment. A further reason is that, in some farm households, labour allocation is biased towards on-farm labour uses because of non-wage considerations such as the existence of in-kind sources of income and a favourable taxation regime (Gardner, 1992).

The analysis has clearly shown that farm household income level depends to a large extend on the resource allocation between on and off-farm employment. In turn, resource allocation is influenced by internal and external factors that also drive farm structural adjustment. For example:

- A decline in farm product prices shifts the farm income possibility curve inwards. This reduces both farm income and the amount of time spent to work on the farm.

- Farm structural characteristics (e.g. size) influence the position of the income possibility curve and, in this way, the choice of working outside the farm. In general, small farms are more likely to manage their farm part-time and allocate time to off-farm employment.
- Technological change can improve farm productivity: this shifts the farm income possibility curve outwards. However, when the new technologies are labour saving, a greater amount of time can be allocated to off-farm work. The final outcome in terms of time allocation between on and off-farm work cannot be determined on this qualitative basis.
- Increasing off-farm labour opportunities (i.e. wage rates) provides an incentive to increase the amount of time spent working off-farm.

The effects of most of those factors are: increasing the share of off-farm labour and income (increasing part-time farming) and, in some cases, abandoning farming (reducing the number of farms).

Empirical evidences witnessed that these are two of the most important changes in the structure of the EU agricultural sector. Recent studies carried out by the European Commission have found that:

- more than one third of EU 27 family farms and farming households carry out another gainful activity (EC, 2008b);
- the process of structural adjustment of the EU agricultural sector is characterised by a continuous decrease in farm numbers, workers and agricultural land (Eurostat, 2007; 2008; 2009);
- pluri-activity is mainly a feature of small farms (EC, 2008b).

3.2.4 Effects of coupled and decoupled direct payments on farm income, farm household income and resource allocation

The focus of the evaluation is on direct payments. Therefore here we refer only to this kind of policy instruments: other policies, such as rural development policies, are not considered explicitly here but just mentioned when relevant.

The household model can be used to evaluate the impact of direct payments on farm income, household income, resource allocation and structural adjustment of the considered farm. Note that direct payments, by supplementing farm revenues, have the effect of increasing farm income and, thus, the income of those managing the farm. This is true for all types of farms, family and non-family farms. However, in the case of family farms, direct payments could directly induce a greater use of the available family working time in farming activities..

The graphical representation explicitly refers only to the use of labour input. Similar considerations could be made for other variable production factors such as, for example, temporary workers, contract work and other inputs.

The impact of direct payments differs, depending on whether these are coupled to production or decoupled. Therefore, the case of coupled payments is treated first and separately from that of decoupled payments.

The case of Coupled Direct Payments (CDP) is depicted in the graph of Fig. 3. These payments shift the income possibility curve outwards (blue curve), increasing farm income and, as a consequence, also household income. Therefore, direct payments can reduce the gap between the income of those engaged in farm activities and the income of non-farm population , if the former is lower than the latter.

The increase of farm income occurs because direct payments add to farm revenues. However, by being coupled to production, they provide an incentive to increase farm production and the use of resources

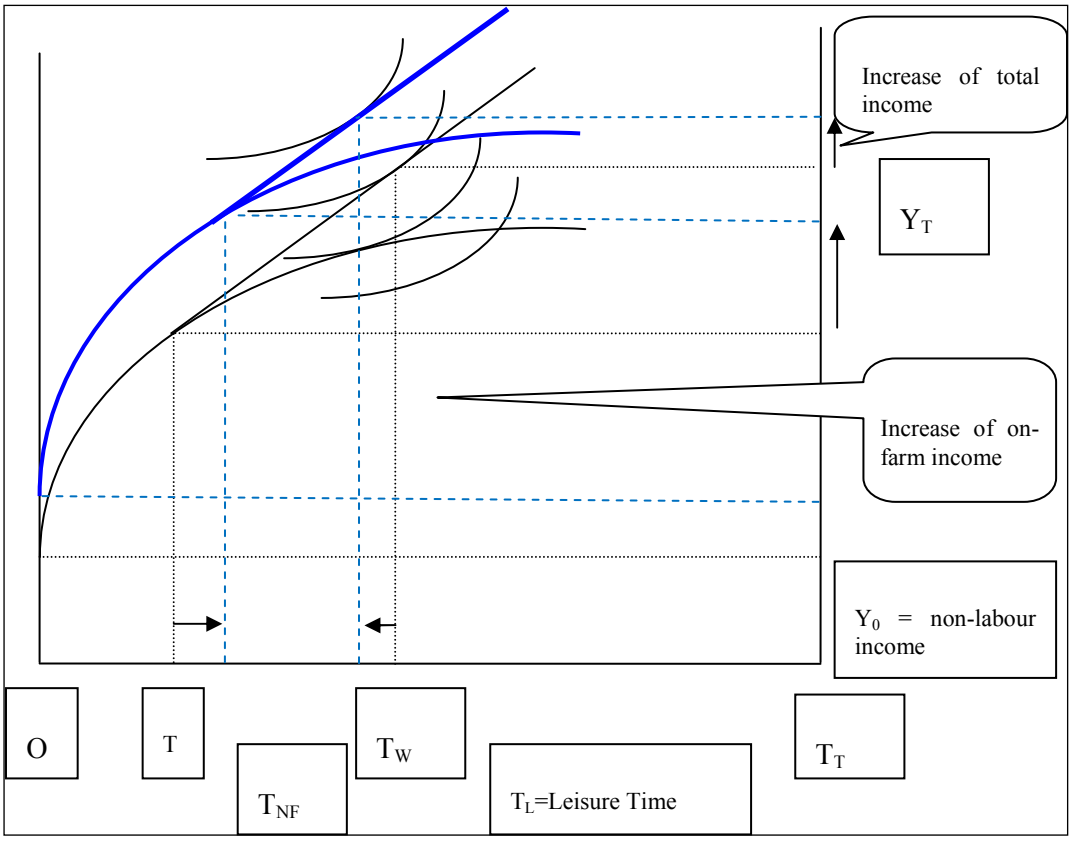
on the farm. In the case of family farms, this provides an incentive to increase the time spent working on the farm. This latter effect shows the distortion generated by this kind of payments, which is due to two different factors, as coupled payments alter:

- the on-farm allocation of resources, in other words, they provide an incentive to use a larger share of resources on the activities that benefit from the payments;
- the on/off-farm allocation of resources, increasing the use of inputs on-farm. This is particularly evident in the case of family farms because they push farm household members to work more on-farm and to reduce the amount of time spent off-farm. This latter factor causes the family to forgo part of the off-farm labour income.

This means that, in the end, only part of the direct payment translates into additional income because part of the payment is needed to compensate for the efficiency loss (e.g. reduction of farm gross margin) caused by the change in resource allocation due to the distortionary nature of the coupled payment This outcome is shown by the graph in Fig. 3, where the increase of on-farm work income is greater than the increase of total income.

The effect of coupled direct payment shown in the graph refers only to the short term. However, coupled payments can have long run effects too. In particular, because these payments stimulate resource use on the farm, they may alter the farm structural adjustment process slowing down the exit of resources from on-farm uses or increasing their accumulation. This implies that the support provided by the policies could have consequences on the long-run viability of the farm sector. Indeed, support could encourage uncompetitive farms to stay in the sector even if they are not competitive without support. This can have the indirect effect of limiting the potential for increasing the farm size of competitive farms. In turn, this may reduce the income that could be potentially generated by each farm in the sector.

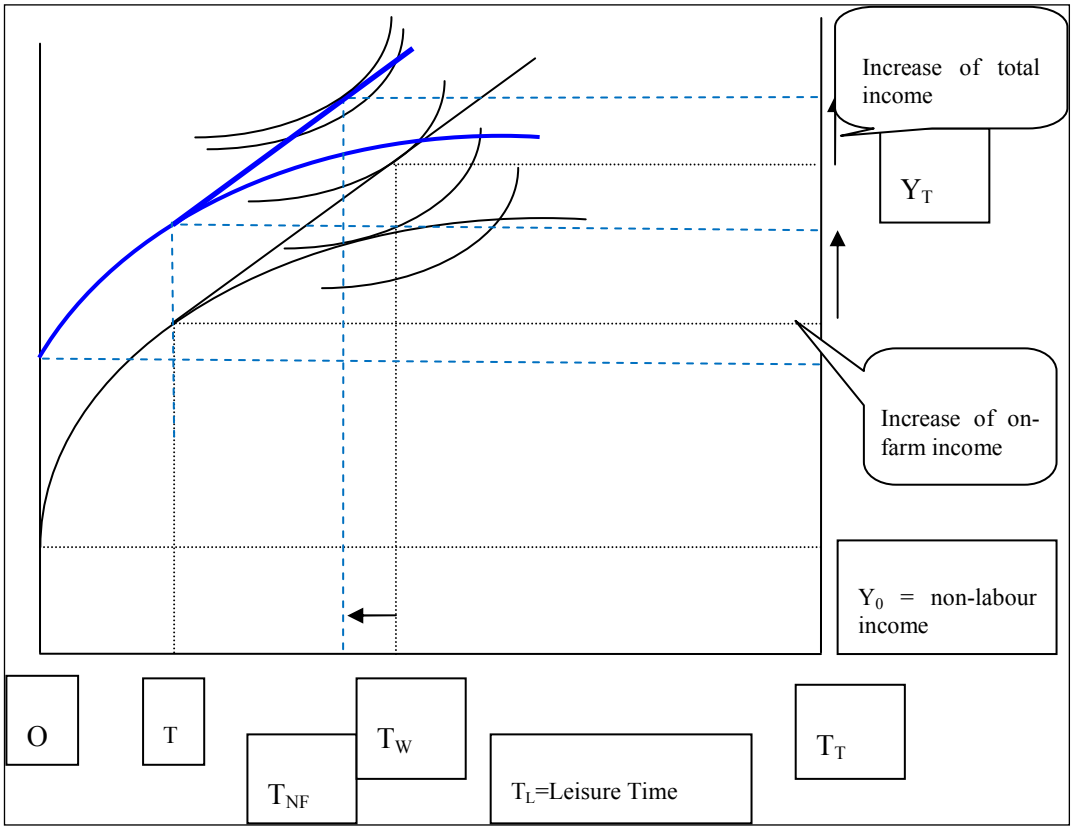
Fig. 3 – Effects of coupled direct payments on farm income, farm household income and resource allocation



Decoupled direct payments (graph in Fig. 4) change the position of the Income Possibility Curve (blue lines) even if this change differs from the one observed in the case of coupled payments. Whilst decoupled payments increase household income (in comparison with no policy at all), they affect resource allocation less than coupled payments because they distort only the on/off-farm allocation of resources:

- they have a negligible impact on the on-farm allocation of resources: payments are not coupled to the level of production of a particular farm activity;
- because of the income enhancing nature of the policy, direct payments may act as an incentive to increase leisure time, thus reducing the amount of time worked off-farm. Therefore, in this case too, part of the off-farm income is forgone, even if the impact of decoupled payments is expected to be less pronounced than that of coupled payments.

Fig. 4 – Effects of decoupled direct payments on farm income, farm household income and resource allocation



3.3 Direct payments under uncertainty

So far, direct payments have been considered in a deterministic context where no risk considerations are made. However, in an uncertain world, risk considerations can affect household decisions and its income level. In particular, while some risks are common to all businesses, risks that affect agriculture are more specific (OECD, 2009):

- Production risks: weather conditions, pests, diseases;
- Ecological risks: production, climate change, management of natural resources;
- Market risks: output and input price variability, relationship with the food chain with respect to quality, safety and so on;
- Regulatory or institutional risks: agricultural policies, food safety and environmental regulations.

This often makes farm activities relatively more risky than off-farm activities. When this is the case, farm households tend to increase the off-farm work participation (Mishra and Hothausen, 2002). Furthermore, looking at on-farm resource allocation, when some farm activities are more risky than others, there is a tendency to reduce the size of the former and to use risk management strategies such as on-farm diversification (Moschini and Hennessy, 2001).

Under uncertainty and when the farmer is risk averse, direct payments (as well as other government schemes) cause two main additional effects other than those already discussed for the deterministic case:

- Wealth effects: Payments affect the total wealth of the farmer and this change in wealth can affect the farmers' attitude to risk (Hennessy, 1998)20. In this case, the increase of wealth caused by the payment allows farmers to take more risk than before and, generally, to produce more (OECD, 2009).
- Insurance effects: If the payment is correlated to the farm revenues or income (net of the payment), the payment can affect the degree of risk faced by the farmer. For example, if payments increase when product prices decrease, payments compensate for the change in price. This reduces the degree of risk faced by farmers (OECD, 2009).

Note that the latter effect should be less relevant for the CAP direct payments given that they do not vary with the level of prices of agricultural products.

Furthermore, if direct payments are less variable than income without payments, the behaviour of risk-averse farmers could be affected in terms of (Mishra and Holthausen, 2002):

- on-farm and off-farm diversification: direct payments would cause a less diversified production pattern with an increased importance of activities enjoying coupled direct payment;
- on/off farm resource allocation: direct payments would cause an increase of on-farm use of labour and of other resources.

As seen before in the absence of uncertainty, decoupled payments do not affect on-farm resource allocation as much as a coupled payments. However, decoupled payments may influence the on/off-farm resource allocation due to the wealth effect, because this kind of payments increases farmers' revenues and wealth. Furthermore, they reduce the variability of total farm revenues and the degree of risk faced by the farmers, possibly allowing them to undertake riskier activities (depending on their level of risk aversion).

3.4 Consequences of agricultural policy for income distribution

Changes in policy can affect the absolute level of income but also the way this is distributed among production factors. The distribution of income among factors can be quantified by calculating factor income shares where the income share of one factor can be defined as the relative cost of that factor on total costs.

The analysis of income distribution is important because factors are owned by different subjects. For example, landowners often account for a small share of labour input, those who supply labour usually own little land and those who supply farm inputs do not belong to the farming sector. For this reason, factor shares show the distribution of income among subjects and economic sectors. This topic is relevant for policy analysis because some of those subjects may not be the primary intended beneficiaries of the policy.

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[20] Wealth can affect risk aversion in case the farmer's utility function shows Decreasing Absolute Risk Aversion characteristics (Hennessy, 1998).

However, the linkage between the distribution of income among factors and economic subjects can be very loose. This is especially true when farmers use their labour and own most of the land and capital they use. Furthermore, a wide range of farm organisations in terms of factor procurement can be found in the same region and wide differences can also be found in different regions.

The analysis of consequences of agricultural policy on income distribution can rely on the analysis of the changes in the factor income shares. Therefore, it is important here to provide a definition of these terms and a simple explanation on the likely impact of policy on factor income shares.

The theoretical analysis developed here uses a very simplified farm case in order to explain the basic idea behind the impact of policies on income distribution. In particular, the discussion relies on the usual assumptions of the neoclassical theory of production under perfectly competitive markets. Furthermore, to investigate the behaviour of distribution consequences, we consider the case of a farm that produces only one product x that is sold at a price P_x by using two factors: factors a and b. Because often agricultural policy analysis is interested in the land input as opposed to non-land inputs, let consider the case that factor a refers to land, while factor b to non-land inputs such as, for example, labour and other non-land factors. A similar reasoning could apply to other factors. Empirical analysis could consider less simplified conditions such as the case of multiproduct farms using more than two factors.

In the long run, profit tends to zero so that the sum of factor payments exhausts the value of output. This can be formally stated as (Gardner, 1987):

$$P_a\, a + P_b\, b = P_x\, x$$

where: Pa, P_b and P_x refer to the prices of factor a, of factor b and product x; letters a, b and x refer to the amount of inputs a and b used, and product x produced.

The factor income shares are defined as the relative shares of the cost of each factor on total costs. Therefore, in the considered case, we have two factor income shares:

- factor income share of land inputs: Pa a / Px x
- factor income share of non-land inputs: Pb b / Px x

A policy change can affect the absolute level of income: for example, a price support policy, increasing P_x, increases farm revenues and farm income. However, a policy can also alter the factor income shares. This is a more complex issue because the change in income shares can be due to two different causes[21]:

- change in the levels of use of the factors (changes in a and b)
- changes in their prices (Pa, Pb).

The prices of factors change when the policy affects farmers' demand for the factors and, in this way, their equilibrium prices. This occurs because a policy usually affects the behaviour of a large number of famers so that the equilibrium of factor markets can be altered.

[21] Formally, the impact of a policy on factor income shares depends on the levels of the elasticity of substitution in production between each couple of factors and on the elasticities of factor supplies. In the simplified one-product and two factor case, it has been shown that, when the elasticity of substitution between factors is equal to 1, a policy that increases the product price does not affect income shares. However, when this is not the case, the change in the relative income share depends on the relative level of the elasticities of factor supplies (Gardner, 1987: 141).

3.5 Evaluating income effects of direct payments

Agricultural policies have multiple objectives. Therefore, in many countries, the objective of sustaining and stabilising income comes together with other objectives such as, for example, sustaining specific types of production, farm structural adjustment and the provision of public goods. This means that the analysis of income effects of agricultural policies is just one of a whole range of aspects to consider when evaluating them.

The analysis of distributional effects of agricultural policies aimed at supporting farm incomes has been traditionally approached through the concepts of fairness, equity and efficiency (OECD, 1999; Zhart, 2008; Zioganas, 1988). These topics are developed in the following paragraphs.

3.5.1 Fairness and equity

The basic idea behind the fairness of a policy refers to the notion that beneficiaries in comparable situations should be treated similarly (Zahrnt, 2008). Therefore this notion is very much linked to the one of equity. This does not mean that treatment should be exactly the same for all beneficiaries. In fact, different treatments are possible but they should be justified by the services they render to society or by social needs of beneficiaries (Zahrnt, 2008). The first condition refers to the fact that some payments are granted according to parameters that are not related to the income situation of beneficiaries. The second condition refers to the fact that the pre-policy situation of beneficiaries should be considered in designing the policy. This allows income policies to provide a different treatment among beneficiaries whenever disparities in beneficiaries' incomes exist.

Indeed, the overall goal of an income support policy is the reduction of income inequalities. In the case of farm policies, two dimensions of inequality should be considered:

- Inter-sector inequality: differences between incomes in farm and in non-farm sectors;
- Intra-sector inequality: differences between incomes of different farms (e.g. small vs. large size farms; farms located in different regions – disadvantages areas or not).

Before proceeding further, it is important to recall that "*... whether the equity criterion can also be applied to specific policies, or should be confined to government transfers as a whole*" (OECD, 1999: p.11) is still debated. Therefore, it is possible to ask ourselves if the concept of equity applies at the sector level as, for example, in the case of agricultural policy. In particular, as noted by OECD (1999: page 12): "*it should be kept in mind that equity is not always an objective of agricultural policy, it is never the only one and it is often not the main one*".

However, whatever the objective of a particular policy instrument is, it may be legitimate to evaluate its impact also in terms of equity. In this case, equity refers to the distribution of support between: sectors, farmers and regions (OECD, 1999). Therefore, in evaluating direct payments, it is important to verify if these reduce: inter-sector income inequality (i.e. between farm and non-farm sectors) and intra-sector income inequality or inequality between farms (e.g. small *vs.* large farms; located in different regions or in Less Favoured Area - LFA - as opposed to non-LFA).

Therefore, agricultural direct payments may be justified from a redistributive point of view if average farm household incomes are below the average non-agricultural household income. However, when there are differences between individual farm household incomes, it is relevant to assess whether those payments should be granted to all farmers irrespective of differences or to the farmers that are more in need. Note that this latter approach can increase the average farm household income and, at the same time, reduce the differences between individual farm household incomes (i.e. reduce income inequalities).

The redistributive effect of direct payments can be defined as the difference between the inequality of farm incomes without and with direct payments (Allanson, 2006). In particular, these payments can be considered unfair as a redistributive tool if their level consistently differ between farmers with similar pre-payments income levels. At the opposite, direct payments can be considered fair if they reduce the degree of dispersion of post-payment incomes.

In order to proceed further on this topic, it is important to analyse the concept of fair standard of living and the problems arising when measuring it.

3.5.2 Definition of fair standard of living for the agricultural community

The improvement of the welfare of the agricultural community represents an important objective of the European agricultural policy. Indeed, as stated in article 39 of the Treaty on the functioning of the EU, one of the key objectives of the Common Agricultural Policy (CAP) is *"to ensure a fair standard of living for the agricultural community, in particular by increasing the individual earnings of persons engaged in agriculture"*.

However, both concepts of "fair standard of living" and "agricultural community" have not been more clearly defined in legislation (Court of Auditors, 2004: p.3).

The "agricultural community" could be defined in a narrow way considering it as the farming community. The reference to farmers as the main intended beneficiaries of the policy seems evident from the second sentence of Art. 33 that says "*in particular by increasing the individual earnings of persons engaged in agriculture*" such as, first of all, the farmers. This seems coherent with the traditional nature of the CAP.

Regarding the meaning of "fair standard of living", the literature indicates that the fair standard of living of the agricultural community is related to the well-being of agricultural households: this depends, first of all, on consumption capability, but also on individual-based factors (i.e. health) and the social and physical context (OECD, 2004).

The economics and sociology literature analysing this issue commonly recognises that, in the presence of a homogeneous population, income levels differences are totally sufficient to define standard of living ordering. Indeed, as in Ebert (2008), homogenous population units would be identical in terms of their attributes, potentially differing exclusively in terms of income.

Nevertheless, as groups heterogeneity is usually observed, income may not represent a completely appropriate measure of welfare. Thus, welfare should be defined by recognising its multidimensionality and by including attributes different from income (Ebert, 2008). As stated in Sanderson (1925a, p. 45), "*whether a standard of living is high or low, is measurable by the extent to which it gives the best conditions for the highest development of human life*". Such a development should be referred to the social group the observational unit comes from, as it should be considered important for the life style characterising a specific group and potentially not extendible to other groups (Sanderson, 1925b).

Summarising, it is possible to identify two different approaches adopted to provide a definition for "fair standard of living":

1. the first approach defines welfare levels by adopting a monetary criterion to define the minimum amount of economic resources necessary to satisfy basic needs, *e.g.* food and housing (*absolute approach*);
2. the second approach, as already mentioned above, provides a wider definition of fair standard of living including deprivation or, conversely, opportunity to fully participate in the political and socio-economic system the population is part of. In this framework, as emphasised by Förster *et al.*

(2004), the welfare concept is defined by adopting a *relative approach* and basic needs are represented not exclusively by consumption capability (Sen, 1976, 1985, 1992; Kolm, 1977; Atkinson and Bourguignon, 1982).

However, the adoption of the second approach requires highly detailed information on farm household incomes, socio-demographic structure and behaviour and it should rely on the availability of panel data at household or individual level in order to overcome the generally high variability of socio-economic phenomena. Unfortunately, this type of information is very often incomplete at the national level and inconsistent across countries due to the implementation of different survey instruments and data collection detail (*e.g.* at macro and at micro level).

In view of the complexity of the topic and of the need to compare the standard of living of agricultural households with a standard of living deemed to be fair, attention has focused on the current capability for consuming goods and services with reference to basic household functions (Zioganas, 1988).

Furthermore, while a household's consumption potential also depends on possessed wealth, in most cases the lack of available data has caused analysis to neglect this aspect and to consider only available income, regarding it as an adequate proxy for households' consumption ability (OECD, 2002).

The available income of an agricultural household consists of income generated by both agricultural and non-agricultural activities, profits and remuneration obtained from other non-core business activities, capital-derived income, welfare benefits and other revenues (OECD, 2002)[22]. Although on the latter point there is clear agreement, opinions still diverge as to how this income has to be defined and measured in detail, and different sources use different definitions and criteria (Agra CEAS, 2007).

In any case, empirical analysis can be based on the comparison between the available income of the agricultural household and a reference level of income. Identification of the latter, however, is also the subject of differing opinions: the reference income may, for example, be the average income level of a particular group of agricultural households, or of a group of non-agricultural households, or of all households or a minimum income level able to provide a minimum spending level for the household (Zioganas, 1988). Furthermore, the debate may extend to whether the comparison of incomes must be conducted in absolute or relative terms (Zioganas, 1988). In more recent studies, the approach adopted has been that of measuring low-income households using a relative approach so as to identify households that have less than others. The OECD for example identifies these households as those having an income below 50% of the average income of the group (OECD, 2002: p.11).

Evaluation of the fair standard of living must also take into consideration the heterogeneous nature of the organisation and structure of agricultural activities. Although the majority of agricultural holdings are individual (family) enterprises, there are also a number of (generally large) farms run by 'complex' undertakings in which the family reference is lost. Moreover, within individual enterprises, there is a clear structural difference between commercial farms and small-sized subsistance farms often run by part-time or retired farmers, whose basic aim is to be self-sufficient.

3.5.3 Measurement of farm household income

In view of the complexity of providing a broad definition of agricultural households' income, different approaches have been adopted for its measurement. The approaches to collect statistical data able to represent farm household income can be classified as the microeconomic, macroeconomic and hybrid approaches (OECD, 2002).

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[22] One of the most obvious difficulties highlighted by the empirical analysis derives from the fact that the household and the farm are different units (Agra CEAS, 2007).

The micro-economic approach is based on the use of data for household units or farms, and may use different data sources.

The macro-economic approach, on the other hand, starts from broad economic aggregates of households, before breaking them down into sub-sets, including units whose income derives from business activities. In particular, Eurostat's *Total Income of Agricultural Households* (TIAH) statistics were based on a further sub-division of this group of households into agricultural and non-agricultural. The hybrid approach integrates the previous two approaches, often using estimates from micro-economic analysis to break down macro-economic data (Feasibility study on the implementation of income of agricultural households sector statistics (IAHS), Agra CEAS 2007)[23].

The results of micro- and macro-economic approaches often lead to very different conclusions, thus it appears inappropriate to compare their findings (Court of Auditors, 2004).

In any case, most of the available literature on the issue of measuring the income of agricultural households agrees on the superiority of the micro-economic approach over the macro-economic approach, mainly because the latter fails to provide exhaustive information on redistribution aspects (UNECE, 2005; Court of Auditors, 2004). Indeed, only micro-economic data can be used to re-aggregate sample data according to the various farm characteristics (e.g. size, farm management type, region) and to farm household characteristics (e.g. number of persons, age of farmer) (Agra CEAS, 2007). This appears to be confirmed by the fact that the European-wide statistical survey *Income of the Agricultural Household Sector* (IAHS) was suspended in 2002 because, as the conclusions of the Agra CEAS analysis stated (2007: page v), "(it) *had never produced reliable and comparable results*".

European Union MSs use different approaches to analyse the income of agricultural households (Court of Auditors, 2004). According to the Agra CEAS (2007) survey, only 10 MSs use the micro-economic approach, using varying methodologies and databases. Three main databases are used: a) the FADN (Farm Accountancy Data Network) database with which *ad hoc* observations are associated to acquire certain characteristics of agricultural households; b) data collection on the budgets of all households, a portion of which is made up of agricultural households; c) databases on income tax returns. The Agra CEAS survey (2007) shows that only 8 MSs[24] collected data relative to non-agricultural income of farm households; in this case too, the adopted methodologies are different, and data cannot be readily compared.

This problem is made more complex by the fact that, as shown in a survey conducted in 2004, in different MSs there are significant differences in terms of: defining the household nucleus (i.e. shared or non-shared management of available budget and food; reference or lack of reference to family ties; *narrow* or *broad* definition) and inclusion or non-inclusion of fishery and forestry activities in household income (Karlsson *et al.,* 2005). This heterogeneity comes as no surprise considering that there is no harmonised protocol for surveys at the European level, and also that MSs are not under any obligation to deliver the data collected (including the additional data collected within the FADN survey) to the Commission.

It has also been reported that the data acquired on the income of agricultural households through the FADN survey do not yield results comparable to those acquired about other social groups (Agra CEAS, 2007: p.43).

Statistical data on household budgets offer the advantage of sharing a methodology that has been defined at the European level (Eurostat, 2002), which has led to the current "*Income, social inclusion*

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[23] A presentation of micro- and macro-economic approaches is provided by Agra CEAS (2007).

[24] Denmark, Germany, Italy, Netherlands, Austria, Finland, Poland and United Kingdom (Agra CEAS, 2007: p.43). It still remains to be seen whether these data are currently collected.

and living conditions" survey (EU-SILC). These statistics are however impaired by two main limitations as far as the analysis of agricultural household incomes is concerned. The first regards the fact that the size of the sample of agricultural households (farms having agriculture as the main sector of business activity) is too small to be able to conduct sufficiently reliable analysis. In particular, the Agra CEAS study (2007: p.48) indicates that the sample accounts for less than 1% of agricultural households identified in IAHS statistics at the European level, with minimum thresholds of less than 0.5% in many MSs. The second limitation is that there is no relationship with data on agricultural holdings and so (even without the problems relating to sample size) structural aspects cannot be considered. The approach adopted, moreover, does not appear to be particularly suitable for measuring the income of agricultural households because of the nature of farms, marked by self-employment (Agra CEAS, 2007: pp. 38-39), and due to problems relating to comparability, quality, soundness and observation times (Bascou, 2004).

Finally, some MSs use databases on income tax returns. This data source is impaired in particular by the fact that, in many cases, agricultural holdings are not subject to a form of taxation based on a complete accounting system. Thus, only in a few cases can this information source give a correct representation of agricultural household incomes (Agra CEAS, 2007: p.49).

Another potentially useful source of income data is the Luxembourg Income Study (LIS). The data is organised by means of a common project aimed at providing comparable statistics on Income from around 11 Countries worldwide including 8 European countries: Finland, France, Germany, Ireland, Italy, Luxembourg, Norway and United Kingdom (see the Luxembourg Income Study project web-site quoted in the reference list for further details). This dataset contains socio-demographic, expenditure and income data that are collected at the household level through national household-based budget surveys. Data are recorded for different time periods or "waves". Up to the 2000 wave, in all 8 EU countries the dataset always recorded the farm self-employment income: this allows for the identification of farm households. However, in the last available waves (years 2004-2005) the variabile V4 (farm self-employment income) has been recorded only in the following European countries : Finland, Hungary, Norway and Poland. In all other considered European countries, it is recorded only the variable PSELF that refers to the sum of all farm and non-farm self-employment income. Therefore in these latter cases, it is not possible to identify and separate farm households from other households. Another important limitation of the LIS dataset is due to the fact that in some countries, farm household sample size is very small. This can generate sample results that may not be representative of all farm households of the considered countries and that may also vary widely across years.

In conclusion, the review exercise regarding the availability of statistical data about agricultural household incomes highlights the numerous and profound difficulties encountered when analysing agricultural household incomes. Not only is there a limited availability of data, but also numerous and sizeable problems arise as to the quality and comparability of the data available for each MS (UNECE, 2005).

3.5.4 Income transfer efficiency

Where income support is an objective, it is important that the policy pursues it in an efficient way. The ability of the considered policy to enhance the income level of agricultural households can be measured in terms of income transfer efficiency (OECD, 2002). Three are the main sources of inefficiency:

- Targeting efficiency
- Economic costs
- Distributive leakages

3.5.4.1 Targeting efficiency

Targeting efficiency is a key concept in policy design. It requires that policy measures are developed in such a way that they impinge as directly as possible on the target variable that policy-makers wish to influence (OECD, 1994). In the case of income support in the agricultural sector, all farmers (in contrast with non-farmers) may be, at first glance, the target of direct payments. However, because income and wealth levels vary among farmers, it is important to target direct payments towards those farmers that are more in need in order to reduce income inequalities. This is why the OECD (1999) asks to evaluate if policies are targeted to low-income households that are generally the target group.

The targeting issue is clearly linked to the efficiency of the policy. If high-income farm households that do not need support were not granted any direct payments, the total amount of employed resources could be reduced without reducing the effectiveness of the policy. Provided that in this way the policy would still be able to reach its objective of sustaining the income of those farms that are in need, this would increase the efficiency of public spending.

3.5.4.2 Economic costs

Apart from the administrative costs generated by the management of the policy, direct payments can cause distortions in terms of how farm resources are allocated. As it has been shown by means of the household model, these distortions can be generated at the household level in terms of:

- on-farm resource allocation (more resources used on those activities that receive coupled direct payments)
- on/off-farm resource allocation (more resources used on-farm).

This happens because the farmers, in order to receive the payments, forgo a more or less important part of their household income: a part of their farm income (net of payment) in the first case or a part of their off-farm incomes in the second case. Therefore, only a fraction of the direct payments granted to farmers can be counted as their net income gain, thus generating an income transfer loss.

3.5.4.3 Distributive leakages

Distributive leakages refer to the case in which a part of the economic benefit of a payment goes to subjects who may not be the intended beneficiaries of the policy (OECD, 1999). Indeed, some of the support provided by direct payments "leak" to non-farm owners of resources. This is particularly true if payments cause a growing demand for farm inputs such as, for example, land. This, in turn, results in an increase of the price of those inputs that:

- increases farm production costs and decreases farm income;
- increases the income of the owners of such inputs.

These may not be farmers and, for this reason, may not belong to the group of the intended main beneficiaries of the policy.

However, it is important to investigate who these indirect beneficiaries of direct payments may be. Indeed, some of them are part of the rural community and their income situation contributes to the general well-being of rural areas. Particular attention should be given to:

- owners of land rented to farmers beneficiaries of direct payments;
- workers hired by farmers beneficiaries of direct payments;

- entrepreneurs offering services (e.g. mechanical services or contract work) to farmers beneficiaries of direct payments.

A non negligible share of the income generated by these categories probably contributes to the income of families located in rural areas including farm families and, therefore, to the overall economic vitality of such areas.

Empirical evidence exists on the fact that part of the support provided by agricultural policies (including direct payments) contributes to increasing the costs of resources, the income of input suppliers and the income of non farming landowners (OECD, 2002). According to this source: "*no support policy linked to agricultural activity succeeds in delivering more than half the monetary transfer from consumers and taxpayers as additional income to farm households*" (OECD, 2002: p.10). However, the level of transfer efficiency and the destination of the money transfer differ according to the policy instrument. In many cases, a large share of the benefits deriving from direct payments are absorbed in increased land prices and rental values (Barnd *et al*., 1997; Janssen and Button, 2004; Kilian and Salhofer, 2008; OECD, 2002; Ryan *et al*., 2001).

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4. METHODOLOGY AND LIMITS OF THE EVALUATION

The evaluation methodology is based on the results of the structuring phase which derived from the theoretical analysis aimed at analysing the role of direct payments in sustaining and stabilising the income of farmers.The theoretical analysis allowed to formulate the hypothesis that have been compared to the results of quantitative analysis and allowed to draft the answers to the evaluation questions.

The methodology applied in this report is mainly based on quantitative analysis, via modelling and other quantitative methods, and has been complemented by literature review and an expert survey.

The major data sources used are: Eurostat, Clearance of Audit Trail System and FADN.

In the following paragraphs we present a detailed description of the methods and approaches used in the framework of this evaluation indicating their limitations.

4.1 Evaluation tools

4.1.1 Statistical analysis

The aim of the statistical analysis was to gauge the main farm income trends and to analyse core issues in the process of farm income generation across the identified farm typologies. This analysis focused on the main farm income indicators with respect to the following three dimensions:

- level of income;
- composition of income, including the remuneration of production factors;
- income variability.

The statistical analysis is based on farm data available from the FADN database (EU-FADN-DG AGRI L-3) across the EU 27 Member States (sample data, i.e. unweighted data). 2007 was the last available year at the begining of the of the evaluation.

It is important to bear in mind that the FADN field of observation is not the entire universe of farms: it consists only of those farms deemed to be 'commercial' according to Regulation 79/65/EEC of 15 June 1965 (and subsequent amendments). A commercial farm is defined as a farm which is large enough to provide a main activity for the farmer and a level of income sufficient to support his or her family. In practical terms, in order to be classified as commercial, a farm must exceed a minimum economic size measured in ESU (1 ESU=1200Euros).Because of the different farm structures in the European Union, the Commission specifies separate thresholds for each Member State. The economic size threshold is as low as 1 ESU in Bulgaria and Romania and as high as 16 ESU in Belgium, Netherlands, Germany and the UK.

The fact that FADN farms are commercial, automatically means that they have to be active farms.

4.1.1.1 Farm typologies

In the present evaluation study, the definition of farm typologies was necessary given the high heterogeneity of the farms' population with respect to a number of key characteristics related to type of farming, size and structure. These are all important factors influencing farm incomes. The sub-division of the FADN samples into farm typologies involved two levels:

- At the first level, farms were classified according to the type of farming (TF), the region or macro-region and the model of implementation of the 2003 CAP reform.

- At the second level, three subsequent farm typologies were constructed to account for different farm characteristics such as farm location, economic size and type of farm organisation.

Type of farming

Classifying the farms according to the dominant farming activities allows constructing fairly homogeneous groups of farms with respect to production technology and cost structure.

Thus, all FADN sample farms are classified into one of seven[25] Types of Farming (TF) following the FADN classification (variable TF8): TF1 - Field crops; TF2 - Horticulture; TF4 - Other permanent crops; TF5 - Milk; TF6 - Other grazing livestock; TF7 - Granivores; TF8 - Mixed.

Regions and macro-regions

Tab. 2 reports the analysed macro-regions classified according to NUTS and FADN codes.

Tab. 2 – Regions and macro-regions

MS and no. of regions/macro-regions		Regions/macro-regions	Eurostat Code	FADN Code
Austria (AT)	1	ÖSTERREICH	AT	660
Germany (DE) [26]	4	BADEN-WÜRTTEMBERG + BAYERN	DE1+DE2	80+90
		BRANDENBURG + MECKLENBURG-VORPOMMERN + SACHSEN-ANHALT + SACHSEN + THUERINGEN	DE4+DE8+DED+DEE+DEG	112+113+114+115+116
		SCHLESWIG-HOLSTEIN + NIEDERSACHSEN + NORDRHEIN-WESTFALEN	DEF+DE9+DEA	10+30+50
		HESSEN + RHEINLAND-PFALZ + SAARLAND	DE7+DEB+ DEC	60+70+100
Belgium (BE) [27]	2	REGION FLAMANDE	BE2	341
		REGION WALLONNE	BE3	343
Bulgaria (BG)	2	SEVERNA I IZTOCHNA BULGARIA	BG3	831+832+833+836
		YUGOZAPADNA I YUZHNA CENTRALNA BULGARIA	BG4	834 + 835
Cyprus (CY)	1	KIBRIS	CY0	740
Denmark (DK)	1	DANMARK	DK0	370
Spain (ES)[28]	5	NOROESTE	ES1	500+505+510
		NORESTE	ES2	515+520+525+530
		CENTRO (E)	ES4	545+555+570
		ESTE	ES5	535+540+560
		SUR	ES6	565+575
Estonia (EE)	1	EESTI	EE0	755
France (FR)[29]	7	BASSIN PARISIEN	FR2	131+132+133+134+135+136
		NORD — PAS-DE-CALAIS	FR3	141
		EST	FR4	151+152+153
		OUEST	FR5	162+163+164
		SUD-OUEST	FR6	182+183+184
		CENTRE-EST	FR7	192+193
		MÉDITERRANÉE	FR8	201+203+204

[25] The Wine sector (TF3) is not included in the analysis as the reform was implemented only on 1st August 2008.

[26] Except for NUTS regions DE3 (Berlin), DE5 (Bremen) and DE6 (Hamburg).

[27] Except for NUTS region BE01 (Région de Bruxelles-Capitale).

[28] Except for NUTS region ES3 (Comunidad de Madrid).

[29] Except for NUTS region FR1 (Île de France).

MS and no. of regions/macro-regions		Regions/macro-regions	Eurostat Code	FADN Code
Finland (FI)	1	MANNER-SUOMI + ALAND	FI1 + FI2	670+680+690+700
Greece (GR)	2	VOREIA ELLADA	GR1	450 + 470
		KENTRIKI ELLADA + ATTIKI + NISIA AIGAIOU, KRITI	GR2+GR3+GR4	460+480
Hungary (HU)[30]	2	DUNÁNTÚL	HU2	761+762+763
		ALFÖLD ÉS ÉSZAK	HU3	764+765+766
Italy (IT)	5	NORD-OVEST	ITC	222+221+250+230
		NORD-EST	ITD	241+242+243+244+260
		CENTRO	ITE	282+281+291+270
		SUD	ITF	292+301+302+311+312+303
		ISOLE	ITG	320+330
Ireland (IE)	1	IRELAND	IE0	380
Latvia	1	LATVIJA	LV0	770
Lithuania	1	LIETUVA	LT0	775
Luxembourg (LU)	1	LUXEMBOURG	LU0	350
Malta (MT)	1	MALTA	MT0	780
Netherlands (NL)	1	NEDERLAND	NL	360
Poland (PL)	2	REGION CENTRALNY + REGION POŁUDNIOWY + REGION WSCHODNI	PL4+PL5+PL6	785+790
		REGION PÓŁNOCNO-ZACHODNI + REGION POŁUDNIOWO-ZACHODNI + REGION PÓŁNOCNY	PL1+PL2+PL3	795+800
Portugal (PT)	1	CONTINENTE	PT1	615+630+640
Czech Republic (CZ)	1	ČESKÁ REPUBLIKA	CZ0	745
Romania (RO)	4	MACROREGIUNEA UNU	RO1	845+846
		MACROREGIUNEA DOI	RO2	840+841
		MACROREGIUNEA TREI	RO3	842+847
		MACROREGIUNEA PATRU	RO4	843+844
United Kingdom (UK)	4	NORTH EAST + NORTH WEST + YORKSHIRE AND THE HUMBER + EAST MIDLANDS + WEST MIDLANDS + EAST OF ENGLAND + LONDON + SOUTH EAST (England)	UKC + UKD + UKE + UK F + UKG + UKH + UKI + UKJ + UKK	411+412+413
		WALES	UKL	421
		SCOTLAND	UKM	431
		NORTHERN IRELAND	UKN	441
Slovenia (SI)	1	SLOVENIJA	SI0	820
Slovak Republic (SK)	1	SLOVENSKÁ REPUBLIKA	SK0	810
Sweden (SE)	1	ÖSTRA SVERIGE + SÖDRA SV. + NORRA SVERIGE	SE1 + SE2 + SE3	710+720+730

Models of implementation of the 2003 CAP reform

The models used for the implementation of the 2003 reform represent the third key factor to be taken into account when constructing farm typologies. The results of the empirical assessment are presented for macro-regions grouped in the following way, so as to highlight income differences across the SPS and SAPS models:

- SPS historic model: Austria, Belgium, Ireland, Netherlands, Portugal (Continente), macro-regions of Belgium, France, Greece, Italy and Spain, Scotland and Wales;
- SPS hybrid models: Denmark, Luxembourg, Finland, Sweden, macro-regions of Germany, England and Northern Ireland;
- SPS regional model: Malta and Slovenia (starting from 2007 onwards);

[30] Except for NUTS region HU1 (KÖZÉP-MAGYARORSZÁG – Budapest region).

- SAPS: Cyprus, Czech Republic, Estonia, Latvia, Lithuania, Slovakia and macro-regions of Bulgaria, Hungary, Poland and Romania.

Farm economic size

Farm size clearly is an important factor in determining the farm income. Farms are grouped into three economic size classes constructed on the basis of their FADN classification according to European Size Units (ESU) [31]:

- Small size farms (<16 ESU);
- Medium size farms (16-100 ESU);
- Large size farms (>100 ESU).

The thresholds for this specific economic size sub-division were defined on the basis of observation of farm sample distributions across the examined macro-regions (i.e. means and standard deviations) with respect to the European Size Unit class using FADN variables ES6 (six ESU classes) and A26 (ten ESU classes).

Farm location

An important dimension that effectively distinguishes different types of farms within the same sector and region is the location in less favoured areas (LFA, as defined by Reg. (EC) No. 1257/1999). Using the information provided in the FADN database (variable A39), farms are classified in the following way:

- Not located in LFA area;
- Located in LFA area
- of which, *located in LFA mountain areas* (where the number of farms is sufficient for the analysis, i.e. >15).

Organisational form of the holding

A further typology classifies farms according to the type of farm organisation, depending on whether the holding is an individual farm or a more complex type of enterprise, such as a partnership or other form. Three farm types are identified at this level, based on information available in the FADN database (variable A18):

- Individual farms: "holdings for which the economic results cover the compensation of unpaid labour input and own capital of the holder/manager and his/her family";
- Partnerships: "holdings where the economic result covers the compensation for the production factors brought into the holding by several partners, of which at least half participate to the work on the farm as unpaid labour."
- Other types: "holdings with no unpaid labour and other holdings not classified into the previous two categories."

4.1.1.2 Applied methodology for the computation of income indicators

In order to identify the changes occurred after the introduction of the SPS, it is necessary that the analysis includes at least some years before the implementation of the reform. The observation period

[31] 1 ESU = 1200 Euros of Standard Gross Margin (SGM).

thus comprises the years 2001-2007 for the old Member States (EU 15), 2004-2007 for the EU 10 and 2007-2008 for Bulgaria and Romania (for these two new Member States, 2008 farm data are estimated according to the methodology illustrated in section 4.1.1.3).

All indicators have first been treated for each farming sector across the macro-regions previously described, operating a distinction between MSs applying the SPS historic, regional or hybrid models, or the SAPS. Subsequently, the income indicators have been treated for the three farm typologies identified according to the proposed dimensions: farm location (i.e. LFA/non LFA), economic size and organisational form.

Certain rules are common to the computation of all income indicators. Only region/TF/typology groups including more than 15 farms are analysed. For reasons of consistency, the ≥15 farms rule always applies, in such a way that groups with less than 15 farms are also excluded from the computation of derived or aggregated variables (e.g. computation of averages across years excludes the groups/years with less than 15 farms).

The FADN variable used to express the time worked by total labour units on the farm are Annual Work Units (AWU) expressed in hours standardised across regions. In the FADN database, work units are calculated on the basis of different numbers of hours of labour per year across the EU, which makes it difficult to compare across the Member States. It seemed therefore necessary to standardise the computation of both paid and unpaid AWU by dividing the total amount of worked hours by 1,800 in each examined sample (equivalent to full-time employment of one labour unit per year).

Until 2003, the FADN database considers Belgium as one whole region. In order to separate this Member State into the two regions BE Région Flamande and BE Région Wallonne, we have used the NUTS2 region codes available in the FADN database. The 2001, 2002 and 2003 samples for the two Belgian regions were constructed by aggregating the relevant NUTS2 regions.

Purchasing Power Standards

The indicators expressed in monetary values were transformed in Purchasing Power Standards[32] (PPS). By eliminating the effects of different price levels, PPSs allow to bring all income values across EU Member States to equivalent levels of disposable income, i.e. comparable levels of purchasing power.

The conversion to PPS was obtained by applying the Purchasing Power Parity (PPP) coefficients provided by Eurostat. PPP tell us how many national currency units costs a given quantity of goods and services in different countries. In our case, however, all FADN data are expressed in Euros and not in national currencies, therefore the PPP coefficients would only apply to the Member States belonging to the Euro-zone. For the Member States outside the Euro-zone, PPS values are obtained by applying Price Level Indices[33] (PLIs). PLIs are obtained as ratios between PPPs and current nominal exchange rates, therefore, PPPs and PLIs values coincide in the Euro-zone countries.

The following table presents the PLIs coefficients (calculated by Eurostat for Gross Domestic Product – GDP) used to perform conversions of farm incomes from Euros to PPSs.

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[32] Purchasing Power Standard is the name given by Eurostat to an artificial currency unit reflecting differences in national price levels that are not taken into account by exchange rates.

[33] PPPs tell us how many national currency units a given quantity of goods and services costs in different countries. For the MSs outside the Euro zone, PPPs are divided by the current nominal exchange rates to obtain a Price Level Index (PLI).

Tab. 3 – Comparative Price Level Indices – PLIs (EU 15=100)

	2001	2002	2003	2004	2005	2006	2007	2008
EU 27	0.949	0.948	0.945	0.943	0.948	0.949	0.950	0.953
EU 25	0.960	0.960	0.956	0.956	0.959	0.960	0.961	0.966
EU 15	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Austria	1.014	0.994	0.989	0.979	1.003	0.998	1.012	1.041
Belgium	0.979	0.960	0.982	1.004	1.018	1.029	1.040	1.063
France	1.015	1.004	1.048	1.052	1.045	1.052	1.045	1.071
Greece	0.742	0.732	0.770	0.779	0.808	0.814	0.832	0.858
Ireland	1.098	1.114	1.133	1.126	1.143	1.146	1.122	1.149
Italy	0.893	0.938	0.954	0.977	0.981	0.971	0.960	0.979
Netherlands	1.002	1.001	1.036	1.018	1.014	1.011	1.002	1.029
Portugal	0.780	0.786	0.789	0.802	0.774	0.771	0.776	0.784
Spain	0.818	0.814	0.841	0.850	0.866	0.857	0.852	0.884
Denmark	1.256	1.240	1.284	1.265	1.305	1.301	1.308	1.343
Finland	1.118	1.113	1.129	1.092	1.106	1.107	1.099	1.128
Germany	1.056	1.045	1.025	1.004	0.981	0.976	0.973	1.000
Luxembourg	1.048	1.037	1.053	1.033	1.078	1.065	1.082	1.108
Sweden	1.117	1.133	1.143	1.117	1.143	1.143	1.125	1.123
United Kingdom	1.114	1.107	1.035	1.043	1.053	1.071	1.096	0.969
Malta	0.674	0.660	0.645	0.636	0.641	0.655	0.664	0.689
Slovenia	0.687	0.692	0.704	0.685	0.692	0.708	0.737	0.768
Bulgaria	0.317	0.317	0.320	0.331	0.347	0.362	0.383	0.413
Cyprus	0.813	0.816	0.836	0.830	0.836	0.840	0.830	0.863
Czech Republic	0.461	0.516	0.492	0.502	0.544	0.577	0.588	0.671
Estonia	0.527	0.530	0.537	0.544	0.568	0.606	0.645	0.677
Hungary	0.477	0.525	0.531	0.562	0.587	0.566	0.612	0.621
Lithuania	0.451	0.456	0.444	0.456	0.487	0.513	0.545	0.589
Latvia	0.491	0.477	0.451	0.461	0.491	0.545	0.635	0.678
Poland	0.560	0.526	0.468	0.460	0.526	0.551	0.572	0.641
Romania	0.349	0.351	0.352	0.360	0.445	0.474	0.531	0.515
Slovakia	0.401	0.413	0.450	0.482	0.500	0.523	0.574	0.631

Source: Eurostat

It is rather evident from the PLI coefficients that purchasing power differs greatly across EU Member States. The most striking differences are found between EU 15 and EU 12 Member States, however, there are some remarkable disparities within the EU old Member States (e.g. Greece and Portugal *vs.* Denmark). In order to show such differences, in the empirical assessment the main income level indicators (i.e. FNVA/AWU and FNVAndp/AWU – see annex § 1.2.1) have been computed both in Euros and in PPS across macro-regions and types of farming.

Level of income

The income of farmers across EU macro-regions was analysed through two main indicators:

- Farm Net Value Added per Annual Work Unit: FNVA/AWU
- Farm Net Value Added net of direct payments per Annual Work Unit: FNVAndp/AWU

The average values of the income indicators for the years 2004-2007/08 have been computed in order to permit a comparative analysis across all 27 Member States of the EU. In addition, in the case of the EU 15, both indicators were analysed as a 2001-2007(2008) series with averages for the years before and after the 2003 reform (i.e. 2001-04, 2006-07/08). The exclusion of 2005 was due to the fact that it represents a transition year, in which some of the old Member States introduced the SPS (i.e. AT, BE, DE, DK, IE, IT, LU, PT, SE, UK) , but others did not until 2006 (i.e. ES, FI, FR, GR, NL). In the case

of the EU 10, the series comprises the years 2004 to 2007 and, again, a computed average income value for the last two available years in the data base (2006-07). Data for 2007 and estimates of 2008 have been calculated for Bulgaria and Romania, as well as an average income value for this biennium.

The data for FNVA/AWU and FNVAndp/AWU were computed in Euros as well as PPS.

Evolution of costs of production

Indices representing the level and the evolution of the production costs have been computed in addition to the income level indicators. Since the evolution of farm income is strongly related to changes in input costs, it seemed important to analyse the former in the light of information about the latter. The costs of production are expected to vary across geographical areas and sectors, but not so much across other farm typologies. Therefore, the following indices (base 2001=100 for EU 15; base 2004=100 for EU 10) were computed at the macro-region and type of farming levels:

- The value of farm Total Output per Annual Work Unit: TO/AWU;
- The value of the farm's Intermediate Consumption per Annual Work Unit: IC/AWU;
- The average cost of hired labour expressed as the ratio: Paid wages(PW)/paid AWU;

Income composition

Two distinct aspects were considered in order to assess the evolution of income composition across the EU. The first aspect is the role played by direct payments (DP) in income generation, in line with the overall objective of the evaluation exercise.

A comparison of the disaggregated effects of coupled and decoupled direct payments (respectively, CDP and DDP) was also performed for the years following the implementation of the 2003 CAP reform. Therefore, two groups of indicators were calculated according to the model of SPS/SAPS implementation across macro-regions, type of farming and farm typologies:

- Percentage share of Direct Payments on Farm Net Value Added: DP/FNVA;
- Percentage shares of coupled and decoupled direct payments on FNVA: CDP/FNVA and DDP/FNVA.

The second aspect of income composition concerns the remuneration of production factors invested in farm activities: land, capital and labour. All production factors were considered, including farm-owned and external factors, for which total remuneration is given by the sum of remuneration of labour (i.e. Family Farm Income FFI, hired labour wages - PW, contract work - CW), land (i.e. paid rents - PR) and capital (i.e. paid interests - PI). The following indicators represent the relative shares of income remunerating each production factor:

- Share of income remunerating family farm labour and entrepreneurial skills: FFI/(FFI+PW+CW+PR+PI)
- Share of income remunerating hired labour: PW/(FFI+PW+CW+PR+PI)
- Share of income remunerating hired contract work: CW/(FFI+PW+CW+PR+PI)
- Share of income remunerating land: PR/(FFI+PW+CW+PR+PI)
- Share of income remunerating capital: PI/(FFI+PW+CW+PR+PI).

These income composition indicators were computed for each type of farming at the regional level. In addition, they are disaggregated according to economic size classes for each region and type of farming.

Income variability

The contribution of direct payments to farm income stability was measured through comparison of the variability of two main farm income variables (per AWU) over the period of observation: farm net value added including direct payments (*FNVA/AWU*) and farm net value added net of direct payments ($FNVA_{ndp}/AWU$).

The Coefficient of Variation (*CV = Standard Deviation/Mean*) is the indicator chosen to represent variability of the two income series over the observed period (2001-2007). Therefore, two Coefficients of Variation were calculated, for each income variable of the EU 15 macro-regions, for which long enough time series are available. In the case of the EU 10, four years of information are available (2004 to 2007), whereas in the case of Bulgaria and Romania the data cover only one year. In both cases, the time series are not long enough to assess whether farm incomes are stable or not.

Therefore, the issue of income variability was examined only for the EU 15, for which seven years were available. In the few cases when one or two years are missing from any of the income series, the CV is still computed, provided that the missing year is not one of those following the reform (i.e. 2006 or 2007). For less than five years we did not compute the coefficient of variation.

The following coefficients of variation were computed:

- CVa of the 2001-07 FNVA/AWU series;
- CVb of the 2001-07 FNVAndp/AWU series;

Similarly to the previous income indicators, variability is assessed separately for each macro-region, type of farming and farm typologies identified by economic size, farm LFA location and type of farm organisation.

Before proceeding to the calculation of the coefficients of variation, the trend component was removed from each income series in order to separate long-term (upward or downward) movements caused by factors exogenous to the analysed variables (e.g. upward income trend due to economic growth in a certain region). The estimation of series trends was done by applying a simple ordinary least square linear regression to the time series. Then the coefficients of variation were calculated on the series free of the trend components. The Coefficient of Variation takes values ranging from 0-1 or 0-100%, if expressed in percentage terms.

A word of caution is necessary, as the Coefficient of Variation has two main limits. The first limit of this indicator is its sensitivity to small or close-to-zero mean values. In such cases, the CV becomes very large even in the absence of actual large variability in the data series. Further to this, the CV should not be used if there are negative values in the series as this would result in low mean values, thus leading to the problem described above. However, if all values in the series are negative, we can consider the absolute value of the CV, also termed Relative Standard Deviation (RSD). In general, we would not expect to find negative farm income values. Nevertheless, negative values may occur when farm incomes are considered net of direct payments (FNVAndp). Besides, this problem could arise in sectors such as the beef sector because the balance of purchase and sale of livestock may result negative on one year, but then be counter-balanced the following year.

4.1.1.3 Update of FADN data of Bulgaria and Romania

In Bulgaria and Romania, FADN data are only available for 2007. In order to have at least two years of available data, for these two Member States the data have been updated to 2008 through estimation.

The first step of the exercise consisted of updating the 2007 values of gross production for the FADN sample farms on the basis of producer price indices. Eurostat provides producer price indices at the national level separately for several categories of crops and livestock products .

Tab. 4 – FADN crops and livestock products and corresponding Eurostat producer price indices

FADN Code	FADN Variable description	Eurostat Price indices (codes)
SE140	Cereals	Cereals (010000)
SE145	Protein crops	Protein crops (022000)
SE146	Energy crops	Industrial crops (020000)
SE150	Potatoes	Potatoes (050000)
SE155	Sugar beet	Sugar beet (024000)
SE160	Oil-seed crops	Oil seeds and oleaginous fruits (021000)
SE165	Industrial crops	Industrial crops (020000)
SE170	Vegetables & flowers	Vegetable and horticultural products (040000)
SE175	Fruit	Fruits (060000)
SE180	Citrus fruit	Citrus fruit (062000)
SE185	Wine and grapes	Wine (071000)
SE190	Olives & olive oil	Olives (065000)
SE195	Forage crops	Forage plants (030000)
SE211	Change in value of livestock	Animals (110000)
SE216	Cows' milk & milk products	Cow's milk (121100)
SE220	Beef and veal	Cattle (111000)
SE225	Pigmeat	Pigs (112000)
SE230	Sheep and goats	Sheep and goats (114000)
SE235	Poultrymeat	Poultry (115000)
SE240	Eggs	Eggs (122000)
SE245	Ewes' and goats' milk	Other milk types (121900)
SE251	Other livestock & products	Animal output (130000)

Source*:* EU-FADN-DG AGRI L-3; Eurostat : Price indices of agricultural products, output: base 2005=100 (annual)

The second step consisted of updating the information relative to farm total intermediate costs available in 2007. The update was based on agricultural input price indices for the main categories of production inputs (e.g. seeds, fertilizers, pesticides, feed, energy). Again, the source of such price indices is Eurostat (Tab. 4, operating expenses).

Finally, in order to account for changes in the level of direct payments, the FADN entry 'Balance of current subsidies and taxes' (variable SE600) has been recalculated on the basis of the updated value for the entry 'Total subsidies excluding on investments' (SE605). This entry has been updated considering the changes of the following components: 'Total subsidies on crops' (SE610); 'Total subsidies on livestock' (SE615); 'Decoupled payments' (SE630); 'Other subsidies' (SE620). Variable SE620 results from the sum of some subsidy variables including variable JC950, in which decoupled CNDP are recorded in 2007. Variable JC950 has been updated considering the changes occurred between 2007 and 2008, as explained in the following paragraphs.

Decoupled payments (SE630) have been updated to take into account the phasing-in process that affects SAPS payments. EU direct payments have been increased according to what is defined by Reg. (EC) N. 1782/2003 (Art. 143a - Introduction of support schemes) as amended by the Act of accession of Bulgaria and Romania (L 157 203 21.6.2005). Indeed, for Bulgaria and Romania direct payments

were introduced in accordance with a schedule of increments expressed as a percentage of the applicable level of such payments in the Community as constituted on 30 April 2004. These levels were 25 % in 2007 and 30 % in 2008. Therefore, for these two Member States, a 20% increase has been applied to the 2007 values recorded in the FADN database to reflect the increase of EU payments in 2008.

The 2007 level of the Complementary National Direct Payments (CNDP) (instituted by art. 143c of Reg. (EC) N. 1782/2003) has also been updated according to the relative change in the CNDP effectively granted in 2007 and 2008 as published by the European Commission. This has been done considering the evolution of decoupled and coupled CNDPs separately. The former are recorded in FADN variable JC950. The latter are recorded in two separate entries: Total subsidies on crops (SE610) and Total subsidies on livestock (SE615).

The main income indicators, Farm Net Value Added (FNVA) and Family Farm Income (FFI), were re-calculated for 2008 on the basis of the updated values of total gross production, intermediate consumption and direct payments.

The used methodology has some limitations that it is important to highlight, as they have an effect on the use and interpretation of the updated values of the considered variables. The new values of the income variables are based on updates of gross production, intermediate farm consumption and direct payments only, whilst other variables are kept constant. Furthermore, the methodology assumes invariance of both farm cost structure and production structure.

4.1.2 Estimate of the effects of CMO measures on farm incomes

This section illustrates the methodology applied to estimate the effects of market measures (i.e. CMO) on farm incomes as well as the estimated commodity-specific coefficients of the effects of market support.

The estimation has been used to calculate some income indicators, net of the effects of market support. This exercice allowed to distinguish the impact of such market measures from the impact of other policies and to assess their relative importance in farm income generation.

4.1.2.1 Applied methodology

CMO measures are extremely diversified across sectors and have different effects on the way agricultural markets operate. One of the main market effects of such measures is on the level of prices of agricultural commodities within the EU. Therefore, we have assessed the impact of price support measures on the value of farm sales revenue.

Price support measures have had the important effect of maintaining EU commodity prices above world markets' levels in many sectors. However, this effect was more important in the past than it is nowadays, as the CAP has undergone such reforms, by which support to the agricultural sector has progressively shifted from sustaining production and prices to direct income support. Indeed, import tariffs and export refunds, as well as other price support measures (e.g. quotas), were able to create and maintain important price diffentials between EU and international prices. Such price differentials are termed as "Market Price Differential" (MPD) and can be expressed as:

$$MPD = PP - RP$$

Where *PP* is the domestic Producer Price (i.e. the current price paid at the farm-gate) that incorporates the effect of price support policies, and *RP* is the Reference (or Border) Price net of price support effect.

The *MPD* offers the advantage of combining the effects of various market support measures in one indicator. At the same time, the *MPD* does not account for direct farm support, whether linked to production or not.

The approach used to distinguish the effects of CMO measures (now the Single CMO) from the effects of other policy measures is based on *MPD* estimates computed annually by the OECD for a number of agricultural commodities produced in the EU. The following revenue values have been derived for each farm typology group considered in the analysis:

- Current sales revenue values are those recorded in the FADN data base: REVC= Σi revi; where the index i refers to the revenues generated by individual farm activities;
- Reference sales revenue values have been computed adjusting REVC on the basis of commodity-specific ratios ((PPi-MPDi)/PPi) (reported below in Tab. 5) used to eliminate the MPD effect in the following way:

$$REV_R = \Sigma i \ rev_i * (PP_i - MPD_i)/PP_i$$

Note that, if the policies applied to a commodity do not generate *MPD* (i.e. *MPD*=0), then $(PP_i - MPD_i)/PPi = 1$ and $REV_R = REV_C$. If policies generate *MPD* (i.e. *MPD*> 0), then $REV_R < REV_C$.

Thus, the absolute level of support provided by CMO policies is estimated as:

$$CMO = REV_C - REV_R$$

whereas the relative level of support provided by CMO policies (CMO%) is expressed as:

$$CMO\% = (REV_C - REV_R)/REV_C$$

The ratio represents the percentage share of farm revenue generated by price support policy. This approach does not account for the indirect effects of price support, such as those affecting the cost of feedstuffs for livestock farms.

Both *MPD* and *PP* data have been obtained at the EU level through the OECD's Producer Support Estimate (PSE) database, that provides *MPD* estimates for a set of 20 commodities[34] at the EU level. All prices are estimated by the OECD at the farm-gate, therefore *PP* and *MPD* can be directly compared.

4.1.2.2 Estimated commodity-specific coefficients

Tab. 5 reports the estimated commodity-specific coefficients of the effects of market support (i.e. $(PP_i - MPD_i)/PP_i$).

[34] The commodity groups are: Maize; Barley; Rice; Refined sugar; Rapeseed; Sunflower; Soybeans; Milk; Oats; Beef and veal; Sheep meat; Pigmeat; Poultry meat; Common wheat; Eggs; Durum wheat; Flower; Potatoes; Tomatoes; Wine.

Tab. 5 – Commodity-specific estimates of the effects of market support[a]

	2001	2002	2003	2004	2005	2006	2007	2008
Maize	0.95	1.00	0.81	0.84	0.84	0.90	0.77	1.00
Barley	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00
Rice	0.72	0.82	0.86	1.00	1.00	0.98	0.95	0.96
Refined sugar	0.41	0.38	0.28	0.31	0.36	0.60	0.52	0.55
Rapeseed	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Sunflower	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Soybean	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Milk	0.72	0.54	0.55	0.61	0.74	0.81	0.96	0.99
Oats	0.78	1.00	0.98	0.84	0.80	1.00	1.00	1.00
Beef and veal	0.47	0.42	0.54	0.56	0.52	0.53	0.60	0.75
Sheep meat	0.73	0.78	0.77	0.81	0.84	0.75	0.74	0.80
Pigmeat	0.87	0.90	0.87	0.86	0.93	0.94	1.00	0.92
Poultry meat	0.74	0.70	0.68	0.56	0.66	0.71	0.61	0.66
Common wheat	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00
Eggs	0.96	0.97	0.97	0.98	0.96	0.97	0.98	0.98
Durum wheat	1.00	1.00	1.00	1.00	1.00	1.00	0.70	1.00
Flower	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Potatoes	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Tomatoes	1.00	1.00	0.98	1.00	1.00	1.00	0.93	0.90
Wine	0.98	0.98	0.98	0.99	0.98	0.99	0.99	0.99

Source: Elaborations based on OECD PSE data.

[a] Data are for EU15 in 2001-2003; EU25 in 2004-2006; EU27 in 2007-2008.

The methodology applied to estimate the effects of CMO measures suffers from three main limitations:

- the evaluation of the impact of agricultural policies on the price level is limited to a set of commodities. However, according to OECD estimates, the considered 20 commodities account for approximately 74% of the EU total agricultural output value (OECD);
- the estimates are calculated at the EU level, therefore they do not account for differences of CMO instruments across Member States. Nevertheless, the methodology has been applied to the current level of prices, thus maintaining the differences observed across Member States that can also be the result of product quality differences;
- coupled direct payments affect the EU supply of products that benefit from such payments. Therefore, direct payments may have an effect on the EU prices of these products. The utilised approach does not account for this aspect that would, however, be non-negligible only for a limited set of products (Renwick et al., 2009)35.

4.1.2.3 List of references for the estimation of CMO effects

OECD (1999). Distributional effects of agricultural support in selected OECD countries. AGR/CA(99)8/FINAL. OECD Paris, 1999.

35 This study, developed by the Scottish Agricultural College, (SAC-Macaulay Institute) and LEI–Wageningen University, provides an estimate of the impact of the elimination of partially decoupled payments on the prices of agricultural products in the EU (Renwick, Revoredo-Giha, Barnes, Jansson, Schwartz, 2009). The results suggest that the impact of decoupling of such payments is generally very limited for crops and non-negligible and positive only for beef and goat and sheep meat.

OECD. The PSE manual. Electronic version available on-line at: http://www.oecd.org/document/43/0,3343,en_2649_33773_41106667_1_1_1_1,00.html.

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Renwick A., Revoredo-Giha C., Barnes A., Jansson T., Schwartz G. (2009). "Assessment of the impact of partial decoupling on prices, production and farm revenues within the EU". Rural Policy Centre – Research Briefing – SAC.

SAC and LEI (2009). "Assessment of the impact of partial decoupling on prices, production and farm revenues within the EU". Final report for DEFRA. December 2009.

4.1.3 Econometric analysis

The application of econometric models was proposed in order to estimate the effects of direct payments on farmers' incomes. Such models were implemented at two different levels of analysis: macro-economic and micro-economic. For both levels, the proposed models share the same objective. However, at the macro-economic level the analysis allowed for comparison of income effects of direct payments across agricultural sectors of all EU regions, whereas the micro-economic analysis allowed to go to further detail and compare income effects differentiating across farming sectors and the farm typologies identified.

The developed models contributed also to providing answers with respect to some of the aspects related to efficiency of direct payments as a policy tool and coherence with other CAP policy instruments.

The application of econometric models allows to reach a sound analytical assessment of the income effects of direct payments by taking into account not only the possible effects of direct payments, but also the impact of a number of other important factors. Such factors comprise other CAP policy instruments (i.e. CMO measures and rural development support), agricultural production factors (e.g. land, labour and capital) and other factors that characterise the socio-economic environment in which agricultural sectors and farms operate.

4.1.3.1 Macro-econometric approach

In this section we illustrate the consolidated methodology applied to estimate the effects of direct payments on farmers' incomes at the macro-economic level. The derived results provide useful information on the effectiveness as well as the efficiency of the evaluated policy. The regression models allow to assess the effectiveness of direct payments (i.e. the net effect) in terms of enhancing the income of farmers. The regression parameters estimate the impact of an additional Euro of direct payments on farm income (i.e if parameters are statistically different from zero and positive in sign, it can be assumed that direct payments contribute to enhancing farm incomes).

Concerning the efficiency of direct payments, the models analyse the effects of coupled and decoupled direct payments on farmers' incomes according to income classes, ordered from the lowest to the highest (quantile regression). The coefficients estimated for each income quantile provide a measure of the changes produced by one additional unit of coupled and decoupled direct payments on income per labour unit of that income quantile.

At the macro-economic level, the available agriculture statistics (Eurostat) provide at least three variables able to represent farmers' income:

- Factor Income;

- Operating Surplus;
- Entrepreneurial Income.

The Factor Income (FI) represents the remuneration of all production factors[36]. The value of the Factor Income provided by Eurostat at the regional level is calculated as net value added excluding taxes on production and including subsidies on production. Thus, because it includes both wages and income of the entrepreneur, the Factor Income seems to be the most appropriate indicator to represent "the individual earnings of persons engaged in agriculture".

The appropriateness of the factor income is supported by the correlations calculated among all the income variables (this time also including the Net value added) weighted by the population (see table below) in the available sample of 20 Member States as shown in Tab. 7. Indeed, the results indicate that the listed variables are highly similar.

Tab. 6 - Correlation matrix of four possible dependent variables (2007)

Variables	Net value added	Factor income	Operating surplus	Entrepreneurial income
Net value added	1			
Factor income	0.9741	1		
Operating surplus	0.9354	0.9849	1	
Entrepreneurial income	0.9175	0.9433	0.9630	1

Source: Elaborations based on Eurostat Regional Agriculture Statistics

4.1.3.1.1 Consolidated methodology for the analysis of income effects of direct payments at the macro-economic level

Corrected Factor Income - CFI

Before proceeding to the specification of the models, some considerations are made on the Factor Income used in the regression models as the dependent variable.

First of all it is important to bear in mind that the value of the Factor Income provided by Eurostat is not available at regional level for some Member States: this is the case for the years 2004, 2006 and 2007 for Belgium, Spain, Italy, Poland Romania and Slovenia. In 2007 the Factor income at regional level is neither available for Portugal (see Tab. 9).

Moreover, the economic accounts data for agriculture provided by Eurostat do not allow to disaggregate the contribution of individual agricultural payments to the factor income. Therefore, we have integrated the more detailed subsidy data available from the CATS database (DG Agri) with the regional agricultural accounts data provided by Eurostat. This operation results in the computation of a new factor income variable, here termed Corrected Factor Income (CFI).

Starting from 2003, the net form of FI is computed by subtracting subsidies on production, other direct aids and market intervention payments from the original factor income value provided by Eurostat. In a second step, the Corrected Factor Income is computed by adding to the net factor income variable the values recorded for direct decoupled aids (starting only from 2004), other direct aids and market intervention payments[37]:

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[36] Whereas the operating surplus measures the returns from land, capital and unpaid labour, and the entrepreneurial income is consequently obtained by adding interests received by agricultural units and deducting interests paid and rents.

[37] As above, cfr. the variables Direct aids (decoupled) (CATS), Other direct aids (CATS) and Market interventions (CATS) are presented in the data collection section.

$$FI_{net} = FI - subsidies_{eurostat} - other\_direct\_aids_{cats} - market\_aids_{cats}$$

$$CFI = FI_{net} + decoupled\_aids_{cats} + other\_direct\_aids_{cats} + market\_aids_{cats}$$

Before it is fed into the econometric models, the Corrected Factor Income is analysed through descriptive methods in relation to agricultural GDP and to CAP payments across the examined EU regions.

Models specification

The theoretical hypothesis, in its broad formulation, assumes the existence of several factors expected to influence CFI. Such factors are defined in terms of the socio-economic system structural characteristics as well as policy interventions, i.e. the level of Corrected Factor Income is assumed to be a linear function of a set of regional socio-economic characteristics. The estimated relationship between the Corrected Factor Income (i.e. the dependent variable representing the income of farmers - CFI) and the set of proposed explanatory exogenous variables, allows to evaluate the contribution of each of them to the level of farmers' income.

Formally, for the i-th region ($i = 1,...,n$), the specification of the econometric model can be represented as

$$\frac{CFI_i}{EMP_i^{agr}} = \beta_0 + \beta_1 * \frac{INV_i}{EMP_i^{agr}} + \sum_j \beta_{2j} * \frac{SUBS_{j,i}}{EMP_i^{agr}} + \beta_3 * \frac{GVA_i^{agr}}{GDP_i} + \beta_4 * \sum_k \frac{EDU_{k,i}}{POP_i} + \beta_5 \sum_s \frac{EMP_{s,i}}{POP_i} + \beta_6 * \frac{GDP_i}{POP_i} + \varepsilon_i$$

where for each i-th region:

- β_0 is the constant term[38]
- $\frac{CFI}{EMP_{agr}}$ represents the factor income recorded at NUTS2 level;
- $\frac{INV}{EMP_{agr}}$ represents the level of Gross Fixed Capital Formation (GFCF) in agriculture per agricultural employee (EMP_{agr}), i.e. the capital component of the production function;
- $\frac{SUBS_j}{EMP_{agr}}$ represents the *j*-th subsidy received per agricultural employee, where $j = 1,...,J$ represents the different aids typologies, i.e. coupled and decoupled payments as well as other types of subsidies;
- $\frac{GVA_{agr}}{GDP}$ represents the share of GDP attributed to the agricultural sector (GVA = Gross Value Added);

[38] The constant term is the sum of the constant effect of omitted explanatory variables and the nonzero mean of the sample error term observations

- $\frac{EDU_k}{POP}$ represents k different population characteristics in terms of schooling level per inhabitant;
- $\frac{EMP_s}{POP}$ represents s different population characteristics in terms of employment level per inhabitant;
- $\frac{GDP}{POP}$ represents the total GDP per capita;
- ε is the error term[39].

The model is based on data from a sample of European Regions (classification NUTS2) recorded for the years 2000-2008. In particular, the econometric analysis focuses on the years 2004 (pre-reform) and 2007 (post-reform). An additional model was tested on 2006 data, for comparison with the 2007 model. The geographical coverage of the analysis is detailed in the table below.

[39] The errore term represents the difference between the actual value of the independent variable and the value predicted by the regression equation In the framework of the Ordinary Least Squares models, the errore term is assumed to be an indipendent identically-distributed random variable sampled from a normal distribution.

Tab. 7 - Number of regions per MS for which data on Factor Income and subsidies are available 2004, 2006 and 2007

	Number of Regions													
	2004				2006					2007				
Member States	Factor income	Rural aids	Markets interventions	Other direct aids	Factor income	Rural aids	Markets interventions	Decoupled direct aids	Other direct aids	Factor income	Rural aids	Markets interventions	Decoupled direct aids	Other direct aids
AT	9	9	9	9	9	9	9	9	9	9	9	9	9	9
BE		11	11	11		11	11	11	11		11	11	11	11
BG	6									6	6	6	6	6
CY	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CZ	7	8	8	8	7	8	8	8	8	7	8	8	8	8
DE	38	38	38	38	38	38	38	38	38	38	38	38	38	38
DK	1	1	1	1	1	1	1	1	1	1	1	1	1	1
EE	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ES		17	17	17		17	17	17	17		17	17	17	17
FI	5	5	5	5	5	5	5	5	5	5	5	5	5	5
FR	26	26	26	26	26	26	26	26	26	26	26	26	26	26
GR	13	13	13	13	13	13	13	13	13	13	13	13	13	13
HU	7	7	7	7	7	7	7	7	7	7	7	7	7	7
IE	2	2	2	2	2	2	2	2	2	2	2	2	2	2
IT		21	21	21		21	21	21	21		21	21	21	21
LT	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LU	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LV	1	1	1	1	1	1	1	1	1	1	1	1	1	1
MT	1	1	1	1	1	1	1	1	1	1	1	1	1	1
NL	12	12	12	12	12	12	12	12	12	12	12	12	12	12
PL		16	16	16		16	16	16	16		16	16	16	16
PT	7	7	7	7	7	7	7	7	7		7	7	7	7
RO											8	8	8	8
SE	8	8	8	8	8	8	8	8	8	8	8	8	8	8
SI		1	1	1		1	1	1	1		1	1	1	1
SK	4	4	4	4	4	4	4	4	4	4	4	4	4	4
UK	37	37	37	37	37	37	37	37	37	37	37	37	37	37

Source: Elaborations based on Eurostat and CATS.

The table below details the data relative to Factor Income data and CAP payments' information in the CATS database for 2004 and 2007 at the regional level for each Member State.

Different econometric approaches are applied to nvestigate the factor income effects of direct payments and to test for the effectiveness and the efficiency of the direct payments:

- Ordinary Least Squares linear model;
- Quantile Regression model;
- *Probit* model.

In the ***Ordinary Least Squares*** model the parameter estimation is based on minimization of the sum of squared residuals from the mean. In this framework, each element of ε is independently and identically distributed with $E(\varepsilon_i) = 0$ and $Var(\varepsilon_i) = \sigma^2$, *i.e.* $\varepsilon_i \approx IID(0;\sigma^2)$.

The ***Quantile Regression*** can be considered as an extension of conditional mean models, i.e. the Ordinary Least Squares model. In fact, if the OLS method represents a model that assumes invariance of the error distribution, further specified as Gaussian model, the Quantile Regression substitutes the mean with the different quantile values and proceeds to minimize the weighted sum of the absolute residuals. In that, the median regression estimator can be considered as a central special case.

Formally, it is possible to demonstrate that, given a random sample $\{y_1, y_2, \ldots, y_n\}$, the sample mean represents the solution to the problem of the squared residuals minimization in an unconditional model:

$$\min_c \sum_{i=1}^{n} (y_i - c)^2 \Rightarrow c = \bar{y}$$

Similarly, it is possible to verify the solution to the problem of minimizing absolute residuals. This is represented by the median:

$$\min_c \sum_{i=1}^{n} |y_i - c| \Rightarrow c = y_{0.5}$$

This procedure can be extended to other distribution quantiles simply by proceeding to introduce a weighted form of the residuals in order to address the asymmetry issue:

$$\min_c \sum_{i=1}^{n} \rho_\tau (y_i - c)$$

where τ represents the value recorded by the selected population quantile, e.g. once again $\tau = 0.5$ represents the median.

In this framework, if the term c is substituted by a parametric function c(x, b), the solution to the minimization problem is represented by the conditional expectation function E(Y|x). By following exactly the same procedure, it is possible to substitute the parametric function, representing the absolute residuals in general terms:

$$\min_c \sum_{i=1}^{n} \rho_\tau (y_i - c(x,b))$$

If c(x, b) is a linear function, the minimization problem can be solved as in the Least Squares model by adopting linear programming models.

Concluding, the Quantile Regression method proves to be particularly relevant in the case of covariates influencing the conditional distribution of the examined sample characteristic not exclusively in terms of its "location", e.g. Gaussian error framework, but also in terms of dispersion, as in the case of heteroscedasticity and multimodality models. Thus, the Quantile Regression approach allows for in-depth investigation of non-Gaussian stochastic distributions.

A conditional probability model is applied to analyse the effect of direct payments on the stability of farmers' income. ***Probit*** **models** are formally defined as:

$$\Pr\left(Y = 1 \middle| X\right) = \Phi\left(X'\beta\right)$$

where $\Phi(.)$ is the standard normal cumulative distribution function and Xs are the explanatory variables.

Probit or *Logit* models are used to explain the behaviour of dichotomous dependent variables that can assume value of 1 or 0, depending on the particular specification adopted. In particular, they estimate the conditional probability of the dependent variable being equal to one. The *Probit* model specification appears to be more appropriate than the *Logit*, given the observed error terms distribution.

In the computational procedure, a particular approach of the *probit* model is used, known as *dprobit*. It presents the same characteristics of the *probit* model but it allows a more immediate interpretation of the effect of the explanatory variables on the dependent variable. In fact, it does not present the model in coefficient form, but allows estimating the change in the probability for an infinitesimal change in each explanatory continuous variable as well as the discrete change in the probability in case of dummy variables.

In the present analysis, the dependent binary variable is based on the Corrected net Factor Income, namely the corrected factor income net of all aids. Thus, starting from the above calculated CFI, the new variable is equal to the Corrected Factor Income minus direct and market aids, in the period 2000-2008:

$$CFI = FI_{net} + decoupled\_aids_{cats} + other\_direct\_aids_{cats} + market\_aids_{cats}$$

$$FI_{net} = CFI - decoupled\_aids_{cats} - other\_direct\_aids_{cats} - market\_aids_{cats}$$

Then, two sub-periods are considered: 2000-2004, the pre-reform period, and 2006-2008, the post-reform period. The year 2005 is not included in the analysis because it is the reform's starting year only for some t of the Member States, thus a year of transition.

For each of these two periods the coefficients of variation of the corrected net factor income are calculated as the ratio between standard deviation and mean, respectively in the considered time periods ($CV_{00\text{-}04}$=Coefficient variation for 2000-2004 period; $CV_{06\text{-}08}$=Coefficient variation for 2006-2008 period). In the next step, a volatility index (VI) is calculated as the ratio between 2000-2004 CV and 2006-2008 CV. Subsequently, a new binary variable (PVI) is created:

$$VI = CV_{00-04} / CV_{06-08}$$

$$VI \geq 1 \Rightarrow PVI = 1 \qquad VI < 1 \Rightarrow PVI = 0$$

4.1.3.2 Micro-econometric approach

This paragraph explains the methodology used to develop the micro-econometric analysis by considering the following topics:

- structure of the basic models (i.e. restricted models);
- structure of the models used to evaluate if the coefficients estimated for coupled and decoupled direct payments differ into sub-groups of farms (i.e. unrestricted models);
- features of the analysis based on individual farm data (including limitations and characteristics of the data sample);
- limitations of the applied methodology.

4.1.3.2.1 Structure of the basic model

The micro-econometric analysis relies on multiple linear regression models in order to explain the statistical relationships between income level (Y) and a number of explanatory variables (X). Therefore, the models take the following general structure:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots. + \beta_n X_{ni} + \varepsilon_i$$

where Y_i refers to the dependent income variable (index *i* refers to the *i*-th observation); $\beta_0, \ldots, \beta_n$ are parameters to be estimated by means of well-known regression techniques such as Ordinary Least Squared (OLS); $X_{1i}, X_{2i}, \ldots, X_{ni}$, refer to *n* independent variables; ε_i is the error term.

Assuming a linear relationship between Y and X_n, the parameter β_n shows how much a unitary change of X_n influences the level of Y. For example, in the cases where X_n refers to direct payments and Y to the farm income, the parameter β_n shows what is the impact of an additional Euro of direct payments on farm income, keeping all other variables constant.

The selected dependent variable refers to the farm average unitary income level. This is given by the ratio of Farm Net Value Added (FNVA) per Annual Work Units (AWU) (variable code: fnvaa)[40].

The following explanatory variables have been considered in all regressed models:

cmoa: support provided by the set of Common Market Organisation instruments excluding direct payments. This is estimated according to the approach described in the 1st interim report (section 6.2) (Euro/Annual Working Units);

cdpa: coupled direct payments (Euro/Annual Working Units);

ddpa: decoupled direct payments (Euro/Annual Working Units); note that in 2004, this variable is always zero in the farms not located in the new Member States given that in the other MSs decoupled payments were not been introduced yet;

otha other annual payments (Euro/Annual Working Units). This variable includes other forms of annual payments on current operations not accounted for in the previously

[40] The use of a relative index of income (i.e. per unit of work) is preferred to the use of an absolute income index (e.g. income per farm) in order to avoid *heteroscedasticity* problems during the estimation (Pindyck and Rubinfeld, 1998). In fact, it is likely that error terms associated with large farms have larger variances than error terms associated with smaller farms. This violate one of the assumptions on which OLS is based causing statistical problems. This approach copes with this problem by allowing a better comparison between data of farms that differ in terms of their size. However, this may not solve the problem that must be analysed by using appropriate statistical tests on the OLS regression results.

described variables. In particular, it is worth noting that subsidies on investments are not accounted for;

ecsize — farm economic size expressed in terms of ESU (ESU);

assa — amount of total assets per unit of labour (Euro/Annual Working Units);

gdp — average regional level of per capita Gross Domestic Products (Euro per person).

In the 2004 models, this last variable has been substituted by the following variable:

nsm — dichotomous dummy variable to identifies farms located in the new Member States (1) or otherwise (0).

Because in 2004 decoupled direct payments were zero in the farms not located in the new Member States and non-zero only in the farms located in the new Member States, the variable ddpa also behaves as a sort of variable that identifies the new Member States. Because the average unitary value added (fnvaa) in the new Member States is lower than in the farms of the other Member States, the coefficients estimated for this variable in a previous version of the model use to be negatively biased, very small or, in some cases, even negative.

In order to cope with this problem, it has been decided to include in the regression model the dummy variable nsm. However, because of the high correlation between variables nsm and gdp (i.e. per-capita regional Gross Domestic Product), it was necessary to drop this latter variable from the model for not incurring into multicollinearity.

4.1.3.2.2 Structure of the models used to evaluate if the coefficients estimated for coupled and decoupled direct payments differ into sub-groups of farms (i.e. unrestricted models)

The variables presented above define the so call *restricted model* to identify a model where the estimated parameters are assumed not to differ in sub-samples of the whole sample (i.e. the considered coefficient(s) are the same in the whole farm sample). However, in order to assess if this is not the case, it is possible to develop the so called *unrestricted models* where estimated parameters are allowed to change and to take a different value into previously specified sub-samples (Pindyck and Rubinfeld, 1998).

In the restricted models, the hypothesis is that the coefficients for direct payments do not differ within the considered groups of farms. Therefore, the coefficients for variables *cdp*a and *ddpa* provide average estimates for the whole groups without taking into consideration possible differences that may exist between farms located in mountain-LFAs and the other farms. The unrestricted models, used in this section, relax this hypothesis.

In the considered case, two kinds of *unresctricted models* have been developed referring to:

- farms located in mountain-LFA and in other areas (i.e. unrestricted-LFA model)
- farms located in regions where the SPS and the SAPS Payment Schemes are applied (i.e. unrestricted-SPS model).

These unrestricted models have been developed in order to reach the following goals.

The *unrestricted-LFA model* has been developed in order to test if the coefficients for the variables referring to coupled and decoupled payments statistically differ in the farms located in mountain LFA and the others. This additional model has also been estimated in each farm group and it contains the following two additional instrumental variables:

Lfacdpa variable obtained by multiplying the dichotomous (or dummy) variable LFA times the variable cdpa (Euro/Annual Working Units); LFA takes the value of 1 if the farms are located in a mountain LFA areas and 0 otherwise;

Lfaddpa variable obtained by multiplying the dichotomous (or dummy) variable LFA times the variable ddpa (Euro/Annual Working Units).

Because of the nature of variables *lfacdpa* and *lfaddpa*, their coefficients express the difference between the coefficients in mountain-LFA farms and in the other farms. This has two main implications.

First, variables *cdpa* and *ddpa* are the same as in the restricted models. However, because the models also contain variables *lfacdpa* and *lfaddpa*, the coefficients for *cdpa* and *ddpa* refer to coupled and decoupled payments only in the farms that are not located in mountain-LFAs and not to the whole samples (as it is in the restricted models).

Second, the estimated coefficients for mountain-LFA farms can be found by summing up the coefficients for the two sets of variables. In particular: the sum of the coefficients for *cdpa* and *lfacdpa* yields the coefficient for coupled payments in mountain-LFA farms; the sum of the coefficients for *ddpa* and *lfaddpa* yields the coefficient for decoupled payments in mountain-LFA farms. If, for example, the coefficients for the variables *lfacdpa* and *lfaddpa* are negative, then the coefficients for farms in mountain-LFAs are lower than the coefficients for all other farms. If, for example, the coefficients for the variables *lfacdpa* and *lfaddpa* are zero, this suggests that the coefficients for farms in mountain-LFAs do not differ from the coefficients for the other farms.

The test is performed jointly on both coefficients by specifying the *unrestricted-LFA* (UR) models in the following way:

$$fnvaa_i = \beta_0 + \beta_1\, cdpa_i + \beta_2\, ddpa_i + \gamma_1\,(LFA\ \ cdpa_i) + \gamma_2\,(LFA\ \ ddpa_i) + \text{other variables} + \varepsilon_i$$

where LFA is a dummy variable taking the value 1 for farms located in mountain LFA and zero otherwise. In this way, the coefficients referring to direct payments in non-LFA farms are β_1 (for $cdpa_i$) and β_2 (for $ddpa_i$). The coefficients specifically for mountain-LFA farms can be obtained in the following way:

$\beta_1 + \gamma_1$ (for coupled payments)

$\beta_2 + \gamma_2$ (for decoupled payments)

Therefore, if for example the coefficients γ_1 is significant and negative, this suggests that the coefficients for coupled payments in mountain-LFA farms is lower than in the other group of farms.

This kind of model has been estimated on both 2004 and 2007 data. However, it is worth noting that the analysis of the estimated parameters for decoupled payments in 2004 only refers to the observations for the farms in the new Member States and not to the farms of all Member States. Furthermore, in new Member States, mountain LFA farms are not very much represented in the sample. For these reasons, the comparison of the coefficients for decoupled payments estimated in 2004 for mountain-LFA and other farms should be considered with caution. Thus, the analysis of the coefficients for decoupled payments should rely more on the 2007 results.

Here the null hypothesis to be tested is that the additional parameters jointly differ from zero (i.e. H_0: $\gamma_1 = \gamma_2 = 0$). This means to test whether the parameters for cdpa and for ddpa do not statistically differ in the considered two sub-samples. The appropriate test statistic to perform (F test) is (Pindyck and Rubinfeld, 1998):

$$\frac{(ESS_R - ESS_{UR})/q}{ESS_{UR} / (N-k)}$$

Where:

- ESSR and ESSUR refer to error sum of squares of, respectively, the restricted and unrestricted models;
- q is the number of variables included in the unrestricted model to be tested (two in the considered case);
- N is the number of observations;
- k is the number of parameters (number of variables plus the intercept) of the unrestricted model41.

This test has a F distribution with q degrees of freedom in the numerator and N-k degrees of freedom in the denominator.

This test can also be described in the following R^2 terms (Pindyck and Rubinfeld, 1998):

$$\frac{(R^2_{UR} - R^2_R)/q}{(1 - R^2_{UR})/(N-k)}$$

After having calculated the F test in one of the two ways, the obtained value is compared to the critical value reported in the usual statistical tables for F distributions for a given level of confidence (e.g. 5%) and for the same level of degrees of freedom (i.e. numerator and denominator). If the value of the test is larger than the critical value, it is possible to reject the null hypothesis and conclude that the set of the two instrumental variables is significant (Pindyck and Rubinfeld, 1998). This means that both coefficients should be considered different from zero and that the coefficients for coupled and decoupled payments in the two sets of farms (i.e. mountain-LFA and other farms) differ.

The models referring to the Payment Scheme, named *unrestricted-SPS model*, have been estimated only on 2007 data[42]. This is done to investigate if the estimated coefficients for the variables referring to coupled and decoupled direct payments (cdpa and ddpa) statistically differ in the farms located in regions where the two forms of Payment Scheme (SAPS and SPS) are applied. The *unrestricted-SPS model* has also been estimated in each considered group of farms including in the model the following two additional instrumental explanatory variables:

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[41] In other econometric textbooks (e.g. Wooldridge, 2009), the symbol k refers to the number of variables and not, as it is the case here, to the number of parameters. In those textbooks, the degree of freedom of the denominator is written as: n – k – 1 given that k+1 represents the number of parameters. Here the notation in Pindyck and Rubinfeld (1998) is used so that the symbol k already represents the number of parameters. Therefore, the differences between the two formulas are just in the notation.

[42] It has not been possible to differentiate the coefficients for coupled payments between old and new Member States in 2004 because the variable referring to decoupled payments (ddpa) is non zero only in the new Member States. The instrumental variable needed to do so (obtained by multiplying cdpa times a dummy variable identifying new Member States) has been found to be very highly correlated to both variable cdpa and ddpa. Therefore, to avoid multicollinearity, it has not been possible to include this instrumental variable in the model.

Spscdpa variable obtained by multiplying the dichotomous variable SPS times the variable cdpa (Euro/Annual Working Units); SPS takes the value of 1 if the farms are located in a region or Member States where the Single Payment Scheme is applied; 0 in those farms located in Member States where the Single Area Payment Scheme is applied;

spsddpa variable obtained by multiplying the dichotomous variable SPS times the variable ddpa (Euro/Annual Working Units).

In this case, the *unrestricted-SPS* (UR) model has the following structure:

$$fnvaa_i = \beta_0 + \beta_1\ cdpa_i + \beta_2\ ddpa_i + \gamma_1\ (SPS\ cdpa_i) + \gamma_2\ (SPS\ ddpa_i) + other\ variables + \varepsilon_i$$

where SPS is a dummy (dichotomous) variable taking the value 1 for farms located in regions where the SPS is applied and zero otherwise. In this way, the coefficients referring to direct payments in SAPS regions are β_1 (for coupled payments) and β_2 (for decoupled payments). The coefficients specifically for SPS regions can be obtained in the following way:

$\beta_1 + \gamma_1$ (for coupled payments)

$\beta_2 + \gamma_2$ (for decoupled payments)

Therefore, if for example the coefficients γ_2 is significant and negative, this suggests that the coefficients for coupled payments in SPS regions is lower than in the SAPS regions.

It is important to note that the differences in the estimated coefficients in the two groups of farms can be due not just to the different payment scheme applied but also to the fact that the two groups of farms differ in terms of other factors. While the models also include some variables other than those referring to direct payments, it is possible that such other factors could not be fully described by the included variables. This may be particularly the case in the models with relatively poor overall estimation results such as when the regression R^2 is low. Similar considerations also applied to the *unrestricted-LFA models*.

The F statistic test previously described with reference to the unrestricted-LFA models has been performed also in this case to verify if the estimated coefficients jointly differ in farms belonging to regions where SPS and SAPS are applied[43].

4.1.3.2.3 Features of the analysis based on individual farm data

The models have been developed on individual farm data rather than regional average data from the FADN database of 2004 and 2007. The use of individual data should be considered as a strength of the analysis in terms of increasing the quality of the results and deepening the analysis of policy-relevant aspects.

Firstly, the use of individual data avoids aggregation bias that adversely affects estimation based on regional average data. In the case of regression analysis, aggregation refers to the use of mean values of the independent variables to predict mean values of the dependent variable (Klein, 1946). Aggregation bias results from the fact that the aggregation of data points removes the variance of the considered variables. Thus, a model derived from aggregated data may fail to draw conclusions that are valid for individuals (Walker and Catrambone, 1992).

[43] The hypothesis of considering both aspects together (i.e. the effect of SPS/SAPS into mountain-LFA and into non mountain-LFA farms) has been abandoned because the instrumental variables needed to perform the tests assume a zero value for exactly the same observations. This yields an high level of correlation between each couple of these variables causing serious multicollinearity problems.

Furthermore, the use of individual data increases the number of observations on which the estimation is based, thus increasing the Degrees of Freedom (DF) of the models. The increase of the degrees of freedom allows to introduce a larger number of explanatory variables in the models.

Finally, the use of individual farm data permits the development of models taking into specific account for possible differences in the coefficients for direct payments (coupled and decoupled direct payments) in farms located in mountain Less Favoured Areas (LFA) or not and, for the 2007, in farms located in regions where the SPS or the SAPS are applied.

Limitations of using individual farm data

The use of individual farm data has also a couple of limitations that should be explained here in order to better interpret the choice of the used methodology and the results of the analysis. These are heteroschedasticity and presence of outliers.

Heteroschedasticity generates problems in the estimation because, unless as it is assumed by standard OLS estimation procedures, the error variance is not constant over observations. This places more weigh on the observations with large error variances, including in particular on outliers, than on those with small error variances (Pindyck and Rubinfeld, 1998). This problem arises often in studies considering a cross-section of firms in one industry as it is the case when using FADN data. Under these circumstances, it is possible that the error terms associated with large farms may have larger variances than error terms associated with smaller farms.

In order to alleviate this problem, it has been decided to divide both dependent (farm value added) and independent variables (e.g. coupled and decoupled direct payments) for the amount of work used on farm obtaining unitary values (e.g. Euro per unit of work). However, the results of tests performed on the OLS regression results, namely the Breusch-Pagan and the White tests (Pindyck and Rubinfeld, 1998), have always suggested the presence of heteroschedasticity even after the transformed variables (i.e. divided by the amount of work used) are used.

The second limitation of the use of individual farm data is the presence of outliers. These are data points which are more than some arbitrary distance from the regression plane (Pindyck and Rubinfeld, 1998). In other words, these are data points with abnormal values for one or more of the examined variables, compared to the values found in the rest of the sample. Outliers may be caused by errors in measurement or in recording and should be carefully considered. These outliers, even if not many, can cause unreliable regression results changing the intercept and the slope of the considered regression. Therefore, when found, observations for which outliers are present should be eliminated or appropriately down-weighted because only in this way reliable regression results are provided (Finger and Hediger, 2008; Maronna et al., 2006).

Both problems have forced us to use a statistical approach able to correct both heteroschedasticity and the presence of outliers and to get robust estimations (Pindyck and Rubinfeld, 1998). In particular, it has been chosen to rely on a robust regression method based on the technique of weighted least squares (Pindyck and Rubinfeld, 1998). In particular, it has been used the robust regression command rreg offered by the statistical software STATA (STATA Corp., 2005) that uses iteratively reweighted least squares by assigning a weight to each observation with higher weights given to better behaved observations. In fact, extremely deviant cases (e.g. strong outliers) can have their weights set to missing so that they are not included in the analysis at all[44]. In short, the most influential points are

[44] According to the Stata 9 Reference Manual (page 162), the robust regression procedure runs the OLS regression, gets the Cook's D values, and then drops any observation if its Cook's D value is greater than 1. Then iteration process begins in which weights are calculated based on absolute residuals. The iterating stops when the maximum change between the weights from one iteration to the next is below tolerance.

dropped, and then cases with large absolute residuals are down-weighted. Robust regression is essentially a compromise between dropping the case(s) that are moderate outliers and seriously violating the assumptions of OLS regression (Chen et al.).

It is important to note that, because of its characteristics, the use of this approach increases the level of R^2 in comparison with that obtained by running on the same data OLS. Therefore, it is important to keep in mind this peculiarity when evaluating the goodness of fit of the considered models.

Quantile regression

Another dimension that has been explored is to verify if direct payments influence in the same way unitary farm value added in farms with low and high unitary farm value added levels. This has been done by using the method of quantile regression that has been already presented in explaining the methodology used in the macro-econometric analysis (see § 4.1.3.1). Because the methodology used in the micro-econometric analysis is the same than the one used in the macro-econometric analysis, the interested reader could refer to what is presented there.

However, it is important to recall that Quantile regression has been used in order to answer the question if the explanatory variables influence the dependent variable differently for observations selected from different levels of the dependent variables. In the considered case, quantile regression parameters for direct payments (cdpa and ddpa) of different quantiles of the unitary farm value added (fnvaa) estimate the changes produced by a one unit change in direct payments on farm value added. Comparing the sizes of the regression coefficients in the different quantiles shows if farm value added is affected by direct payments in a different way in the different percentiles. In other words, this allows to verify if the impact of direct payments changes according in the farm sample according to the level of the unitary value added.

Quantile regression models have been developed in all farm groups. However, estimation results for 3 farm typologies (Horticulture, Permanent crops and Granivores for both 2004 and 2007) are not presented and discussed because these have provided poor regression results in terms of low R^2 in the basic models. The rationale for this choice is that, in these cases, the results of the quantile regression (that represents a further and more sophisticated approach) could be too unreliable for being considered for analysis.

Characteristics of the data sample

Regression models have been developed on the basis of individual FADN farm data grouped according to the Typologies of Farms.

Tab. 8 - Definition and number of farms considered in the micro-econometric analysis

Typology of Farm		Number of farms	
TF code	**Description**	**Year 2004**	**Year 2007**
1	Field crops	22,108	23,326
2	Horticulture	4,381	5,120
4	Permanent crops	7,141	8,236
5	Milk	10,739	12,184
6	Other grazing livestock	9,516	10,705
7	Granivores	4,198	4,678
8	Mixed	13,204	12,764
Total	Sum of the previous typologies of farms	71,287	77,013

In order to have an overall and general picture, models have been developed also for the whole sample of farms regardless their production orientation (i.e. considering all types of farming together).

4.1.3.2.4 Limitations of the used methodology

The micro-econometric analysis has some limitations that should be outlined in order to better interpret the estimation results.

The models account for variables referring to direct payments and other forms of support. Furthermore, other variables, referring to farm structural characteristics and to the general economic environment in which these farms are located have been added. Nevertheless, the model is very simple and in some cases the considered variables are not going to account for all the other factors that may be important in determining the unitary level of farm value added. In particular, it seems safe to analyse with caution the estimation results of those models where the regression R^2 is low.

The existence of a high correlation between possible explanatory (independent) variables has prevented the use of a larger set of explanatory variables that may have permitted to enrich the estimation models. However, the inclusion of variables highly correlated has not been possible in order to avoid multicollinearity problems.

Apart for each typology of farms, models have been developed also for the whole sample of farms regardless their production orientation. It is important to note that the results of this kind of models should be considered with caution. Indeed, this is coming from the aggregation of farms with a large degree of heterogeneity in terms of production orientation and structural characteristics.

The regression models have been developed on 2004 and 2007 data and an attempt has been done to compare the estimation results deriving from these two periods. However, it is important to recall that the change in the estimated parameters can be due to many other factors that have changed over time other than the changes in direct payment policies.

While it is interesting to analyse the results of both 2004 and 2007 regressions, it should be stressed that more emphasis should be given to the 2007 results. This is not just because this dataset is the most updated, but especially because the policies in place in that year are more similar to the ones currently in place. In particular, it should be stressed that, in 2004, decoupled payments were granted only in the new Member States while the SPS was not yet applied in the other Member States.

Some caution is needed in interpreting the results stemming from the models developed to investigate if the estimated parameters for direct payments differ in sub-groups of farms such as it is the case of mountain-LFA and other farms, and of farms located in regions where the SAPS and the SPS are applied. Particularly in this latter case, it is important to note that the differences in the two groups of farms can be due not just to the different payment scheme applied but also to the fact that the two groups of farms differ in terms of other factors. While the models include some variables other than those referring to direct payments, it is possible that such other factors could not be fully described by all variables included in the models. Therefore, it should be avoided to suppose that all possible differences are only due to the different ways of implementing the payment schemes.

4.1.3.2.5 List of references for the microeconometric modelling

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The literature review was aimed at identifying and analysing farm household income information (i.e. collected and published for selected countries and regions) not otherwise available in the EU official statistics, as such data are not collected in a systematic harmonized way throughout the EU.

In particular, the literature review investigated the following topics:

- Level of farm household income: a) the difference between farm and non-farm households income levels; b) its evolution over time; c) the income distribution and share of low income cases among farm households; d) the heterogeneity of farm household income levels among farm types.
- Composition of farm household income. This analysis was especially focused on the contribution of farm business income and off-farm income on the total income of farm households including its evolution over time.
- Role of agricultural policies in the generation of farm household income.
- Variability over time of both farm household income and farm business income.

The next paragraphs illustrates the coverage of the review and some of the limitations of this exercise. A general discussion of the overall results of the literature and some considerations more directly linked to the topic covered by this evaluation are provided in the answer to the EQ 1 (§ 5.1).

4.1.4.1 Coverage of the literature review

The analysis has considered two kinds of studies/sources:

- studies developed on groups of countries (the literature review focuses only on the results regarding EU Member States) ;
- studies or statistics referring to single Member States of the EU.

The first group of studies is very useful because they provide a comparison between some EU Member States. However, only three studies have been identified and reviewed: they have been developed by OECD or using the common database from the Luxembourg Income Study.

The OECD (2003) study has a relatively large coverage of EU Member States (11) but unfortunately the data is relatively old (mid 1990s). The OECD (2009) study provides more up-to-date data (2004-05) but the coverage is limited in terms of number of EU countries (8) and in terms of analysed topics given that the main focus of the study is on income diversification. The Henry de Frahen et al. (2008) paper, based on data from the Luxembourg Income Study, cover only 7 EU MSs and the data are not up-to-date (mid 1990s).

The studies and statistics referring to single Member States allows to cover additional MSs and provide more up-to-date data. However, it has not been possible to obtain studies and statistical data for many Member States. This is particularly the case of most of the Member States that joined the EU in 2004 with the exception of Poland and Romania where some statistical data is available. However, recent studies and up-to-date statistical data have not be found for other Member States such as Portugal, Spain and Sweden. An overview of the studies considered is summarised in the following table.

Tab. 9 - Data availability of studies and statistics on Farm Household Income on EU countries

Source:	OECD 2003	OECD 2009	Henry de Frahen et al. (LIS)	Eurostat 1998	Eurostat 2002	National Studies	National Statistics	N° of analysed studies
Belgium	1997-99				1999			1
Bulgaria								0
Cyprus								0
Czeck Republic								0
Denmark	1997-99	2004-06			1999		2004	3
Germany	1997-99	2005/06	1994		1993			3
Greece	1996+98				1998	2005		2
Spain				1993	1993			0
Estonia								0
France	1997	2003	1994		1994	2003		4
Hungary								0
Ireland	1994-99	2004/05	1996		1988	2006	2006	5
Italy	1993-95		1995		1995	2002		4
Lithuania								0
Luxembourg			1994	*1989^*	1990			1
Latvia								0
Malta								0
Netherlands	1996-99	2004/06			1997	2009(e)		3
Austria		2004-05				2002	2008	3
Poland	1999-00	2003-06					2007	2
Portugal				*1989^*	1989			0
Romania							2007	1
Finland	1996+98-99	2003-05	2004		1999	2002		4
Sweden	1995-97				1997			1
Slovakia								0
Slovenia						2001		1
United Kinghdom	1996-98	2004/05	1995					3

The last year of available data is reported.

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4.1.4.2 Limits of the literature review

Apart from the lack of up-to-date studies and statistical data on Farm Household Income in some Member States, the literature review suffers from some additional limitations that are important to be underlined before moving to the description of the results.

The available income of a farm household consists of income generated by both agricultural and non-agricultural activities, profits and remuneration obtained from other non-core business activities, capital-derived income, welfare benefits and other revenues (OECD, 2002). Although on this definition there is clear agreement, opinions still diverge as to how this income has to be defined and measured in detail, and different sources use different definitions and criteria (Agra CEAS, 2007; Hill, 2009). This is also the case of European data because there is no harmonised protocol for surveys at the EU level and MSs are not under any obligation to deliver the data collected to the Commission (Karlsson et al., 2005; UNECE, 2005).

This heterogeneity represents a major limitation when attempting to compare results of studies and statistics on the farm household income based on different sources such as it is the case when data from different countries is analysed. This also means that some caution is needed to interpret the results of this exercise (OECD, 2004). For this reason, before moving to presenting the finding from the literature review, it is important to underline the main differences in definition and measurement criteria encountered in the considered studies and statistics.

4.1.4.2.1 Differences in definitions

One of the most obvious difficulties highlighted by the literature derives from the fact that the household and the farm are different units (Agra CEAS, 2007). In some cases, a farm can generate incomes for two or more households and vice-versa.

Some sources refer to a "narrow" definition while others to a "broad" definition of farm households (OECD, 2002). The first definition, used for example in Austria, France, Germany, Netherlands and Poland, refers to the case where most of the household income (generally more than 50%) comes from an independent farming activity. The "broad" definition, used for example in Denmark, Finland, Ireland and the United Kingdom, refers to the case where some income comes from this activity.

Generally a further criterion is used in selecting the sample of farm household to analyse. The sample is sometime selected only from households with a farm of at least a given minimum size. However, the used parameters and threshold levels very often differ. For example, farms should be bigger that a given value expressed in economic terms (e.g. in Austria, Germany, Netherland in terms of Standard Gross Margin), of area (e.g. in Denmark 10 ha and in France 12 ha of Utilised Agricultural Area) or of labour use (e.g. in France more than 0.75 and in UK more than 0.5 Agricultural Working Units).

The definition of household is also not the same in the considered studies. In some cases the incomes of all member of the households are considered (e.g. in Denmark, France, Ireland and Poland), while in other cases only the incomes of the manager and his/her spouse are considered (e.g. Austria, Finland, Germany, Netherland and United Kingdom).

The comparison between the income of the farm household and a reference level of income can be biased by how the latter is defined. The reference income is defined sometimes on the basis of the average income level of a particular group of non-farm households (e.g. household with salary income

or households with an independent non-agricultural business) and sometimes on the basis of that of all households. In this latter case, the considered group also includes farm households.

In some cases (e.g. Romania) the income figures also include non-monetary income such as income in kind expressed as the value of the products used for home consumption.

Finally, a further difference is that some sources use only the Gross Net Disposable Income, while others (e.g. in Netherlands) also refer to the Net Disposable Income. The latter differs from the former because Total interests on loans, Taxes on income and capital and Social contributions are deducted. For this reason, the results from using the two types of income figures could differ.

4.1.4.2.2 Differences in the measurement of farm household income

The comparison of income levels is conducted generally in terms of income per household and only few sources also provide the income level per member of the household[45]. However, the two data sets are likely going to give different pictures given that the number of household members can differ between farm and non-farm households. Indeed, farm households have often an higher average number of members than non-farm households.

The approaches to collect statistical data able to represent farm household income can be classified as the microeconomic, macroeconomic and hybrid approaches (OECD, 2002)[46]. The results of these approaches often lead to very different conclusions, thus it appears inappropriate to compare their findings (Court of Auditors, 2004). For this reason, most of the literature reviewed in this evaluation refers only to the micro-economic approach.

Statistical data on household budgets offer the advantage of sharing a methodology that has been defined at the European level (Eurostat, 2002), which has led to the "Income, social inclusion and living conditions" survey (EU-SILC). These statistics are however impaired by two main limitations as far as the analysis of agricultural household incomes is concerned. First, the sample of agricultural households is too small to be able to conduct sufficiently reliable analysis. In particular, the Agra CEAS study (2007: p.48) indicates that the sample accounts for less than 1% of agricultural households identified at the European level, with minimum thresholds of less than 0.5% in many Member States. Second, there is no relationship with data on agricultural holdings and so farm structural aspects cannot be considered. The approach adopted, moreover, does not appear to be particularly suitable for measuring the income of agricultural households because of the nature of farms, marked by self-employment (Agra CEAS, 2007: pp. 38-39), and due to problems relating to comparability, quality, soundness and observation times (Bascou, 2004).

Finally, some Member States (such as France and Denmark) use databases on income tax returns. This data source is impaired in particular by the fact that, in many cases, agricultural holdings are not subject to a form of taxation based on a complete accounting system. Thus, only in a few cases can this information source alone give a correct representation of agricultural household incomes (Agra CEAS, 2007: p.49).

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45 Note that the income per member can be expressed in term of income per member or in equivalent member. In this latter case, household members are weighted according to an equivalence scale.

46 A presentation of micro- and macro-economic approaches is provided by Agra CEAS Consulting (March 2007). "Feasibility study on the implementation of agricultural households sector (IAHS) statistics". Final Report for the European Commission. The micro-economic approach is based on the use of data for household units or farms, and may use different data sources. The macro-economic approach starts from broad economic aggregates of households, before breaking them down into sub-sets, including units whose income derives from business activities. The hybrid approach integrates the previous two approaches, often using estimates from micro-economic analysis to break down macro-economic data..

In conclusion, the review exercise regarding the availability of statistical data highlights the numerous and profound difficulties encountered when analysing agricultural household incomes. Numerous and sizeable problems arise as to the limited availability, quality and comparability of the data available for each MS (UNECE, 2005).

4.1.5 Expert survey

In the framework of the present evaluation, we have contacted a group of experts requesting their informed opinions regarding the phenomena under analysis. The main scope was to collect the informed opinion of the experts in order to better interpret the results of the analysis of issues related to farmers' incomes also allowing for a better understanding of the complexity of situations within the EU due to differences at the geographical, cultural, legislative and economic levels.

On the basis of the results of the analysis, a document containing a list of relevant questions was sent to the experts (30 experts from 19 Member States have been contacted). They have been asked to express their agreement/disagreement/opinion on a number of results deriving directly from the analysis undertaken.

We have received 10 answers and the opinions obtained from the experts have been integrated in the analysis of those questions for which it have been proposed to implement this qualitative tool.

5. THEME 1 – FAIR STANDARD OF LIVING OF THE AGRICULTURAL COMMUNITY AND ECONOMIC VIABILITY OF FARMS

TO WHAT EXTENT HAVE THE DIRECT PAYMENTS CONTRIBUTED TO ACHIEVING A FAIR STANDARD OF LIVING FOR THE AGRICULTURAL COMMUNITY, BY STABILISING AND ENHANCING THE INCOME OF FARMERS? (QE 1A)

5.1 Comprehension and interpretation of the evaluation question

The evaluation question requires to assess to what extent direct payments have contributed to achieving a fair standard of living for the agricultural community, by way of enhancing the income of farmers and decreasing income variability over time.

The steps required to answer this question encompass 1) providing a definition of "fair standard of living for agricultural communities", 2) defining the variables that can be used to measure it.

As discussed in the theoretical analysis (§ 3), the economics and sociology literature commonly recognises that, in the case of homogeneous populations, income level differences are totally sufficient to define standard of living orderings.

If we accept that farm income is an appropriate proxy to measure the standard of living for the agricultural community, the next steps consist of defining an approach that allows to assess whether farm incomes are above or below a level that can be considered as "fair" and which income variables are suited for the measurement.

With respect to the first point, from an opportunity-cost perspective, a farm's economic activities must be able to generate a level of income equal to or above a certain benchmark value of income in a counterpart population. The income variables used as benchmarks are presented in the § 5.2 "Methodological approach, data sources and limits".

At the point of defining which income variables are better suited to measure the standard of living, we encounter a further problem. : the definition of farmers' incomes is not straightforward, as agricultural households often have a total income that is formed by agricultural and non-agricultural income (e.g. income from capital gains, rents and interests, income from off-farm employment).

Unfortunately there are no harmonised statistics providing information about off-farm income at EU level and for individual Member States. Therefore, the choice of data for analysis is restricted to the variables representing the remuneration of agricultural production factors (land, labour and capital). As article 39 of the Treaty on the Functioning of the EU refers in particular to the individual earnings of persons engaged in agriculture, it does not seem inappropriate to focus on the level of farm business income relative to the main activity of the persons engaged in agriculture (i.e. farming).

However, it is important to examine the available information regarding farm household total income. Therefore, on the one hand, the analysis employs European agricultural statistics and farm data (FADN) to examine the impact of direct payments on farm business income. On the other hand, the analysis of farm household total income is done through a review of the available literature and published national data.

5.2 Methodological approach, data sources and limits

The analysis to answer EQ1 is conducted across the EU 27 Member States, for the observation period corresponding to the years 2001 onwards. The methodology comprises two levels of analysis: macro- and micro-economic, and a complete range of analytical tools.

Level of the analysis:

- At the macro-economic level, the analysis is based on data from the EU regional statistics provided by Eurostat and is carried out at the NUTS II regional level.
- At the micro-economic level, the analysis is based on farm data from the FADN database (EU-FADN-DG AGRI L-3) and is conducted at regional level and at farm typology level (see § 2.1.1.1.1 page 11). The definition of farm typologies was necessary given the high heterogeneity of the farms' population with respect to a number of key characteristics related to type of farming, size and structure, all of them important factors influencing farm incomes. Based on these typologies, farms were first classified according to the type of farming, the region or macro-region and the model of implementation of the 2003 CAP reform. At the second level, three subsequent farm typologies were constructed to account for different farm characteristics such as economic size, farm location, and type of farm organisation.

Analytical tools:

- Statistical methods are applied to analyse the evolution of the main variables with respect to the level and stability of income of farmers, as well as to the benchmarking of the fair standard of living of the agricultural community.
- Econometric modelling developed at both the micro- and the macro-economic level. The adoption of an econometric approach aims to distinguish the income effects of direct payments from the effects of other factors.
- A review of the literature concerning total farm household incomes.
- A qualitative survey provided by informed experts, aimed at better interpreting the results of the quantitative analysis.

The breakdown into two levels (macro and micro), a further breakdown of the micro level into types and the use of four analytical tools made the analysis particularly complex. To facilitate an understanding of results in order to come up with a final judgement, we decided to break down findings into two parts.

Part one, contained in this chapter, responds to the evaluation question at a macro and micro level, focusing at the micro level on the classification of farms by sector, region, model of implementation of the 2003 reform and economic size. The effects of the CAP on the observed phenomena have also been analysed. The chapter uses all the analytical tools and studies the effects of direct payments on farm business income (statistical methods, econometric modelling, expert survey) and on farm household total income (review of literature, expert survey).

Part two of EQ1, contained in the next chapter, develops the microeconomic analysis. The analysis considers a possible differentiated role of direct payments on the farm business income of EU farmers according to area types (less favoured area, mountain areas) and the organisational form of the farm holding (individual farms; partnerships; other forms). The chapter uses three analytical tools: statistical methods, econometric modelling, expert survey.

Below we detail the methodology adopted for the statistical analysis developed in this first part of the answer to the EQ1. For the description of the adopted methodology of the macro- and micro-econometric analyses, of the review of the literature and that of the expert survey, please refer to § 4.

The statistical analysis essentially draws upon the indicators of farmers' income level, composition and variability calculated on the basis of FADN farm data (see also § 4.1.1). In addition, the income variable was calculated at the macro-economic level using the data from the EU regional statistics provided by Eurostat.

The economic accounts data for agriculture provided by Eurostat do not allow to disaggregate the contribution of individual agricultural payments to the factor income. Therefore, we have integrated the more detailed subsidy data available from the CATS database (Clearance of Accounts Audit Trail System, provided by DG Agri) with the regional agricultural accounts data provided by Eurostat. This operation results in the computation of a new factor income variable, here termed Corrected Factor Income (CFI). Details on the calculation of the CFI: § 4.1.3.1

At the micro-economic level, the income of farmers across EU macro-regions was analysed through the Farm Net Value Added per Annual Work Unit: FNVA/AWU. See also 4.1.1.

Levels of the FNVA/AWU indicator and the share of direct aids on FNVA/AWU were analysed by converting the original values of the FADN database into PPS values, in order to take into account the differences in existing purchasing powers across Member States (and consequently in the real available individual income for consumption).

All analyses were conducted according to the FADN classification (variable TF8), which gives an approximate representation of the prevalent business areas of farms and differentiates seven types of farming . Each type of farming thus represents a homogeneous reference unit to which the analytical method was applied. The types of farming analysed are: Field crops (TF 1); Horticulture (TF 2); Other permanent crops (TF 4, i.e. permanent crops except wine); Milk (TF 5); Other grazing livestock (TF 6, i.e. beff, sheep and goats); Granivores (TF 7); Mixed (TF 8, i.e. various crops and livestock combined).

Farm income per labour unit (FNVA/AWU) was analysed in a number of steps:

- Average income level: the average value for each type of farming and for each region was calculated for the period 2004-2007 in order to compare in a homogeneous manner average income levels in all macro-regions, including those of EU12 Member States (for which FADN data are available only from 2004 onwards). The sole exceptions are the macro-regions of Romania and Bulgaria, for which the calculated averages only refer to the period 2007-08. The average values of FNVA/AWU have been calculated in the real situation (with direct payments) as well as in the simulated situation (by deducting direct payments).
- Average income trends (FNVA/AWU with direct aid and without direct aid) between pre- and post-reform periods: the analysis was conducted solely for EU15 macro-regions by comparing for each sector average values for the period 2001-04 (pre-reform) and the period 2006-07 (post reform).

The analysis is based on variable samples of farms belonging to rather heterogeneous types of farming. TF 1 for example refers to field crops, the composition of which can vary greatly in different macro-regions (in terms of technological and economic parameters and support levels). The results of analyses may thus be influenced by these composition differences.

In some cases the small size (fewer than 15 farms) or absence/inadequacy of FADN data for calculating averages led to the exclusion of these macro-regions from the analysis.

Wherever possible, the analysis was also conducted according to the economic size of the farm (three classes of ESU: small, up to 16 ESU; medium, from 16 to 100 ESU; large, greater than 100 ESU[47]). The number of regions by sector and by ESU class on which the analysis was developed is summarised in the table below.

Tab. 10 - Number of regions and macro-regions considered in the analysis by ESU class

	Small	Medium	Large
TF1	34	50	40
TF2	20	30	20
TF4	21	32	19
TF5	19	45	32
TF6	28	41	20
TF7	9	29	26
TF8	28	44	28

Source: EU-FADN-DG AGRI L-3

The analysis of average income trends prior to and after the reform was also influenced by the availability of data (by type of farming and by region) for both periods considered.

The impact of direct payments on the stability of farmers' income is assessed by comparing the variability of farm income (FNWA/AWU) computed with direct payments and farm income computed by deducting direct payments (FNVAndp/AWU). The comparison uses the Coefficients of Variation (CV = Standard Deviation/Mean) over the observed period (2001-2007).

The analysis covers the macro-regions of the EU 15 for which sufficiently long income series are available (i.e. at least 5 years worth of data, but always including 2006 and 2007). Before proceeding to the calculation of the coefficients of variation, the trend component was removed from each income series in order to separate long-term movements caused by exogenous factors. There are instances in which it is not possible to assess the impact of direct payments as one of the calculated coefficients of variation is not reliable. This happens when one of the two income series presents negative values, which result in an out-of-range variation coefficients.

Finally, one of the key objectives of the CAP is "to ensure a fair standard of living for the agricultural community". As already mentioned, the European Community has never defined the concepts of 'agricultural community' and 'fair standard of living' as they appear in Article 39 of the TFEU Treaty. There are therefore still no clear concepts or criteria which can be applied to measure these variables.

In this context, to assess the contribution of direct payments to the income objective, the analysis had to compare farm income with an income variable to be used as benchmark. For the purpose of this evaluation, the examination of the available income measures in the official EU statistics (e.g. basic national minimum wage, annual gross earnings, industrial mean earnings, Gross Domestic Product) and considerations about comparability issues led to choosing the Gross Domestic Product (GDP) per employee as a benchmark (Eurostat, average 2004-2007).

The GDP is the market value of all final goods and services produced in a year and it is often positively correlated with the standard of living. Accordingly, regional GDP is a measure of a region's overall economic output and it represents an overall income benchmark (i.e. income generated by all sectors of a regional economy) to be compared with farm income expressed in terms of value added generated by all production factors.

[47] One ESU corresponds to a farm's Standard Gross Margin (SGM) of 1.200 Euro/year

The analysis was carried out at regional level for each sector. The ratio was computed in the real and simulated situation (farm income computed by deducting direct payments) for the period 2004-2007, for the period 2001-04 (pre-reform) and the period 2006-07 (post reform). The original values of the database were converted into PPS values.

A further analysis was conducted with a view to assessing whether and to what extent direct payments make it possible for the family units to attain an income (FFI/FWU) corresponding to at least the opportunity cost of paid employment. The benchmark used is the average wage of farm employees, obtained from the spending item Wages Paid of the sample of FADN farms, calculated at a regional level for all sectors.

The unit average wage in the region *r* has been calculated as follows: WP*r*/paid AWU*r* = Σ WP*ri*/ Σ paid AWU*ri* (i= 1..n farms of the FADN sample in region r). The unit average wage of the region *r* has been calculated as a regional average for the set of sectors, and is thus the same for all sectors. This assumes that, on average, the labour cost of farm employees (contractual wage) is the same within the same region, regardless of the type of farming to which the farms in which hired workers operate belong.

This methodological choice represents clearly a simplificationof reality, but makes it possible to limit the variability of the unit value of wages calculated for different samples (variable samples) of FADN farms, in particular in the type of farming/region combinations that have a limited farm sample[48].

5.3 Judgement criteria and indicators

In order to reply to this part of the question, we base our judgement on the following criteria:

Criteria and indicators
Judgement criterion no. 1 **In the EU regions direct payments have (they have not) contributed to enhancing and stabilising the income of farmers**
Subsidies relative intensity (SI) across EU regions 2004/2007
Index of subsidies specialisation (ISP) of the EU regions (direct payments *vs*. rural development aids) in 2007
Index of subsidies specialisation (ISP) of the EU regions (coupled *vs*. decoupled payments) in 2007
Regression parameter estimates for direct payments at the region level (2004 and 2007)
Probit parameter estimates for direct payments at the region level
Judgement criterion no. 2 **Over the examined time period, the level of farmers' incomes has increased (it has not) in the regions and farm typologies considered in the analysis and direct payments have (they have not) contributed to enhancing the income of farmers**
Context indicator: Variation % 2001-2007 Annual Work Unit (AWU)/farm and AWU/Hectare
Comparison of FNVA/AWU (in PPS, average 2004-2007) with and without direct payments in the regions of the EU27, with respect to type of farming, model of SPS implementation, farm economic size
DP/FNVA ratio (average 2004-2007) in the region of the EU27 with respect to type of farming, model of SPS implementation, farm economic size

[48] In actual facts, wages are likely to differ depending on the degree of specialisation of hired workers. It should be stressed however that it is not possible to distinguish possible differences even when analysing single types of farming.

Criteria and indicators
Informed views of the experts
Regression parameter estimates for direct payments at the farm level (2004 and 2007)
Judgement criterion no. 3 **Over the examined time period, direct payments have (they have not) contributed to stabilising the income of farmers in the regions and farm typologies considered in the analysis**
Comparison of the coefficients of variation calculated on FNVA with direct payments and on FNVA without direct payments (EU15, 2001-2007) with respect to type of farming, model of SPS implementation, farm size
Informed views of the experts
Judgement criterion no. 4 **Over the examined time period, direct payments have contributed (they have not) to achieving a fair standard of living for the agricultural community**
Comparison of FNVA/AWU (in PPS, average 2004-2007) with and without direct payments with GDP/employee (in PPS, average 2004-2007), with respect to type of farming, model of SPS implementation, farm economic size
Comparison of Family Farm Income per Family Annual Work Unit (FFI/FAWU) in PPS (average 2004-2007) with and without direct payments with regional average wage of farm employees (in PPS, average 2004-2007) , with respect to type of farming and the model of SPS implementation
Judgement criterion no. 5 **Following the implementation of the 2003 CAP reform, there is has been (or not) an improvement in the standard of living of the agriculture community**
Comparison of FNVA/AWU in PPS with and without direct payments, average 2001-2004 and 2006/2007, in the regions of the EU15, with respect to type of farming, model of SPS implementation, farm economic size
Informed views of the experts
Comparison of DP/FNVA ratios (average 2001-2004 and 2006/2007) in the regions of the EU15 with respect to: type of farming, model of SPS implementation and distinction between decoupled and coupled direct payments
Comparison of FNVA/AWU in PPS, average 2001-2004 and 2006/2007, with and without direct payments with GDP/employee in PPS, average 2001-2004 and 2006/2007, with respect to type of farming, model of SPS implementation, farm economic size
Judgement criterion no. 6 **On the basis of available information at the country level: across EU Member States the farm household incomes have shown (have not shown) a development over the examined time period, partly due to agricultural policies**
Level and evolution of Farm Household Income (FHI): - differences between farm and non-farm household income levels - evolution of the relative level of FHI - income distribution and incidence of low income cases among farm households - heterogeneity of FHI levels among farm types
Composition of FHI
Informed views of the experts
Role of agricultural policies in the generation of FHI
Variability over time of FHI and farm income

5.4 Analysis of income effects of direct payments at the macro-economic level

The regional analysis has been mainly used for measuring the net effects of direct payments on the level and volatility of agricultural income per labour unit.

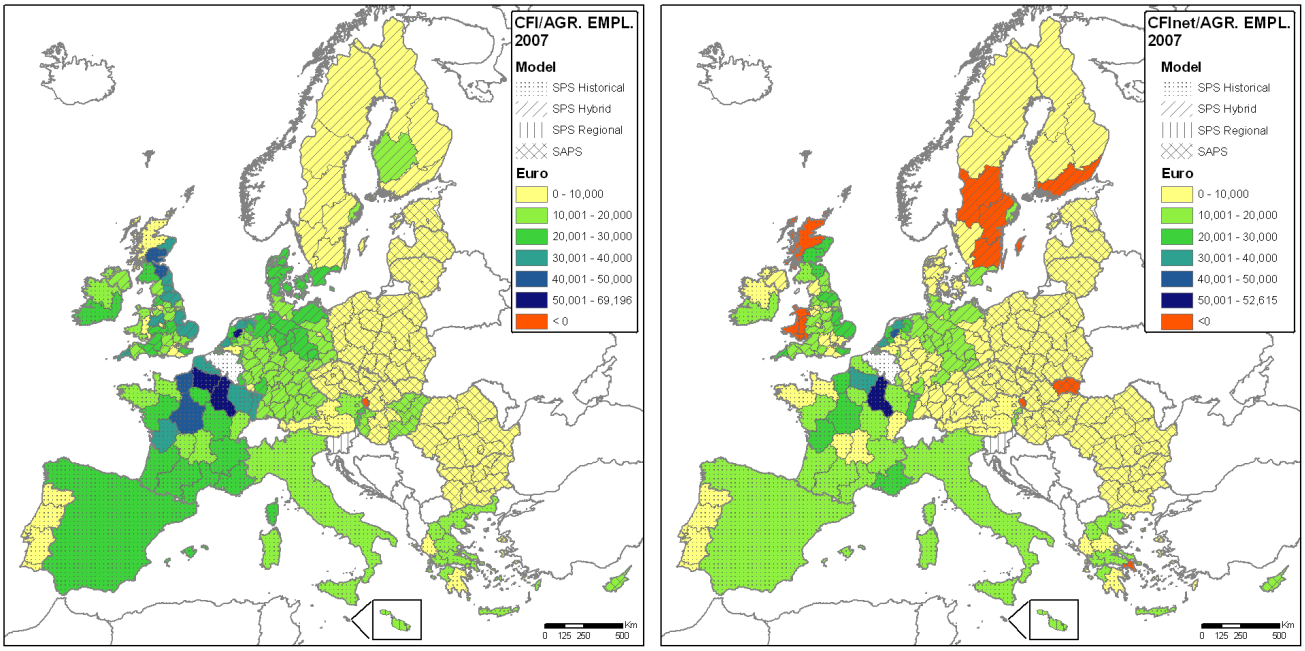
5.4.1 Descriptive analysis

The descriptive analysis provides a snapshot of the economic structure of the European agricultural sector at the regional level. Such an investigation contributes to improve the comprehension of the econometric results obtained by examining the effects of agricultural payments, and in particular direct payments, on the income of farmers.

As briefly discussed in the § 4.1.3.1.1, the agricultural Corrected Factor Income (CFI) is adopted as a *proxy* of the standard of living of the agricultural community (for calculation details see also § 4.1.3.1.1). Thus it seems important to examine European agriculture systems at the regional level and to compare the economic development of agricultural sectors with the overall economic development across EU regions.

The maps published below show the distribution by class for the CFI by agricultural employee (2007), gross and net direct payments, in EU27 regions.

Fig. 5 – UE 27 - Distribution by class of CFI/agricultural employee (euro, 2007)



Source : Elaborations based on data from Eurostat Regional Agriculture Statistics and CATS

The CFI per agricultural employee seems to be positively related with the share of regional GDP produced by the agricultural sector (GVA_{AGR}) as shown in Fig. 6 (both in 2004 and 2007). As a consequence, economic systems of the Member States where agriculture has a predominant role are more efficient in terms of labour productivity and more effective in terms of factor income production.

However, the economics literature usually comes to the opposite conclusion, stating that economic systems dependent on the agricultural sector usually are the less developed ones, showing high levels of GVA_{AGR}/GDP, but low levels of labour productivity, technological advance and industrial progress.

The conclusion of the economics literature can be easily demonstrated in the European regions assuming that observation units are properly selected in order to focus on agricultural economies. In fact, if Fig. 6 is accurately analysed, it appears that the investigated sample of regions shows different behaviours depending on the different values of the GVA_{AGR}/GDP ratio. Thus, the above highlighted positive relationship is particularly strong if low values of the ratio GVA_{AGR}/GDP are examined. On the contrary, the same relationship appears to be increasingly weak if agricultural economies (*i.e.* higher values of GVA_{AGR}/GDP) are considered.

These conclusions are strongly supported by the results presented in Fig. 7 In fact, if regions characterised by higher values of GVA_{AGR}/GDP are selected, the positive relationship described by Fig. 6 turns negative, suggesting, in line with the economic literature, that increasing predominance of the agricultural sector is associated with decreasing levels of agricultural Corrected Factor Income per labour unit.

Fig. 6 - Relationship between CFI/employee and share of GDP produced by the agricultural sector, 2007

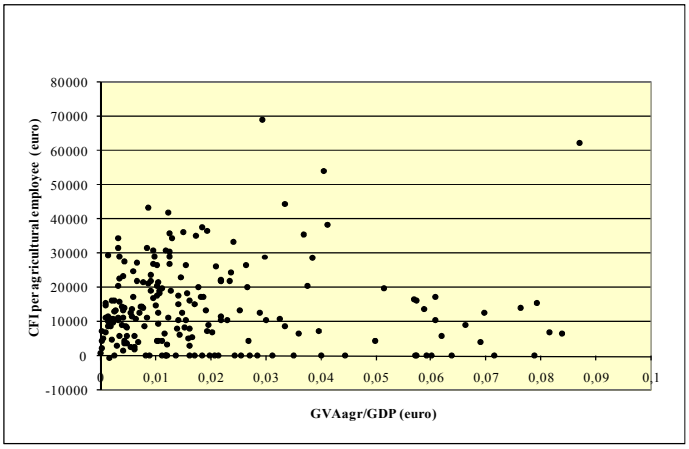
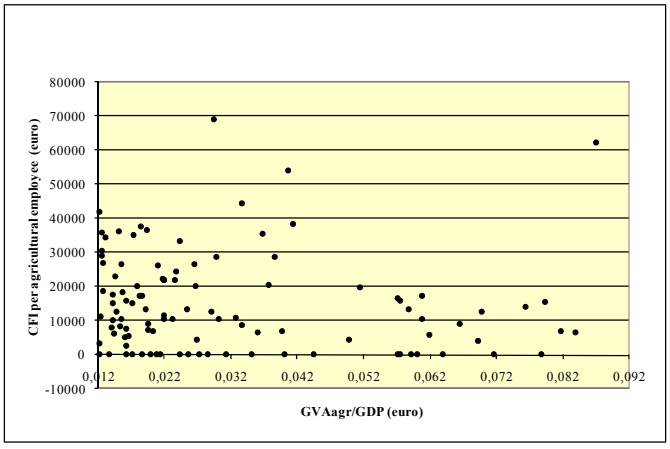


Fig. 7 - Relationship between CFI/employee and share of GDP produced by the agricultural sector in the regions characterised by high GVAagr/GDP, 2007



Source: Elaborations based on data from Eurostat Regional Agriculture Statistics and CATS.

This part of the analysis focuses on the relationship between the economic performance of the agricultural sector and EU agricultural payments. The investigated variables are considered both in absolute values (Fig. 8) and in relative terms by taking into account their level per labour unit (Fig. 9). Statistical analysis shows a linear correlation (2004 and 2007) between the level of the EU agricultural payments (i.e. the payments both of I and II Pillar) and the level of corrected factor income.

Fig. 8 - Relationship between the level of EU agricultural payments and the level of CFI, 2007

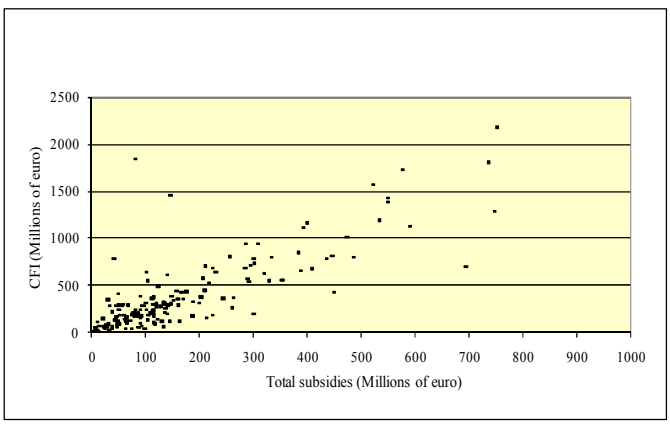
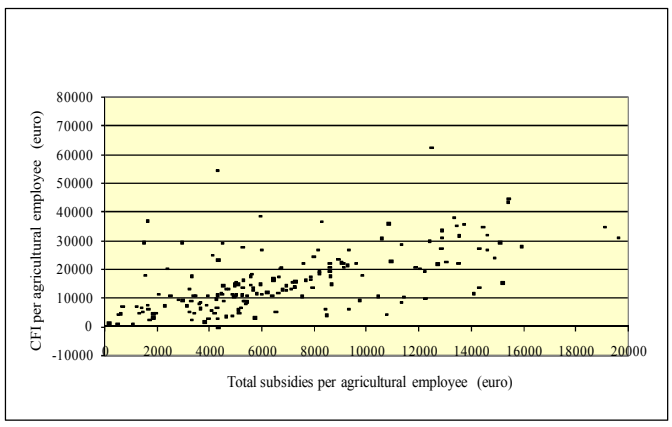


Fig. 9 - Relationship between the level of EU agricultural payments and the level of CFI per labour unit, 2007



Source: Elaborations based on data from Eurostat Regional Agriculture Statistics and CATS.

The analysis of payments distributions across different economic systems can be further developed by investigating the occurred variations in the level of subsidies per Euro of agricultural CFI between 2004 and 2007. It is important to notice that in this case, the values recorded at the regional level are weighted by adopting the average values of subsidies per Euro of produced CFI. Subsequently, an index can be created to describe the subsidies' relative intensity (SI) at the regional level, formally represented as:

$$SI = \frac{S_i / CFI_i}{\sum_i S_i / \sum_i CFI_i}$$

The SI index allows to distinguish different situations across regions (for each year) and to compare the degree of subsidy intensity for a region in different years, thus providing a useful tool to further analyse the role of direct payments.

Six different timepathscan be defined at the regional level by comparing the SI indices in 2004 and 2007, as shown in Fig. 10. Each of such trajectories intuitively represents a different development pattern of the assigned subsidies per Euro of CFI between 2004 and 2007.

Firstly, all units placed above the bisecting line are characterized by an increase in the received subsidies per Euro of CFI. Nevertheless, there are important differences between the three identified areas in this upper part of the graph:

- units in the first area (I) can be categorized as regions with high and increasing subsidy intensity as they are characterized by increasing aid levels, which are higher than the system averages in both years;
- units in the second area (II) can be defined as regions characterized by strong increasing intensity of subsidies as they present in 2004 and 2007, respectively, lower and higher levels of subsidies relative to the system mean;
- units in the third area (III) can be identified as low increasing intensity regions as they are characterized on average by levels of subsidies per euro of CFI that are increasing during the period but in general lower than the overall system.

Units placed under the bisecting line can be described in a symmetrical way, as they present opposite characteristics compared to the first three areas:

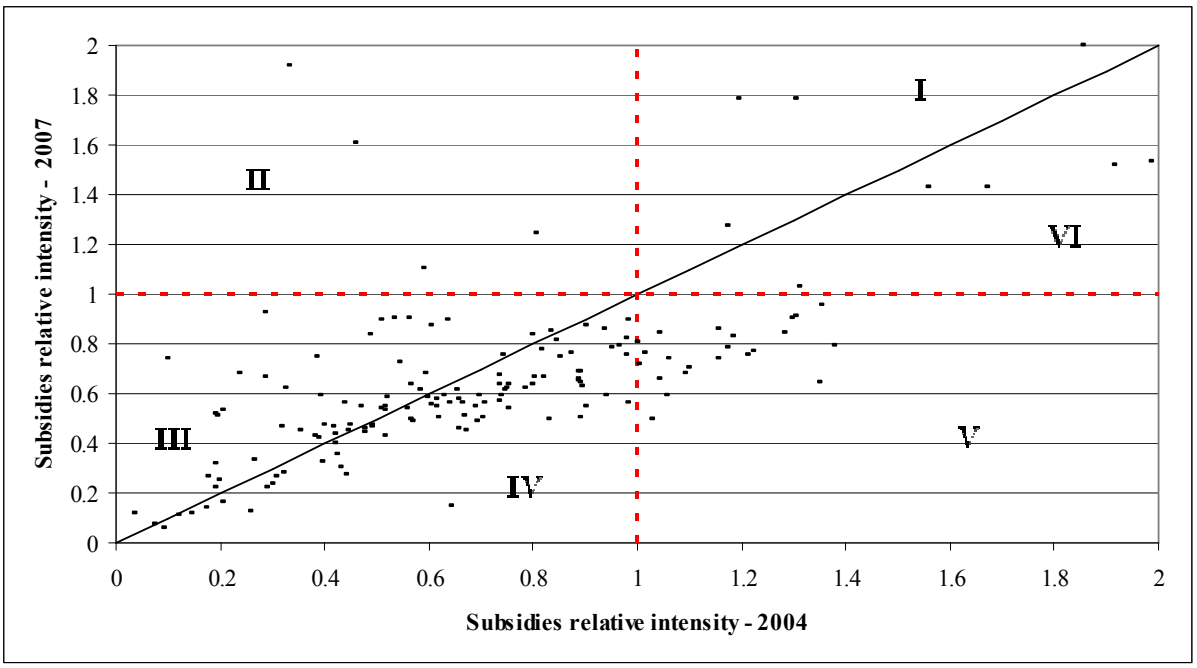
- units in the fourth area (IV) are regions characterized by decreasing low intensity as they present a reduction in the intensity of subsidies, which are, in general, lower than the mean value recorded by the overall system in both years;
- units in the fifth area (V) are characterized by a strong decreasing intensity, symmetrically opposite to regions in area II;
- units in the sixth area (VI) can be categorized as high decreasing subsidies' intensity regions, as they are characterized by decreasing levels of subsidies intensity during the period, but higher than the system mean in both years.

The results lead to three main considerations:

- A significant part of the examined regions, are placed in sectors III and IV (125 on 174 units), i.e. the most numerous group is formed by units characterized by subsidies' relative intensity lower than the system mean in both years.

- Among the remaining areas (including 49 observation units), V and VI are the most numerous groups (respectively 20 and 17 regions), suggesting that an important part of the regions can be described as characterized by a decreasing dynamics of subsidies' intensity.
- Finally, results indicate that the number of units characterized by a level of subsidies' intensity higher than the system mean decreases between 2004 and 2007. Indeed, the number of regions placed in sectors I, II and VI (29), where relative intensity is higher than average intensity in the year 2007, is lower than the number of the regions in sectors I, V and VI areas (42), where relative intensity is higher than average intensity in the year 2004.

Fig. 10 - Subsidies' relative intensity, 2004 and 2007



Source: Elaborations based on data from Eurostat Regional Agriculture Statistics and CATS.

The investigation of subsidies' distribution can be concluded by examining the composition of total subsidies received at the regional level in 2007. For this purposes an Index of Specialization (ISP) is calculated. The ISP represents the relative percentage share of each individual aid typology on the total amount of subsidies at the regional level over the share of the same aid typology received by the overall sample

The Index of Specialization can be formally represented as:

$$ISP = \frac{\frac{a_{ij}}{\sum_{j} a_{ij}} - \frac{\sum_{i} a_{ij}}{\sum_{ij} a_{ij}}}{\left(1 - \frac{a_{ij}}{\sum_{j} a_{ij}}\right) * \frac{\sum_{i} a_{ij}}{\sum_{ij} a_{ij}} + \left(1 - \frac{\sum_{i} a_{ij}}{\sum_{ij} a_{ij}}\right) * \frac{a_{ij}}{\sum_{j} a_{ij}}}$$

where a_{ij} represents the j-th (j = 1, ...,k) aid typology received by the i-th (i = 1, ..., n) region. The ISP ranges from a minimum of -1 to a maximum of 1 ($-1 \leq ISP \leq 1$), therefore a region can be defined as

specialized (non-specialized) on the *j*-th aid if the share of this aid on total subsidies at the regional level is higher (lower) than the same share recorded in the overall system.

For example, in Burgenland Region rural aids(a_{ij}) represent about the 39% of the total aids received by the Region in 2007 ($\sum_j a_{ij}$), but, considering the overall sample, rural aids ($\sum_i a_{ij}$) represent only about the 14% of the total aids ($\sum_{ij} a_{ij}$), showing a specialization on rural aids for this Region with respect to the average behaviour of the sample. Proceeding with the example, the difference between the percentage in the Region (0.39) and the percentage in the sample, (0.14) is 0.25 ($\frac{a_{ij}}{\sum_j a_{ij}} - \frac{\sum_i a_{ij}}{\sum_{ij} a_{ij}}$).

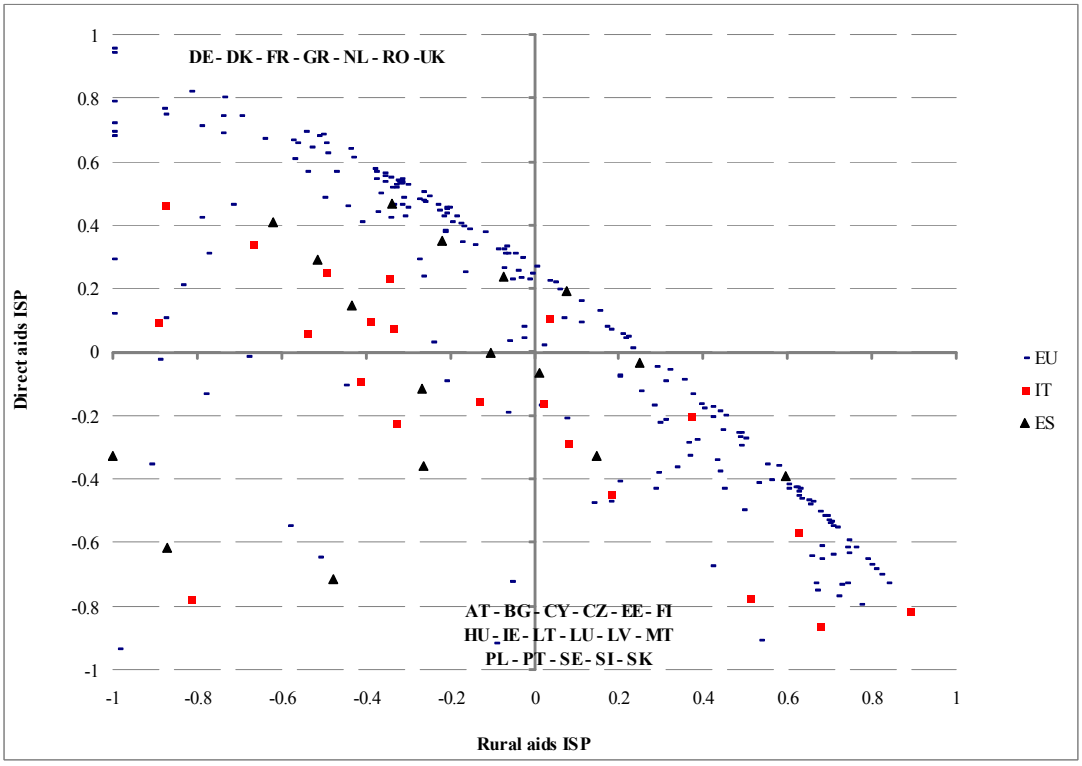
The denominator standardises the index in the range +1 -1, obtaining the final value of 0.60.

The obtained results show the existence of different aid distributions across Member States (Fig. 11). In particular, if direct payments are considered together as a sum of decoupled direct aids and other direct aids (i.e. coupled), it is evident that two groups can be defined:

- direct aids specialized Member States
- rural development aids specialized Member States.

Member States are assigned to either the rural or direct aids specialisation group according to the subsidies specialisation characteristics showed by most of each country regions. However, it occurs that individual regions within the same country are assigned to different specialisation classes. Italy and Spain, for example, cannot be exactly classified and, as a consequence, have to be considered as mixed specialized Member States.

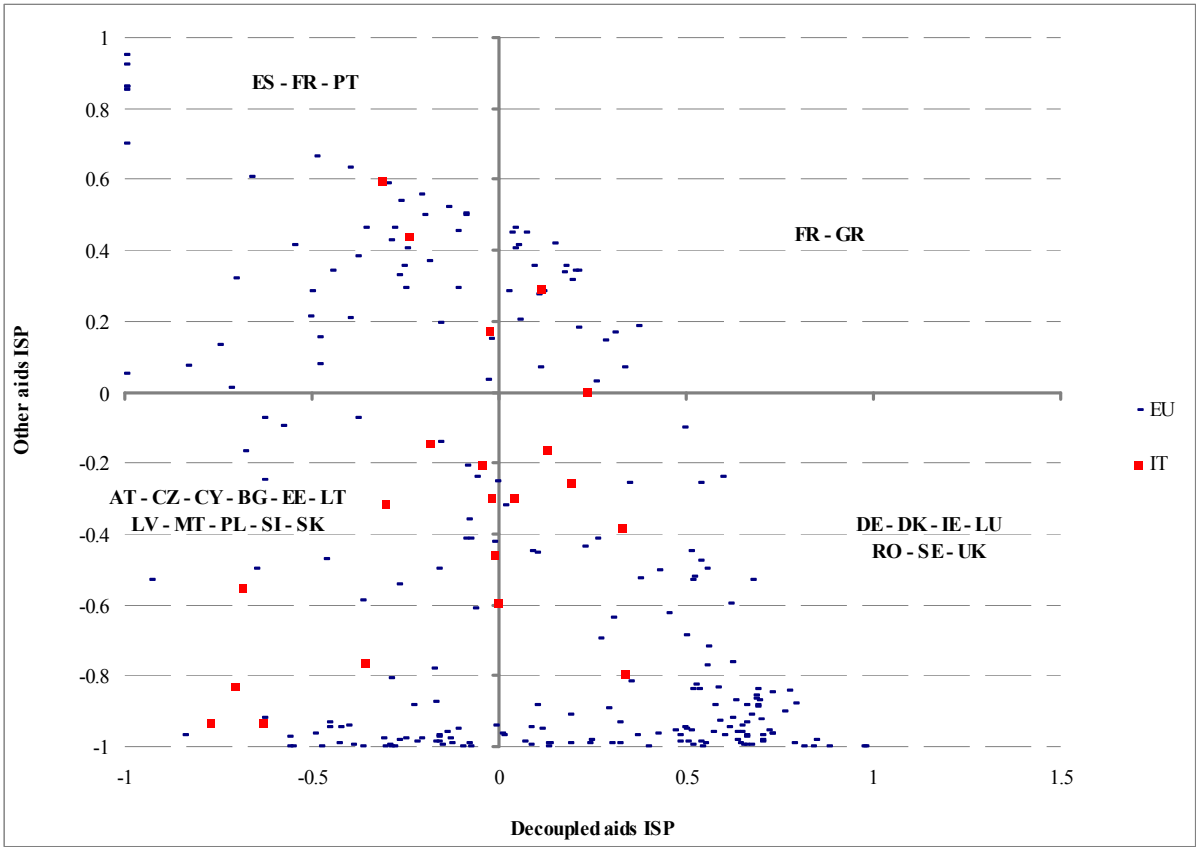
Fig. 11 - Comparison between Direct and Rural Aids (ISP, 2007)



Source: Elaborations based on data from Eurostat Regional Agriculture Statistics and CATS.

The analysis of aid specialization is further developed by distinguishing between the two different components of the variable direct aids, *i.e.* decoupled and other direct aids. As is it possible to notice by examining the results presented in Fig. 12, in line with the conclusions just drawn above, the majority of rural aids specialized Member States are classified as non-specialized Member States in terms of both direct aids typologies, with negative ISP values in both cases. On the contrary, the remaining Member States show mixed behaviours (i.e. France and Italy), although 4 out of the 7 direct aids specialised Member States in Fig. 11 result to be decoupled aids specialized. Hungary and Netherlands cannot be classified.

Fig. 12 - Comparison between Decoupled and Other Direct Aids (ISP, 2007)



Source: Elaborations based on data from Eurostat Regional Agriculture Statistics and CATS.

The analysis of the effects of CAP payments reform on agricultural income is further developed by analysing the determinants of the Corrected Factor Income per agriculture employee. As previously illustrated in the methodology section, OLS models are applied to test for statistical significance of direct payments' effects on income level. Furthermore, the effects of coupled and decoupled direct payments on income stability are analysed through the application of a *probit* regression model. The geographical coverage of the OLS models is illustrated in Tab. 7.

5.4.2 Net effects of direct payments on the level of farmers' income

Tab. 11 and Tab. 12 present the results obtained by applying the OLS linear models respectively in the years 2004 and 2007. In this framework, the role played by each factor and the robustness of the defined relations are accurately verified by testing different econometric specifications.

In the two tables, Model 1 and Model 2 have to be considered as transient models, while Model 3 is defined as the basic model which the discussion of the results refers to. Model 1 introduces exclusively variables representing the level of Gross Fixed Capital Formation (GFCF) as a proxy of

agricultural investment dynamics and variables representing the amount of subsidies received. Subsequently, Model 2 introduces information on the economic system structure (i.e. the role played by the agricultural sector in GDP formation) as well as information on regional socio-economic characteristics. Finally, Model 3 uses only the variables for which statistically significant estimates are found in Model 2. Furthermore, the specification of Model 3 is tested again in Models 4 and 5 that sub-divide the examined regions into two groups differing in the share of total GDP produced by agriculture (GVAagr/Total GDP), i.e. level of an economic system dependency from the agricultural sector. The median value recorded in each year is used as discontinuity point to separate the sample into two groups (in Model 4, the sub-sample is defined by selecting units characterized by a level of GVAagr/GDP lower than the median value, whereas in Model 5 the sub-sample is defined by selecting units with a level of GVAagr/GDP higher than the median value).

Finally, Model 6 in Tab. 12, uses 2006 data and, as a result, it allows to compare the relationships found in 2007 with the situation recorded in 2006, *i.e.* the first actual reform year.

As it is possible to verify, all the proposed models fit the assumed hypothesis: the computed R^2 ranges between 0.48 and 0.65 in the case of the models in Tab. 11, and between 0.65 and 0.77 in the models presented in Tab. 12 and the introduced variables are generally constantly significant.

Furthermore, the application of the Breusch-Pagan test excludes the presence of heteroscedasticity in the examined system.

The regression parameters estimate the impact of an additional Euro of direct payments on the Corrected Factor Income per agriculture employee. If parameters are statistically different from zero and positive in sign, it can be assumed that direct payments contribute to enhancing CFI. The magnitude of the parameters provides an estimated measure of this contribution.

The analysis shows that CAP aid typologies affect differently the level of the Corrected Factor Income per agriculture employee. As it may be expected, the parameter estimates for the direct aids variables are statistically significant and positive in sign.

The subsidies introduced in the second pillar of the EU CAP, *i.e.* rural development aids, produce in the short run a negative effect on the recorded level of CFI per employee. The variable is generally strongly significant, in particular in the 2006 and 2007 models. Such a result could be related to the structural nature of the examined aids that comprise interventions for environmental protection, promotion of less intensive land use, *etc*, therefore interventions much more oriented to improve life conditions in marginal territories, than to increase production and income of production factors.

Indeed, if we had used a variable expressing quality of life as the dependent variable in the models, instead of a measure of income generated by agricultural production (i.e. CFI), then we would be likely to find that rural development aids have a significant and positive effect.

Furthermore, the negative sign associated to rural aids can be further explained by considering the negative correlation existing between per capita GDP and per capita rural aids at the regional level.

Particularly interesting are the results obtained when introducing direct decoupled aids in the 2007 model. Although coefficient estimates for both coupled and decoupled aids variables are both positive, the effects of coupled aids (*i.e.* other direct aids) on CFI result to be definitely stronger than those produced by decoupled aids.

Such a result seems to be confirmed by the analysis conducted on the sample broken down into the two different economic groups defined in Models 4 and 5.

Finally, if the results obtained by using 2007 data are compared with those derived by applying the model to 2006 data, it is possible to conclude that policy interventions seem to be more effective in 2007.

Tab. 11 - OLS analysis – 2004

Dependent variable: Factor Income per agriculture employee	mod1 - Year 2004	mod2 - Year 2004	Model 3 - Year 2004 Basic model	Model 4 - Year 2004 - GVAagr/GDP <=median	Model 5 - Year 2004 - GVAagr/GDP >median
Gross Fixed Capital Formation per agriculture employee	1.14***	1.13***	1.01***	.477***	1.18***
	(8,97)	(9,45)	(8,34)	(3,07)	(4,68)
Rural Aids per agriculture employee	-2.26***	-1.92***	-1.07*	-0,972	-0,13
	(-3,68)	(-3,27)	(-1,72)	(-1,26)	(-,14)
Markets Aids/Employee	1.53*	2.14***	1.56*	2.74***	-1,08
	(1,84)	(2,67)	(1,93)	(3,54)	(-,56)
Other Aids/Employee	.224**	.216**	.18**	0,0876	.482*
	(2,46)	(2,51)	(2,17)	(1,17)	(1,76)
Agriculture GVA per euro of Total GDP		108***	158***	626***	125***
		(4,29)	(5,14)	(3,92)	(2,97)
Education level 0-2 - number of persons 15-24 years per inhabitant			-52.9***	-52.7***	-58.7**
			(-3,71)	(-3,32)	(-2,02)
Education level 5-6 - number of persons 15-24 years per inhabitant			323***	346***	120
			(3,48)	(3,59)	(,68)
Education level 3-4 - number of persons 25-64 years per inhabitant			-25.5***	-32.5***	-28.2*
			(-2,99)	(-3,2)	(-1,8)
Education level 5-6 - number of persons 25-64 years per inhabitant			-55**	-52.6**	-19,2
			(-2,99)	(-3,2)	(-1,8)
Constant		3.62***	16.8***	17.4***	17.1*
			(-2,26)	(-2,15)	(-,39)
N	158	158	157	87	70
degree of freedom - regression	153	152	147	77	60
degree of freedom - model	4	5	9	9	9
r squared	0,47929	0,53554	0,5891	0,65333	0,6458
F	35,207	35,052	23,417	16,124	12,155

*Legend: * p<.1; ** p<.05; *** p<.01*

Source: Agrosynergie regression estimates based on data from Eurostat Regional Agriculture Statistics and CATS.

Tab. 12 - OLS analysis – 2007

Dependent variable: Factor Income per agriculture employee	mod1 2007	mod2 2007	Model 3 - Year 2007 Basic model	Model 4 - Year 2007 - GVAagr/GDP<= Median	Model 5 - 2007 - GVAagr/GDP> Median	Model 6 - Year 2006
Gross Fixed Capital Formation/Employmee	.599*** (4,91)	.593*** (4,82)	.679*** (5,85)	0,137 (,97)	1.01*** (5,36)	.733*** (5,93)
Rural Aids/employee	-3.21*** (-4,82)	-2.65*** (-4,01)	-2.5*** (-3,9)	-2.12*** (-3,02)	-3.36*** (-3,04)	-2.15** (-2,43)
Decoupled Aids/Employee	1.37*** (7,41)	1.45*** (8,12)	1.14*** (5,78)	1.54*** (6,82)	.969*** (3,04)	.913*** (6,16)
Markets Aids/Employee	0,779 (1,21)	0,947 (1,53)	0,967 (1,6)	0,395 (,71)	3.47** (2,2)	0,0371 (,11)
Other Aids/Employee	2.28*** (4,08)	1.67*** (2,98)	2.43*** (4,09)	2.02** (2,2)	2.15** (2,51)	1.99*** (4,06)
Gross Value Added/GDP		130*** (3,78)	177*** (4,97)	408** (2,1)	171*** (3,37)	89.6*** (3,23)
GDP per capita		0,000079 (1,43)				
Education level 0-2 - number of persons 15-24 years per inhabitant			-42.2*** (-3,28)	-18,8 (-1,28)	-66.1*** (-2,92)	-31.1*** (-2,89)
Education level 5-6 - number of persons 15-24 years per inhabitant			88.1* (1,83)	37,3 (,72)	75,2 (,92)	43,6 (,77)
Education level 3-4 - number of persons 15-24 years per inhabitant						-55.1*** (-2,86)
Constant	5.88*** (4,96)	0,946 (,45)	5.93*** (2,81)	5.04** (2,44)	9.23* (1,95)	11.7*** (4,68)
N	167	167	167	89	78	164
degree of freedom - regression	161	159	158	80	69	154
degree of freedom - model	5	7	8	8	8	9
r squared	0,64954	0,67914	0,69748	0,7018	0,7671	0,70816
F	59,68	48,077	45,534	23,535	28,409	41,522

*Legend: * p<.1; ** p<.05; *** p<.01*

Source: Agrosynergie regression estimates based on data from Eurostat Regional Agriculture Statistics and CATS.

5.4.3 Net effects of direct payments on income stability

The last part of the macro analysis focuses on the impact of coupled and decoupled direct payments on income stability. Probit regression is applied to investigate the role of direct aids in contributing to the stability of the Corrected Factor Income over the observation period (for the details of the methodology please see § 4.1.3.1).

The results presented in Tab. 13 show that both coupled and decoupled direct payments take a positive sign, suggesting a positive impact of payments on income stability. In particular, the analysis of marginal effects (Tab. 14) allows to estimate the increase in stability due to a unitary increase in decoupled aids as equal to +1.8% and the increase in stability due to a unitary increase in coupled aids as equal to +6.5%.

However, the results have to be evaluated taking into account the analysis of the statistical validity of the proposed probit model. In particular, two weaknesses have to be highlighted:

- the relatively small level registered for the Likelihood Ratio (LR) Chi-Square means that at least one of the predictors' regression coefficient is not equal to zero in the model;
- the low significance of the estimated parameter for the coupled aids variable, with P>|z| equal to 15,4%.

In other words, if a positive and robust contribution to stability by the decoupled aids variable can be detected, on the other hand, the contribution of the coupled aids variable is not so clearly defined, showing a higher level of indeterminacy. This conclusion is confirmed by the fact that the confidence interval (at 95% of probability) for coupled aids presents values ranging from a minimum of -0.10645 to a maximum of 0.673589.

On the basis of the analysis and taking its limitations into account, we can conclude that decoupled payments have a significant stabilising effect on income, however, we are not able to draw unequivocal conclusions as to the effect of coupled payments.

Tab. 13 - Probit regression estimates

Dependent Variable: PVI	**Coefficients**	**Std. Err.**	**z**	**P>|z|**	**[95% Confidence Interval]**	
Decoupled aids	0.078683	0.035079	2.24	0.025	0.00993	0.147437
Coupled aids	0.283568	0.198994	1.43	0.154	-0.10645	0.673589
Constant	0.465687	0.19786	2.35	0.019	0.077889	0.853484
Number of observations: 175	LR χ^2 = 10.24 Prob > χ^2 = 0.0060		Log likelihood = -75.057015 Pseudo-R^2 = 0.0638			

Source: Elaborations based on data from Eurostat Regional Agriculture Statistics and CATS.

Tab. 14 - Probit regression marginal effects

Dependent Variable: PVI	**dF/dx**	**Std. Err.**	**z**	**P>|z|**	**[95% Confidence Interval]**	
Decoupled aids	.0181545	0.035079	2.24	0.025	0.00993	0.147437
Coupled aids	.0654275	0.198994	1.43	0.154	-0.10645	0.673589
Number of observations: 175	LR χ^2 = 10.29 Prob > χ^2 = 0.0058		Log likelihood = -79.580853 Pseudo-R^2 = 0.0607			

Source: Elaborations based on data from Eurostat Regional Agriculture Statistics and CATS.

5.5 Analysis of income effects of direct payments at the micro-economic level

This section of the report analyses the effect of direct payments on farmers' income across 55 Community macro regions (listed in table 2, chapter 4.1.1.1) within the framework of seven types of farming and by class of economic size. Following the applied methodology, the steps involved in the analysis encompass:

- a statistical analysis of the role of direct payments in the level of the income of farmers;
- an econometric analysis of the net effects of directs payments in determining income levels;
- a statistical analysis of the role of direct payments in stabilising the income of farmers;
- the comparison of farmers income with overall income benchmarks.

5.5.1 Preliminary notes

The results of the analysis may be influenced by the evolution of the structural characteristics of farms, in particular by the evolution of the average number of annual work units (AWU) per farm and the average number of AWU per hectare of utilised agriculture area. Therefore, in a preliminary phase we decided to analyse the context to verify the existence of specific phenomena.

The analysis shows that in the period 2004-2007 in the Eastern European Member States and in Germany East & North-East, the average number of AWUs per farm is noticeably higher than in EU-15 Member States. This is true for all types of farming, albeit with some differences.

Furthermore, over time the number of AWUs per farm in EU15 States varies considerably. Comparing pre- and post-reform averages, the following were noted: a general fall in average AWU/farm in the macro-regions of France, Belgium, Portugal, Austria, Greece and Ireland; an almost global increase in the macro-regions of Italy, Germany, Denmark, Luxembourg and Sweden; a more varied situation (increase or fall depending on sector and/or macro-region) in other EU15 member States (i.e. United Kingdom, Spain, Netherlands, Finland).

The comparison of pre- and post-reform averages highlights also a widespread phenomenon entailing a curb on the number of labour units by surface area. The most important regular exceptions were in the Italian macro-regions for permanent crops and in the macro-regions of southern Spain.

The results of the analysis can also be influenced by the economic situation of farms. Therefore, we have compared the annual average variation rate (2001-2007 for EU 15 regions; 2004-2007 for EU 10 regions) of: total output/AWU, intermediate consumption/AWU and wages paid/AWU paid, computed, on the basis of the FADN data, for each macro-region and for each sector. The results show that:

- In most regions, the annual average growth rate of Intermediate consumption/AWU is higher than the annual average growth rate of Total output/AWU (and therefore exists a trend to an increasing gap between costs and revenues). This is quite frequent in the case of other grazing livestock sector (72% of the analysed regions); milk and granivores (69% of the analysed regions); horticulture (63% of the analysed regions). On the contrary, in field crops sector this is true only for 28% of the analysed regions.
- In most regions (around 70%), the annual average growth rate of Wages paid/AWU paid is lower than the annual average growth rate of Total output/AWU (and therefore the growth of wages is lower than Output/AWU development). The only exception concerns granivores (the wages growth is highest than Output/AWU in 58% of the analysed regions). It should be stressed however that, in general, the regions where the growth of wages is higher than the growth of Output/AWU are very much concentrated in the EU 10 Member States.

5.5.2 Effects of direct payments in enhancing the income of farmers: results deriving from the statistical analysis

This section reports the results of the analysis of the income level and the share of direct payments. The results are first discussed at a global level for each type of farming and by class of economic size; subsequently, income levels are briefly analysed at regional level.

In the first instance, we analysed overall farm income level per labour unit (FNVA/AWU, weighted average for period 2004-2007, expressed in PPS) for the whole EU, for the group of old Member States (EU15) and for the group of new Member States (EU12). Average farm income was calculated for each type of farming, regarding both the actual situation (with direct payments) and the simulated situation (calculations done by deducting direct payments).

Tab. 15 - FNVA/AWU, with and without direct payments, by sector and by group of member States (average 2004-2007 in PPS; %)

	Total EU Avg	EU 15 Avg	EU 12 Avg	EU15 Avg/ EU12 Avg
	With direct payments			
Fields crops (TF1)	23.351	29.376	18.295	1,61
Horticulture (TF2)	22.630	24.880	11.957	2,08
Other permanent crops (TF4)	19.298	21.603	8.749	2,47
Milk (TF5)	23.311	29.016	13.542	2,14
Other grazing livestock (TF6)	19.160	21.861	11.406	1,92
Granivores (TF7)	25.475	40.211	16.821	2,39
Mixed farms (TF8)	17.999	28.242	13.181	2,14
Average	**21.604**	**27.884**	**13.422**	**2,08**
	Not including direct payments			
Fields crops (TF1)	12.991	16.179	10.131	1,60
Horticulture (TF2)	22.073	24.325	11.385	2,14
Other permanent crops (TF4)	17.474	19.656	7.486	2,63
Milk (TF5)	16.180	20.454	8.850	2,31
Other grazing livestock (TF6)	9.632	10.693	6.564	1,63
Granivores (TF7)	21.576	36.332	13.010	2,79
Mixed farms (TF8)	10.433	15.873	7.605	2,09
Average	**15.765**	**20.502**	**9.290**	**2,21**

Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

In the real situation (with direct payments), even though calculations were done in PPS, there was a big difference between the average FNVA/AWU of EU15 Member States and that of EU12 Member States in the period 2004-2007.

The ratio between the two averages (2.08:1 for the global averages), rose to a maximum of 2.47:1 in the case of permanent crops, and fell to a minimum of 1.61:1 in the case of farms specialised in field crops.

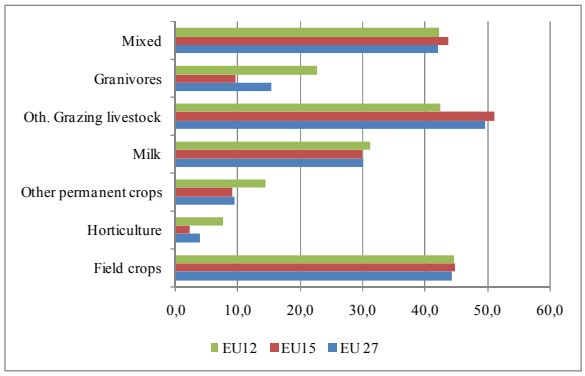
The global averages are the result of quite different situations across sectors: in EU15 the highest average level was obtained by farms operating in the granivores sector (over 40,000 PPS/AWU) benefiting from quite limited direct aid. The lowest level (on average) was reached by farms operating in permanent crops and those specialising in other grazing livestock (a little less than 22,000 PPS/AWU). It is noted that the latter two sectors generate the least income in EU12 as well. On the

other hand, in EU12 farms specialised in field crops earn the highest incomes (about 18,300 PPS/AWU)[49].

It was also noted that (on average) the highest value for the indicator in the EU12 was still less than the lowest level in the EU15.

The analysis of the share of direct payments on farm value added (% of DP/FNVA per AWU, average for 2004-2007) shows that direct support plays a particularly important role in generating income in grazing livestock specialist farms, especially in the EU15 (49.7% EU27; 51.1% EU15 and 42.4% EU12). This type is followed by field crops and mixed farms, with an share that was basically the same in the groups of States.

Fig. 13 - DP/FNVA % by sector, avg. 2004-2007



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

Direct aid is also important in farms specialised in milk (30.1%). Cow milk is a quota-based production which in the EU15 has received direct payments only since the year of application of the single payment. Furthermore, the dairy cattle farming may also benefit from direct payments relating to the production of other products receiving direct support (including some products used to feed livestock) and premiums relating to the production of meat. In EU12 Member States farms receive, like all others, direct payments provided for by the SAPS or the regional SPS.

In the simulated situation (direct payments not included), the removal of direct payments would have lead to a 27% fall in FNVA/AWU values, slightly less in the set of EU15 Member States. Accordingly, in the absence of direct payments the ratio between the average FNVA/AWU for EU15

[49] We recall that:

- In the past, no support has been given through direct payments to the granivores sector. However, granivores farming was able to receive direct payments relating to the production of cereals destined for livestock feed and, of course, for other crops for which direct support can be granted. After the reform, in EU15 countries applying the historic SPS model the rules have remained unaltered, while where the hybrid SPS is applied and in EU12 countries (SAPS or regional SPS), farms benefit, like all others, from direct payments
- Also activities relating to horticulture do not receive direct payments. Aid granted to these farms are the result of other very limited activities receiving support. After the reform, in EU15 countries applying the hybrid SPS and in EU12 countries (SAPS or regional SPS), farms benefit, like all others, from direct payments.
- Concerning permanent crops (with the exception of viticulture), for most of which the CAP has not historically provided any direct support. Nevertheless, an exception to this general rule is olive growing and some other crops limited to the part of production destined for processing (in particular citrus fruits, peaches and pears, dry figs, etc)..

Member States and that for EU12 would rise slightly: it is noted that this average rise is chiefly attributable to the granivores sector.

The fall in simulated income levels is of course more noticeable in types of farming where farms benefit from higher direct aid. In particular, in field crops and mixed farms the drop in income would be almost 45% (in both EU15 and EU12 Member States), and in grazing livestock farms it would be -50% in EU15 Member States (about -42% in EU12).

On the other hand, as might be expected, in horticulture sector the fall in income in the absence of direct payments would be marginal (-2.2% in EU15 and -4.8% in EU12), and quite small in farms specialised in permanent crops and granivores in EU15 Member States (less than 10%)[50].

Finally, in the simulated situation and in this broad context of diminishing income levels, the disparity among Community macro-regions would have generally increase, as shown by comparing the two (actual and simulated) coefficients of variation (coefficients of variation around the EU average, calculated for the macro-regions)

	Coefficient of variation in the actual situation (with DP)	Coefficient of variation in the simulated situation (without DP)	In the absence of direct support, there would be:
Crops	40.2%	52.2%	A large increase in the non-uniformity of average income levels among Community macro-regions
Horticulture	39.9%	42.0%	Unaltered situation
Permanent crops	45.6%	51.6%	The lack of uniformity of average income levels among Community macro-regions would become more pronounced
Milk	46.5%	60.1%	A large increase in the non-uniformity of average income levels among Community macro-regions
Grazing livestock	40.3%	84.6%	The differences among macro-regions would lead to a large increase in variability around the Community average. Thus, in the absence of direct payments, there would be a dramatic rise in disparity of average FNVA/AWU values among macro-regions
Granivores	60.8%[51]	76.0%	The lack of uniformity of average income levels among Community macro-regions would rise significantly
Mixed farms	46.1%	62.6%	The lack of uniformity of average income levels among Community macro-regions would rise significantly

[50] For these two sectors, it is noted that the loss in income in the EU12 is more noticeable. In particular, in granivores the FNVA/AWU value fell by 22%. This might be ascribable to a different composition of the production mix in EU12 farms compared with EU15 farms.

[51] In this case, the large variability is significantly conditioned by the presence of two FNVA/AWU average values, in ES Noroeste and IT Nord-Ovest, that are respectively 314% and 217% of the Community average. In these macro-regions this anomaly is attributable to the breeding of heavy swine for the production of high quality hams, enabling farmers to obtain particularly high prices.

Informed views of the experts

We have asked the experts their opinion concerning the motivations of the rise in disparity among regions in the simulated situation (lack of direct payment (lack of direct support).

First of all, some experts do not totally agree with the assertion that direct payments have also a role of cohesion between regions ("direct payments are different across EU-Member States - this is causing disparities which are induced by policy"; "I do not think that the lack of direct payment would increase disparity of farmers income in different regions and countries").

Other experts attribute the increase of the farmers' income disparity among regions in absence of direct support to:

- the fact that incomes would be more exposed to market conditions, with respect to both input and output prices;
- the fact that, without direct payments, production and investments would concentrate in the most competitive areas;
- producers would be more exposed to natural conditions especially in southern EU regions where yields variability is higher due to climate conditions.
- the mix of production and its variation from region to region.

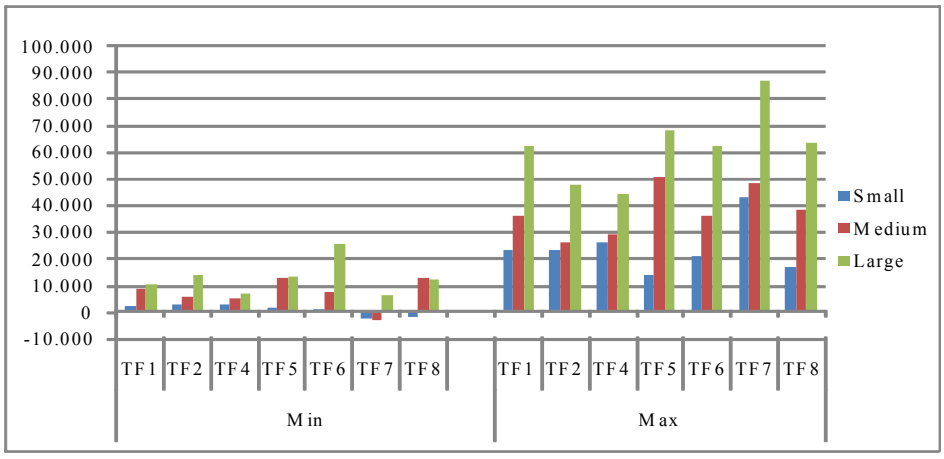
The overall average values discussed above conceal the existence of differences. **Indeed, the study conducted on farms from the FADN database broken down by class of economic size[52] shows the existence of a close and direct relationship between the level of the labour unit income and the economic size of farms**.

In the actual situation, the ratio between the average level of income of large farms and small farms is 3.92 for field crops, 2.76 horticulture, 3.12 other permanent crops, 4.7 for milk farms, 4.1 for other grazing livestock, 3.36 granivores and 4.58 for mixed farms. In the simulated situation, absolute levels are down in all classes, and the ratios between the average level of income of large farms and small farms remain the same (ratio become higher in field crops and mixed farms, respectively 4.4 and 5.23).

The graphs below show the minimum and maximum levels of the FNVA/AWU elaborated for the set of macro-regions analysed in each sector, for each of the ESU classes. Averages for the FNVA/AWU values gross and net the aid reflect almost exactly the same type of relations, even though in the simulated situation absolute levels are down in all classes.

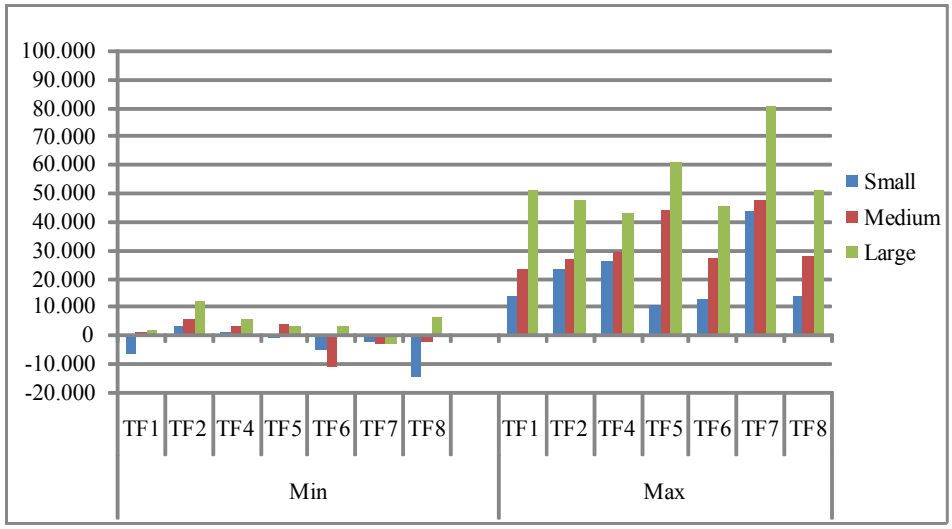
[52] Three classes of ESU: small, up to 16 ESU; medium, from 16 to 100 ESU; large, greater than 100 ESU. One ESU corresponds to a farm's Standard Gross Margin (SGM) of 1.200 Euro/year

Fig. 14 - Minimum and maximum actual FNVA/AWU levels (average for period 2004-07) posted in macro-regions analysed by type of farming and by ESU class (values in PPS)



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

Fig. 15 - Minimum and maximum simulated FNVA/AWU levels (average for period 2004-07) posted in macro-regions analysed by type of farming and by ESU class (values in PPS)

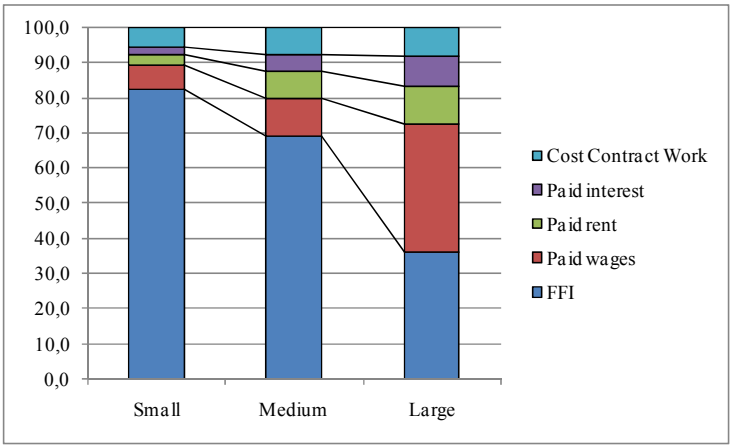


Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

On this basis, in order to interpret the results of the analysis it seemed appropriated to verify if there is a relation between ESU classes and choices concerning the use of production factors within farms. This, also to establish in which class can be placed (mainly) family farm and non family farm holdings.

For the three ESU classes of the FADN EU 27 sample, we have calculated the values of the use of each internal and external production factor employed in the farm. The value of the work of the family labour units and the capital of the farm were considered internal factors.The cost of contract work, paid interests, paid rents and paid wages were considered external factors.

Fig. 16 - Percentage ratios of production factors on income (EU 27, avergare 2004-2007)



Source: Elaborations based on sample data EU-FADN- DG AGRI L-3

The results show that (on average), in small farms more than 80% of the value of the total use of factors is constituted by internal factors. This ratio decreases to 36% in large farms. Conversely, the relative share of all the other factors is limited in small farms and increases progressively from medium farms and to large farms. In particular, we observe that the value of employed work goes from around 7% in small farms to 37% in large farms. Moreover, we observe an increase of paid rents (from 3% to 10%) related to the increasing of the ESU classes, while contract work increases in a more limited measure.

From the analysis we can say that there is actually a relation between ESU classes and choices concerning the use of production factors. The concentration of internal factors in small farms allows us to conclude that family farms are concentrated in this class. Similarly, it is possible to conclude that non family farms are concentrated in the large class of holdings.

5.5.2.1 Results at a regional level

In next paragraphs, the income levels were analysed (for each sector) at a regional level for average levels of the sample of all farms and considering their economics size. Maps summarise the distribution by class of FNVA/AWU value in EU27 regions broken down by model chosen to implement the single payment scheme. As already mentioned, the absence of data from one or two macro-regions may be attributable to the inadequacy of the FADN sample (number of farms fewer than 15) or to the fact that in that macro-region productions included in the specific sector are not present.

It should be stressed that irrespective of the various reasons justifying differences in average FNVA/AWU levels among macro-regions (within the same sector), a role is undoubtedly played by the different composition of farms by economic size class[53]. Therefore, average levels for the FNVA/AWU indicator of the three farm size classes have been compared with the global average level of the FNVA/AWU relative to the specific type of farming. It should be recalled that the analysis by ESU class entailed a reduction in the number of regions analysed (see § 5.2).

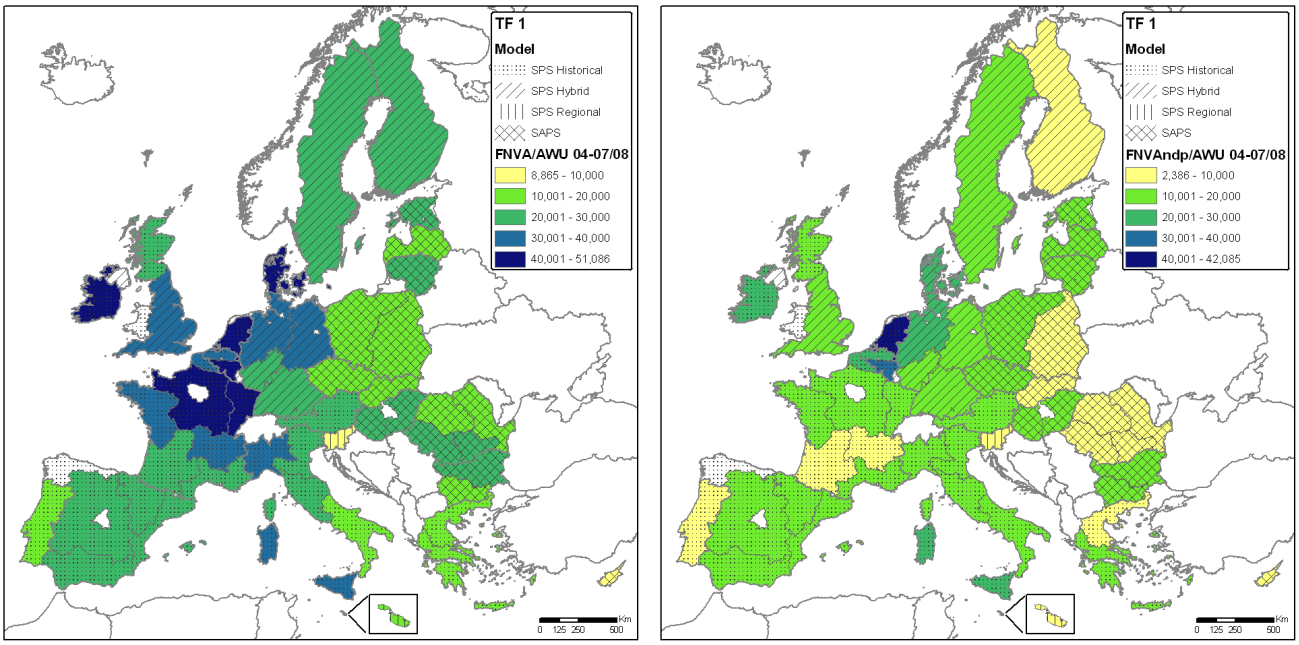
[53] In EU15, for instance, in almost all sectors Small farms are located almost exclusively in macro-regions of the South, and this lowers the average FNVA/AWU value for these macro-regions (as we shall see, the average FNVA/AWU value for Small farms is considerably lower than that of Medium farms, and much lower than that of Large farms).

Field crops

The average EU27 income level (FNVA/AWU with direct payments) for the period 2004-07 was 23,351 PPS, and the ratio between the highest level (Netherlands, 51,026 PPS) and the lowest (Slovenia, 8,865 PPS) is 5.7. The average share of direct payments was 44.4%, but in more than one third of macro-regions studied, in particular in France, Portugal, Finland, Sweden and Germany East & North East, the degree of dependence on direct payments is higher. EU12 States are in line with the EU average except for Romania and Slovakia.

The maps published below display distribution by class for the FNVA/AWU value (average for 2004-2007/08), gross and net direct payments, in EU27 regions, broken down according to the model chosen to implement the SPS or SAPS.

Fig. 17 - TF1: distribution by class of FNVA/AWU value (PPS)



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

In 14 out of the 51 analysed macro-regions the income level is below the average (three located in EU15: macro-regions of Greece and continental Portugal). None of the EU12 regions manage to reach the EU15 average.

As regards the simulated situation (FNVA/AWU without direct payments), in a general context of diminishing income levels, the reaction in macro-regions is not at all uniform:

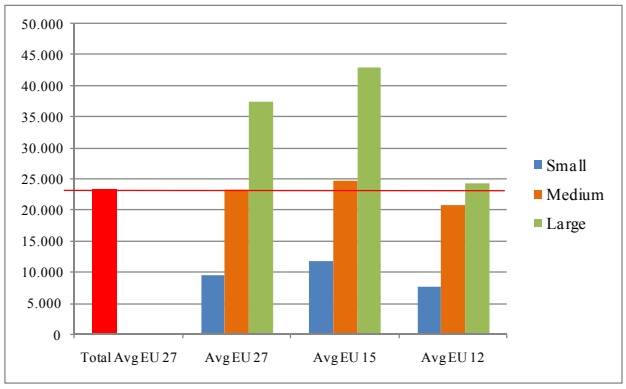
- In 17 macro-regions the simulated income level would fall by over 50% (with peaks of 60% and 70%) namely in: all French macro-regions with the exception of Nord Pas-de-Calais, North Greece, Portugal, Scotland, Finland, Sweden, Latvia, Slovakia and three of the four macro-regions of Romania).
- In 9 macro-regions the simulated income level would fall by less than 30%, namely in: BE Flamande, Centre-South Greece, Italy Sud and Italy Isole, Netherlands, Malta, Bulgaria Centralna, East Poland.

The simulated income value does not in any case reach negative values (on average) in any of the macro-regions analysed. Finally, it is noted that variations in level from the real situation to the simulated situation cannot be correlated with the type of single payment scheme adopted.

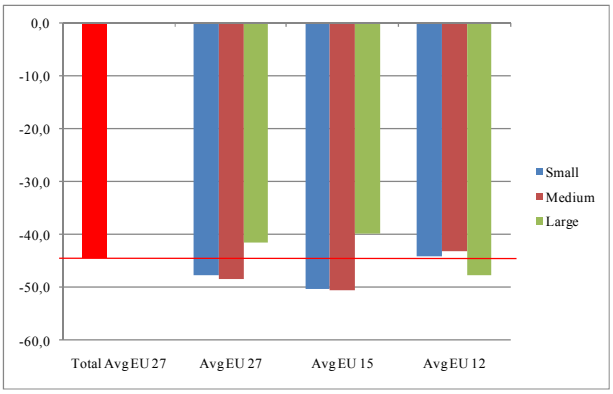
The analysis by economic size class confirms the existence of a close and direct relationship between the income level and the size of farms. As a global average, the difference is between 37,370 PPS for large farms and 9,538 PPS for small farms (i.e. 27,832 PPS), the ratio between these two levels (with aid) is thus 3.92. It is noted that, to varying extents, this relationship is repeated for the EU15 average (with slightly higher values), and for the EU12 average (slightly lower values, especially for large farms).

Fig. 18 - TF1: FNVA/AWU with direct payments and percentage variation of FNVA/AWU between the simulated situation and the actual situation, average 2004-2007 (PPS)

With directs payments



Percentage variation



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

The average results of the simulation basically reflect the same type of relationship, even though absolute levels fall proportionally. It should however be stressed that, in the absence of aid, the income would fall (EU27 average) to about 5,000 PPS for small farms, and to 22,000 PPS for large farms; thus the ratio between the two values of the indicator would rise to 4.4. Therefore, in the absence of aid the gap increases.

The following observations can be made as a result of the regional analysis:

	Small farms	**Medium farms**	**Large farms**
Regions with FNVA/AWU level below the EU27 average	100% of cases	52% of cases	12% of cases, all located in EU12
Regions with simulated FNVA/AWU level (without aid) below the EU27 average	100% of cases, except Denmark	54% of cases	17.5% of cases
Regions with negatives values for the simulated FNVA/AWU	Sweden and Finland	No case	No case
Regions with FNVA/AWU level 50% below the EU27 avg. level	79% of cases[54]	6% of cases	1 region (Slovakia)
Regions where FNVA/AWU level exceeds 50% of the EU27 average	No case	6% of cases[55]	57% of cases
Minimum FNVA/AWU	Slovenia (2,479 PPS)	Romania Unu (8,887 PPS)	Slovakia (10,430 PPS)
Maximal FNVA/AWU	Denmark (23,254 PPS)	Lithuania (36,444 PPS)	ES Centro (62,347 PPS)
Min. simulated FNVA/AWU	Sweden (-6,283 PPS)	DE East & N-E (1,191 PPS)	Romania Trei (1,989 PPS)
Max. simulated FNVA/AWU	Denmark (14,058 PPS)	Netherlands (23,304 PPS)	Netherlands (50,807 PPS)

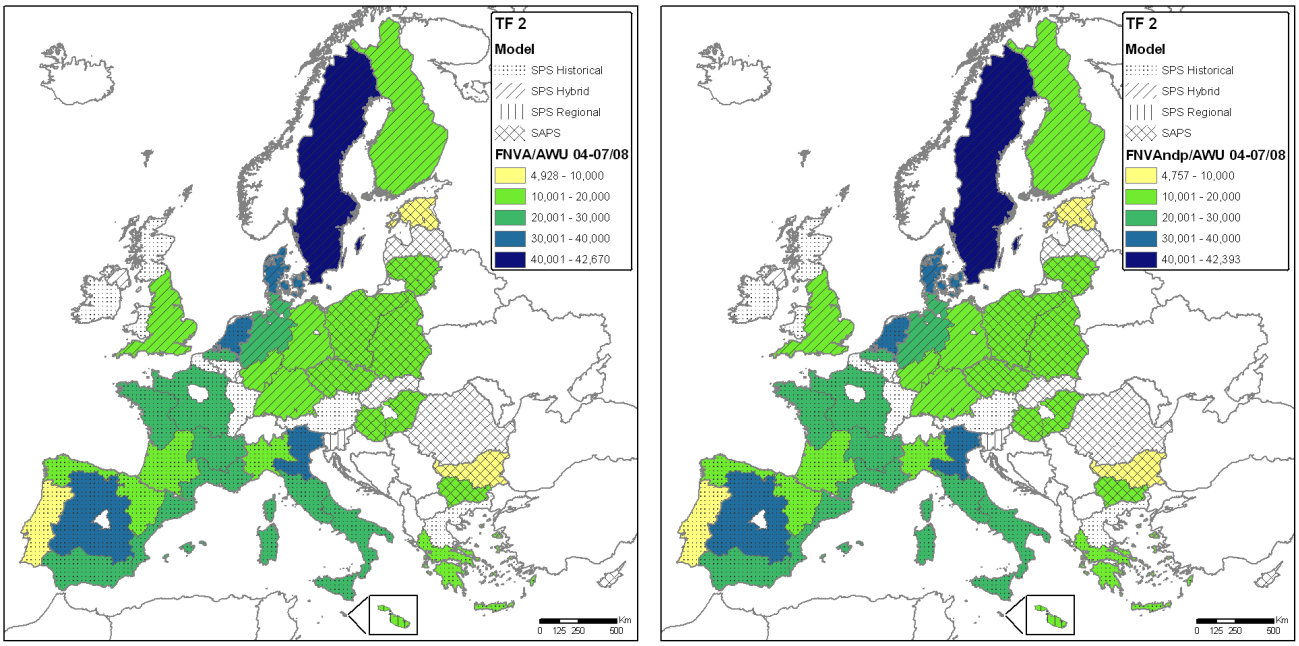
[54] All Greece regions, all Italy regions, Sweden, Portugal, Finland and all EU12 regions with the exception of HU Alföld és Észak

[55] France Bassin Parisien, Ireland, Lithuania

Horticulture

In this sector, the EU27 average income for the period 2004-07 is around 22,630 PPS, and the ratio between the highest level (Sweden, 42,670 PPS) and the lowest level (BG Severna I Iztochna, 4,928 PPS) was 8.7. However, only in Sweden was the income level at least 50% greater than the Community average, while only in 3 macro-regions of the 37 analysed (Continental Portugal, BG Severna I Iztochna and Estonia), was the income level at least 50% lower than the Community average[56].

Fig. 19 - TF2: distribution by class of FNVA/AWU value (PPS)



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

As already pointed out, this type of farming consists of highly specialised horticultural farms, for which in EU15 Member States no support is provided through direct payments (in EU12 Member States horticultural farms receive, like all the others, direct payments envisaged by SAPS or by regional SPS). Consequently, the share of direct payments on FNVA/AWU values is very low (3.8% in the EU27 on average for 2004-2007; 2.2% EU15 and 7.5% EU12). It should thus come as no surprise that the analysis of the simulated situation of no direct payments uncovers very slight variations.

The analysis by economic size class confirms what was previously stated. The difference is between 27,997 PPS for large farms and 10,137 PPS for small farms (i.e. 17,859 PPS) and the ratio between the two levels of the indicator (with aid) is thus 2.76. It should be noted that this ratio is the same in the EU15 average (values a little higher), but not in the EU12 (lower absolute values and gap between large and small farms limited to 5,400 PPS).

Other permanent crops

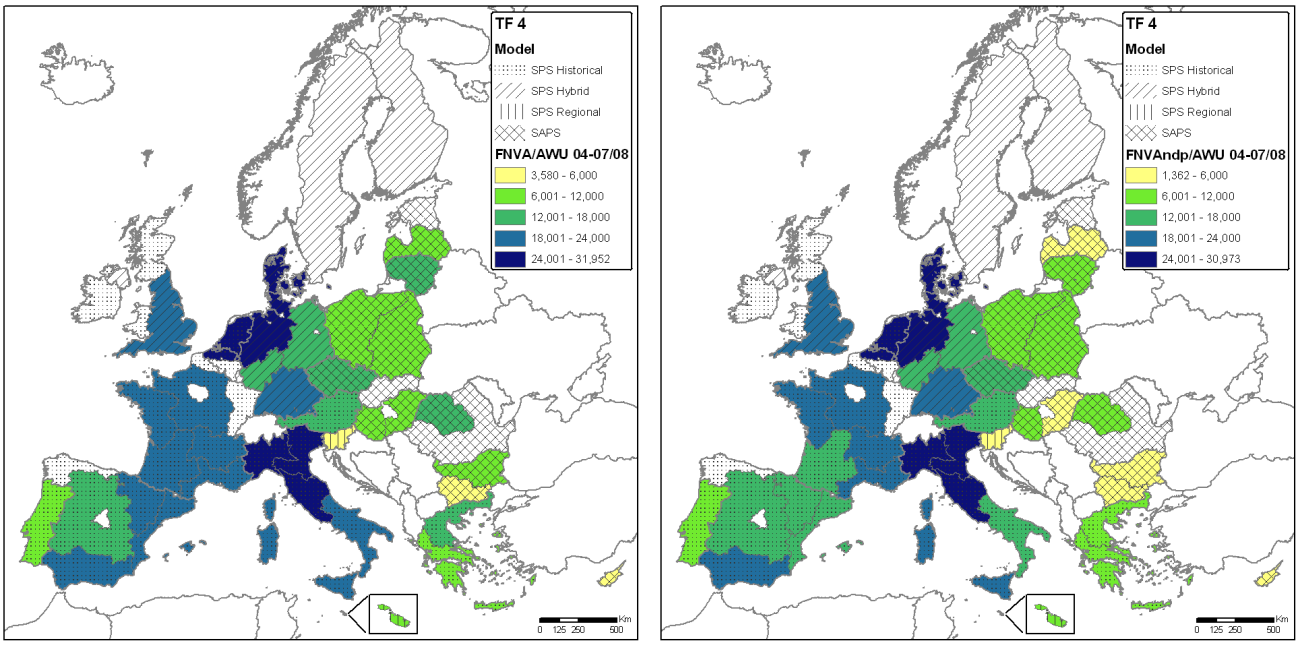
In this sector, the average EU27 income level for the period 2004-07 was 19,298 PPS, the ratio between the highest level (IT Centro, 31,952 PPS) and the lowest level (Cyprus, 3,580 PPS) is 8.9.

[56] The particularly low values recorded by Portugal and the region BG Severna I Iztochna point to problems with FADN data.

In only 3 macro-regions however of the 39 analysed (namely IT Centro, Netherlands and Denmark) the income was at least 50% greater than the Community average. On the other hand, the income was less than 50% of the Community average in 10 macro-regions, 9 of which (with the exception of Portugal) located in EU12 Member States. All 13 macro-regions analysed in EU12 have a FNVA/AWU value below the Community average.

As in previous paragraphs, the maps below summarise the distribution by class of FNVA/AWU value (average for 2004-2007/08), with and without direct payments, in EU27 regions broken down according to the model chosen to implement the SPS and SAPS.

Fig. 20 - TF4: distribution by class of FNVA/AWU value (PPS)



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

In this sector, farms receiving direct payments are concentrated mainly in the Mediterranean macro-regions. Accordingly, even if for this sector too analysis of the simulated situation highlights only slight variation, it is possible to highlight some differences. In the EU15 in the event of no direct payments, the income would fall more significantly in macro-regions of the South, in particular South Italy (-21%), Centre-South Greece (-25%), South Spain (-20%). Less promising is the situation in most of the EU12 macro-regions, where the stopping of aid would lead to a big fall in FNVA/AWU values, in particular in HU Alföld és Észak (-44%), Lithuania (-32%), Latvia (-24%) and above all Cyprus (-62%).

Income values are not in any case negative (on average) in any of the macro-regions analysed.

Results of the analysis by economic class show a relationship between the income level and the size of farms only for the EU15 set. The situation is quite different for the EU12 set, where levels (significantly lower for all three size classes) are relatively higher in the medium class (11,172 PPS) than in the large class (7,002 PPS). Average results for the simulation show for the EU15 set a higher percentage loss in income for small farms compared with medium and large farms.

The following observations can be made as a result of the regional analysis:

	Small farms	Medium farms	Large farms
Regions with FNVA/AWU level below the EU27 average	100% of cases, except IT Nord-Ovest	59% of cases	2 regions[57]
Regions with simulated FNVA/AWU level below the EU27 average	idem	65.6% of cases	3 regions[58]
Regions with negatives values for the simulated FNVA/AWU	No case	No case	No case
Regions with FNVA/AWU level 50% below the EU27 avg. level	66.7% of cases[59]	Netherlands	1 region (BG Y. Centralna)
Regions where FNVA/AWU level exceeds 50% of the EU27 average	No case	6% of cases (all EU12)	47% of cases
Minimum FNVA/AWU	Cyprus (2,767 PPS)	HU A. Észak (5,258 PPS)	BG Y. Centralna (7,002 PPS)
Maximal FNVA/AWU	IT Nord-Ovest (26,279 PPS)	Netherlands (29,323 PPS	IT Isole (44,271 PPS)
Min. simulated FNVA/AWU	Cyprus (991 PPS)	HU A. Észak (2,820 PPS)	BG Y. Centralna (991 PPS)
Max. simulated FNVA/AWU	IT Nord-Ovest (25,765 PPS)	Netherlands (29,240 PPS)	IT Centro (43,229 PPS)

Milk

The average labour unit income value for EU27 for the period 2004-07 was 23,311 PPS, and the ratio between the highest level (ES Sur, 54,579 PPS) and the lowest level (Slovakia, 6,119 PPS) is 8.9. It is noted however that in the region Romania Doi (average for period 2007-08) the FNVA/AWU ratio was negative (-187 PPS).

The average share of direct payments in the EU27 was 30.1%. In almost half of the macro-regions studied, concentrated in some member States, the degree of dependence on direct payments is above the average. In particular Finland, where direct aid accounts for 78.5% of farm net value added, Slovakia (70.2%), Sweden (51.2%), all French macro-regions (from 44.4% to 60%). Regions that are less dependent on aid are also concentrated by member State: Italy, Spain, Poland and Bulgaria.

In 23 macro-regions of the 50 analysed, the income level is below the Community average; of which seven are located in EU15 (3 macro-regions of France, Austria, continental Portugal, Finland and Sweden). In the macro-regions where the SAPS is adopted, as in the macro-regions where the regional SPS is used, only in Romania Unu has the level of the Community average been reached.

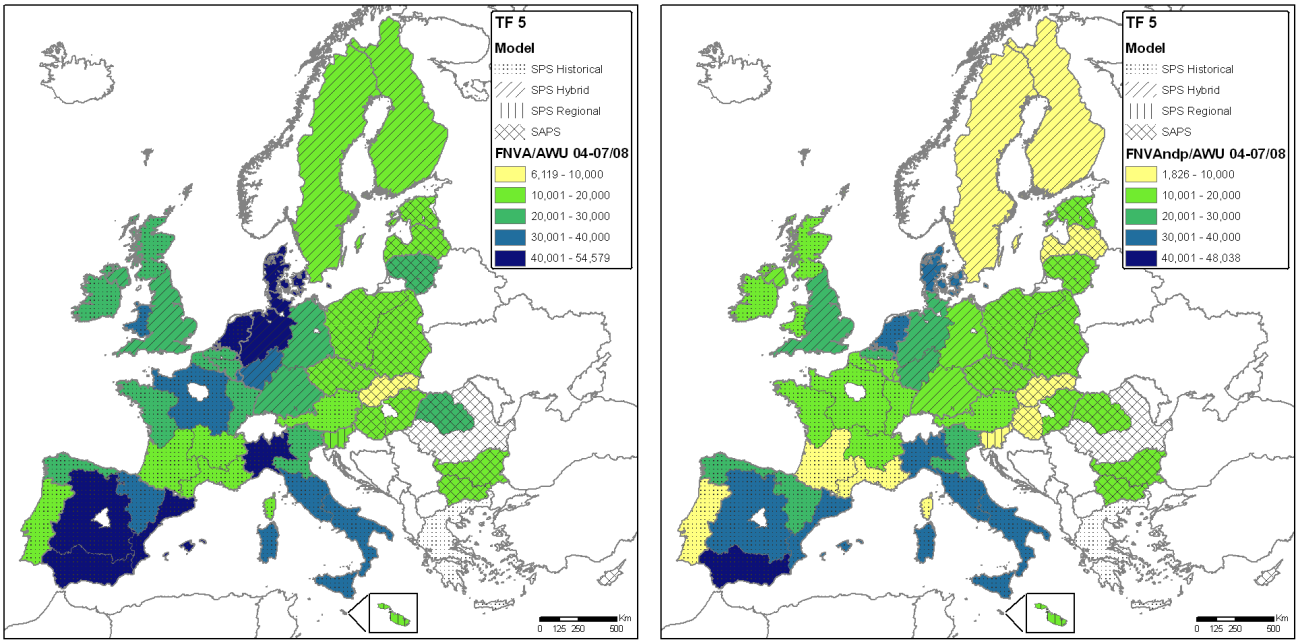
Moreover, in 10 macro-regions - all located in the EU15 (mostly in Italy and Spain), the income level is at least 50% greater than the Community average. Of these, 5 macro-regions (ES Este, ES Centro, ES Sur, Netherlands and Denmark) exceed the Community average by over 100%. On the other hand, apart from Romania Doi, in only 2 other macro-regions, Slovenia and Slovakia, was the level at least 50% less than the Community average.

[57] DE East & North-East and BG Y.Centralna. In the simulated situation, plus ES Este

[58] DE East & North-East, BG Y.Centralna, ES Este

[59] Italian regions except Nord-Ovest , Portugal and all EU12 regions analysed

Fig. 21 - TF5: distribution by class of FNVA/AWU value (PPS)



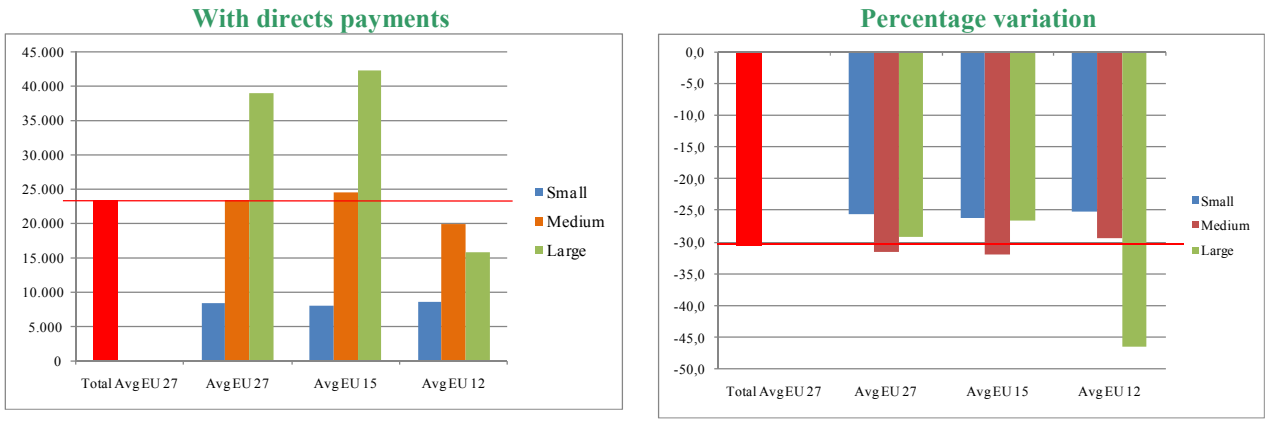
Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

In the simulated situation, in a general context of diminishing FNVA/AWU levels, the reaction in macro-regions was not at all uniform:

- in 11 macro-regions (of the 50 analysed) the income would drop by over 50%, with peaks of 60% to 70% in FR Sud-ouest, Finland, HU Dunántúl and Slovakia. Furthermore, in Romania Doi the indicator reached an even more negative level.
- in some macro-regions this fall would be not more than 20%, in particular in four macro-regions of Italy, three macro-regions of Spain, BG Severna I Iztochna and PL East.

In the analysis by class of ESU and as regards the global average, the difference is between 38,871 PPS for large farms and 8,290 PPS for small farms, the ratio between the two levels of the indicator (with aid) is thus 4.7. This relationship is repeated in the EU15 average, but not in the EU12 average, where the level of the indicator is lower in large farms compared with medium farms.

Fig. 22 – TF5: FNVA/AWU with direct payments and percentage variation of FNVA/AWU between the simulated situation and the actual situation, average 2004-2007 (PPS)



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

The averages for the simulation of FNVA/AWU levels without aid basically reflect the same type of relationship, the general fall is around the same values practically everywhere, with the exception of large farms in the EU12, where the drop in income is significantly higher than the average. In the absence of aid, the FNVA/AWU level would fall (EU27 average) to about 6,161 PPS for small farms, and to 27,572 PPS for large farms and the ratio between the two levels of the indicator would fall to 4.5: thus, in the absence of aid, the gap would narrow, albeit very slightly.

The following observations can be made as a result of the regional analysis:

	Small farms	**Medium farms**	**Large farms**
Regions with FNVA/AWU level below the EU27 average	100% of cases	58% of cases	15% of cases[60]
Regions with simulated FNVA/AWU level below the EU27 average	100% of cases	60% of cases	15% of cases
Regions with negatives values for the simulated FNVA/AWU	Sweden	No case	No case
Regions with FNVA/AWU level 50% below the EU27 avg. level	84%	No case	No case
Regions where FNVA/AWU level exceeds 50% of the EU27 average	No case	Spain: Este, Centro and Sur	59% of cases
Minimum FNVA/AWU	Sweden (1,924 PPS)	Sweden (12,638 PPS)	Latvia (13,387 PPS)
Maximal FNVA/AWU	Lithuania (13,765 PPS)	Spain Sur (50,675 PPS)	Spain Sur (68,677 PPS)
Min. simulated FNVA/AWU	Sweden (-1,216 PPS)	Finland (3,478 PPS)	Finland (3,144 PPS)
Max. simulated FNVA/AWU	Spain Noroeste (10,641 PPS)	Spain Sur (44,376 PPS)	Spain Sur (61,262 PPS)

Other grazing livestock

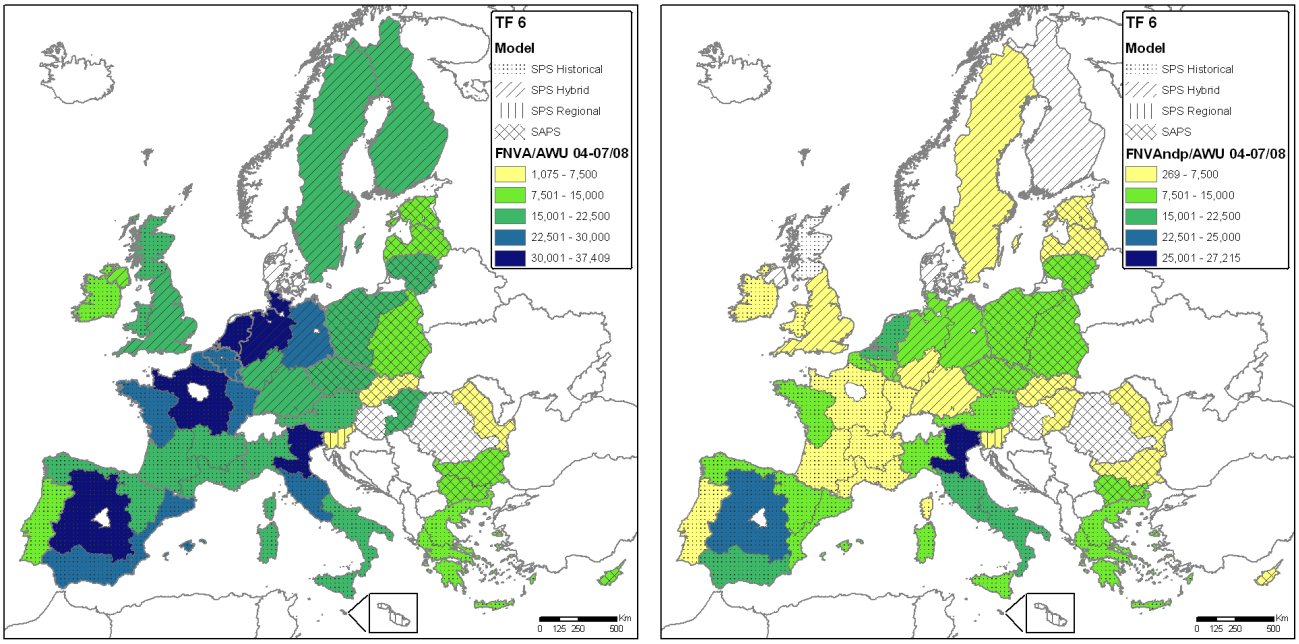
In this sector, the average level of income for the EU27 (FNVA/AWU with direct payments) for the period 2004-07 was 19,160 PPS; the ratio between the highest level (IT Nord-Est, 37,409 PPS) and the lowest level (Romania Doi, 1,475 PPS) is extremely high: 34.8.

The average share of direct payments in the EU27 in the period 2004-2007 was 49.7%, although the EU15 group is more dependent. In over 50% of macro-regions the degree of dependence on direct payments is above average, mainly in EU15: Finland, where direct aid has a 161% incidence on farm net value added, United Kingdom (all macro-regions), Sweden, France (all macro-regions) Germany (all macro-regions). Less dependent on direct aid are farms in Italy, Greece and Belgium.

The maps below summarise the distribution by class of income.

[60] 5 of 32 macro-regions: all analysed EU12 regions plus Finland. The same regions in the simulated situation

Fig. 23 - TF6: distribution by class of FNVA/AWU value (PPS)



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

None of the macro-regions analysed where the SAPS model is adopted, nor the only region analysed implementing the regional SPS model (Slovenia) exceed the Community average. Among EU15 macro regions, in 9 macro-regions out of the 27 analysed, the income level is below the Community average: Finland, DE West, UK Northern Ireland, the 2 macro-regions of Greece, Austria, Ireland, continental Portugal, ES Noroeste.

Furthermore, in 8 macro-regions (of the 49 analysed), all located in the EU15, the income level is at least 50% greater than the Community average, in particular in four macro-regions of France, IT North-East, Netherlands, ES Centro and DE North-West. In IT North-East and in ES Centro, the average level exceeds 70% of the Community average (it is noted that in these macro-regions farms belonging to TF6 specialise in fattening calves bought from other macro-regions/member States). On the other hand, in 4 macro-regions, 3 of which located in EU12 Member States, and one only in the EU15 (Portugal), the level is at least 50% less than the Community average.

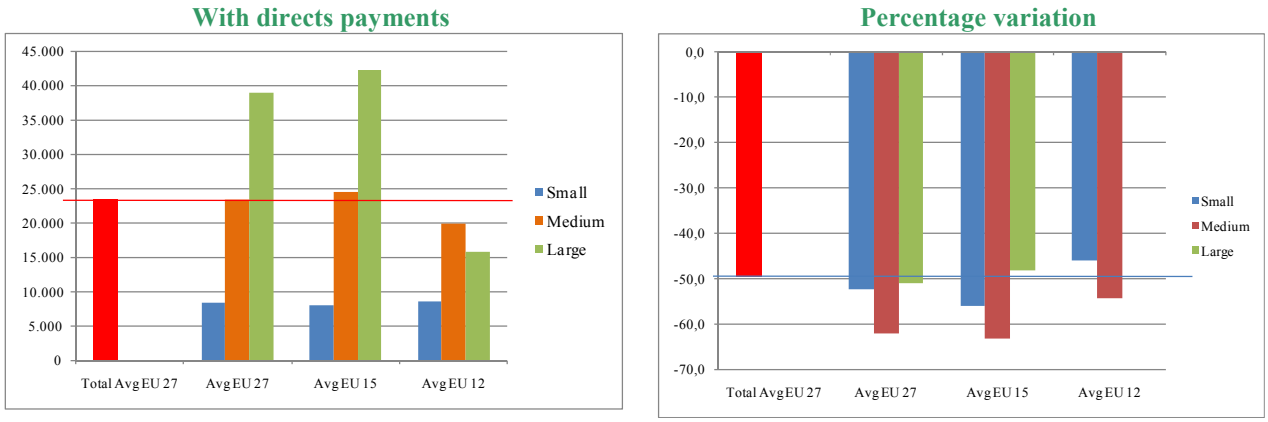
In the simulated situation (no direct payments), in a general context of diminishing FNVA/AWU levels, the effects in macro-regions are not uniform and, in some cases, dramatic:

- In 3 EU15 macro-regions average incomes would become negative (Scotland, Finland and North Ireland). In Finland the situation would be particularly dramatic
- In a further 14 macro-regions (of the 49 analysed) the FNVA/AWU level, while remaining positive, would decline by over 70% (almost all macro-regions in France, Ireland, Portugal, Denmark, DE West, Sweden, Wales, England in the EU15; Slovenia and Slovakia in the EU12).
- On the other hand, in 10 macro-regions FNVA/AWU would fall by less than 30%, namely in 4 of the 5 Italian macro-regions, two of the five Spanish macro-regions, GR Centre-South, BG Yugozapadna Yuzhina Centralna and in the two Polish macro-regions.

It is in any case noted that variations in level from the real situation to the simulated situation cannot be correlated with the implementation model adopted, but rather with the different husbandry techniques used in the various macro-regions and the various levels of support granted[61].

The analysis by class of ESU shows that the level of the global average is 37,626 PPS for large farms and 9,179 PPS for small farms, the ratio between the two levels of the indicator (with aid) is thus 4.1. It is noted that this ratio is repeated almost exactly in the EU15 average (values a little higher), while in the EU12 the ratio is quite similar between Small and Medium farms – no region with Large farms was analysed).

Fig. 24 - TF6: FNVA/AWU with direct payments and percentage variation of FNVA/AWU between the simulated situation and the actual situation, average 2004-2007 (PPS)



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

Averages for the simulation of FNVA/AWU values net of aid basically reflect the same type of relationship, even though falls in absolute values were consistent: the ratio between the two levels of the indicator would rise to 4.2. Thus, in the absence of aid, there would only be a slight rise in the gap.

At regional level, the following observations can be made:

	Small farms	Medium farms	Large farms
Regions with FNVA/AWU level below the EU27 average	100% of cases, except Spain Centre	49% of cases	No case
Regions with simulated FNVA/AWU level below the EU27 average	idem	61% of cases	20%[62]
Regions with negatives values for the simulated FNVA/AWU	France Méditerranée, North Ireland, Sweden	Finland, UK Scotland and Northern Ireland	
Regions with FNVA/AWU level 50% below the EU27 avg. level	57%	Slovenia	No case
Regions where FNVA/AWU level exceeds 50% of the EU27 average	No case	France Bassin Parisien, Spain Noroeste and Centro	85%
Minimum FNVA/AWU	Romania Doi (1,362 PPS)	Slovenia (7,815 PPS)	DE East & N-E (25,572 PPS)
Maximal FNVA/AWU	Spain Centro (20,736 PPS)	Spain Centro (36,444PPS)	IT Nord-Est (62,703 PPS)
Min. simulated FNVA/AWU	FR Méditerr. (-5,288 PPS)	Finland (-11,448 PPS)	UK Scotland (2,708 PPS)
Max. simulated FNVA/AWU	Spain Centro (12.176 PPS)	Spain Centro (27,308PPS)	IT Nord-Est (45,447 PPS)

[61] For instance, macro-regions with a greater/lesser presence of suckler cow herds, towards macro-regions with a greater/lesser presence of fatstock which, as is well known, receive/received diversified forms of support.

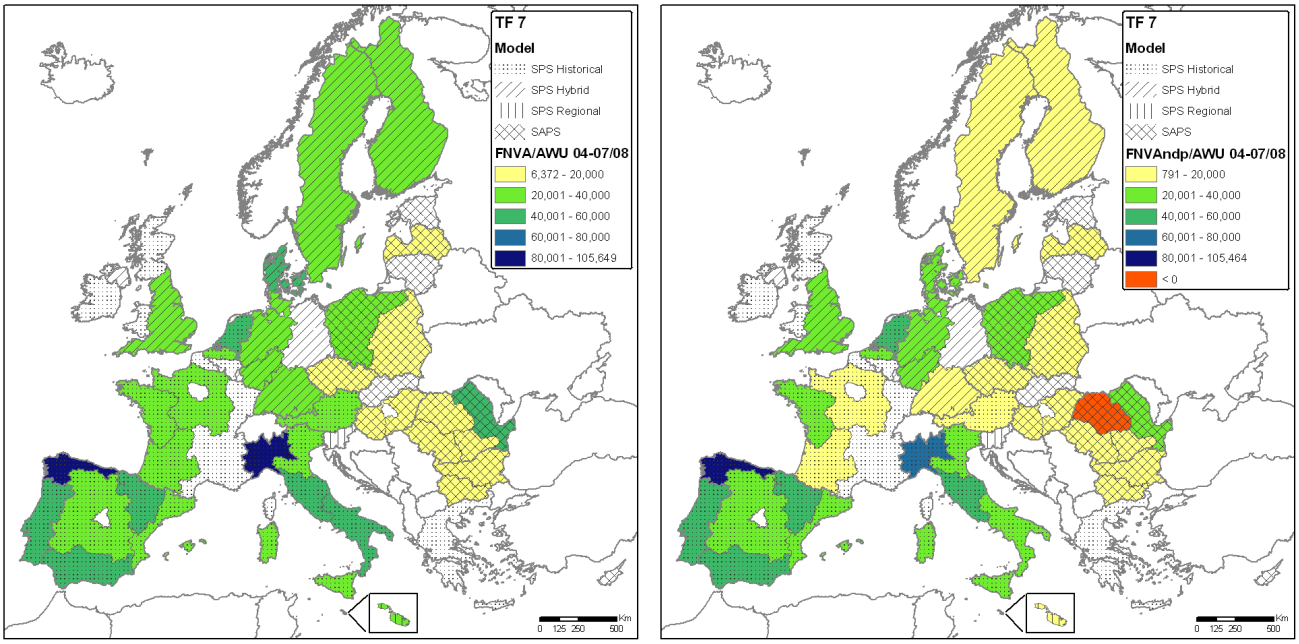
[62] UK Scotland and Wales, FR Est and Centre-Est

Granivores

The average income level for the EU27 for the period 2004-07 was 25,475 PPS; in the EU15, apart from ES Noroeste and IT Nord-Ovest (see above), the FNVA/AWU value for most producer macro-regions is quite close to the average value of about 40,000 PPS, with a few exceptions lying below this value (Austria, FR Sud-Ouest and FR Bassin Parisienne, Sweden, etc). With regard to EU12 macro-regions, all 13 macro-regions analysed have a FNVA/AWU value below the Community average, with the exception of RO Macroregiunea Doi (the level reaches the average level of the EU15) and PL West.

The maps below summarise the distribution by class of income.

Fig. 25 – TF7: distribution by class of FNVA/AWU value (PPS)



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

As recalled, this type of farming consists of farms specialised in the breeding of granivores, for which in the past no support has been given through direct payments. Prior to the reform, however, they were able to receive direct payments relating to the production of cereals destined for livestock feed and, of course, for other crops for which direct support can be granted.

In the EU15 the average share of direct payments for the period 2004-2007 is consequently low (9.6%). The analyses point to two groups of regions/member States: one, not overly dependent on aid (Belgium, Italy, Netherlands, Portugal, Spain), the other (Finland, France, Germany, Sweden, Denmark) where the DP/FNVA ratio is higher than average. In the EU12 the share of direct payments was 22.7%, with Malta, Bulgaria and Hungary (all macro-regions) above average.

As a result, in general the simulated situation (no direct payments) shows a negative variation compared with the actual situation, albeit limited.

The analysis by ESU classes shows at a global level a difference in the income between 36,503 PPS for large farms and 10,862 PPS for small farms (i.e. 25,641 PPS), the ratio between the two levels of the indicator (with aid) is thus 3.36. The analysis highlights a difference between EU15 and EU12:

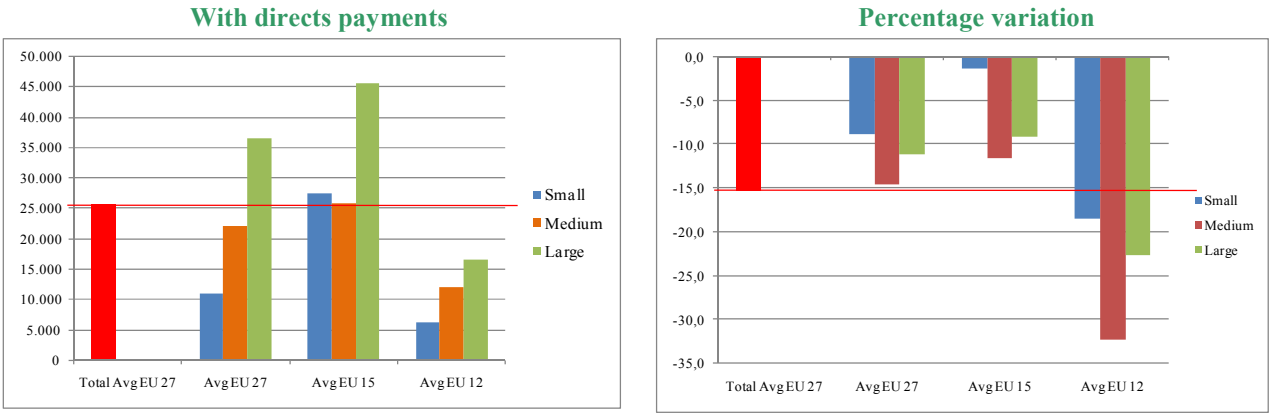
- in EU12, the ratios between classes is roughly the same as the EU 27 (although absolute levels are lower);

- in EU15, the ratios between classes are very different from those computed at EU27 level; indeed, the absolute level of the income is about the same in the small and in the medium classes and noticeably higher in the large class.

In the EU15 the indicator is basically similar for the Small and Medium classes, while the level is noticeably higher for the Large class.

Averages for the simulation (FNVA/AWU values without aid) basically reflect the same type of hierarchy. Percentage variations of FNVA/AWU gross and net aid highlight a rather modest fall in income in all ESU classes in the EU15, and a larger drop in income in EU12 regions, in particular for Medium farms. It should however be stressed that, in the absence of aid, the FNVA/AWU value would fall to a limited degree (EU27 average) and the ratio between the two levels of the indicator (3.28) remains practically the same.

Fig. 26 - TF7: FNVA/AWU with direct payments and percentage variation of FNVA/AWU between the simulated situation and the actual situation, average 2004-2007 (PPS)



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

The following observations can be made as a result of the regional analysis:

	Small farms	Medium farms	Large farms
Regions with FNVA/AWU level below the EU27 average	8 cases of 9 (exc. SP Sur)	76% of cases	27% of cases, all located in the EU12
Regions with simulated FNVA/AWU level below the EU27 average	idem	69% of cases[63]	31% of cases, all located in the EU12 + Germany E-NE
Regions with negatives values for the simulated FNVA/AWU	BG Y. Yuzhina Centralna	BG Y. Yuzhina Centralna	Romania Unu
Regions with FNVA/AWU level 50% below the EU27 avg. level	8 cases of 9 (exc. SP Sur), Bulgaria Centralna negative	17% of cases[64], Bulgaria Centralna negative	No case
Regions where FNVA/AWU level exceeds 50% of the EU27 average	No case	UK England and ES Sur	50% of cases
Minimum FNVA/AWU	Bulgaria Centr. (-2,399 PPS)	Bulgaria Centr. (-3,147 PPS)	BG S. I Iztochna (6,597 PPS)
Maximal FNVA/AWU	ES Sur (43,488 PPS)	UK England (48,660 PPS)	IT Nord-Ovest (86,880 PPS)
Min. simulated FNVA/AWU	The minimum and maximum levels of the simulated value are in the same regions with no/minimal variations		Romania Unu (-2,763PPS)
Max. simulated FNVA/AWU			IT Nord-Ovest (80,877 PPS)

[63] This is the only case among TF analysed where a relative improvement has been estimated in the simulated

[64] 5 of 29 regions analysed, all located in the EU12 with the exception of Sweden.

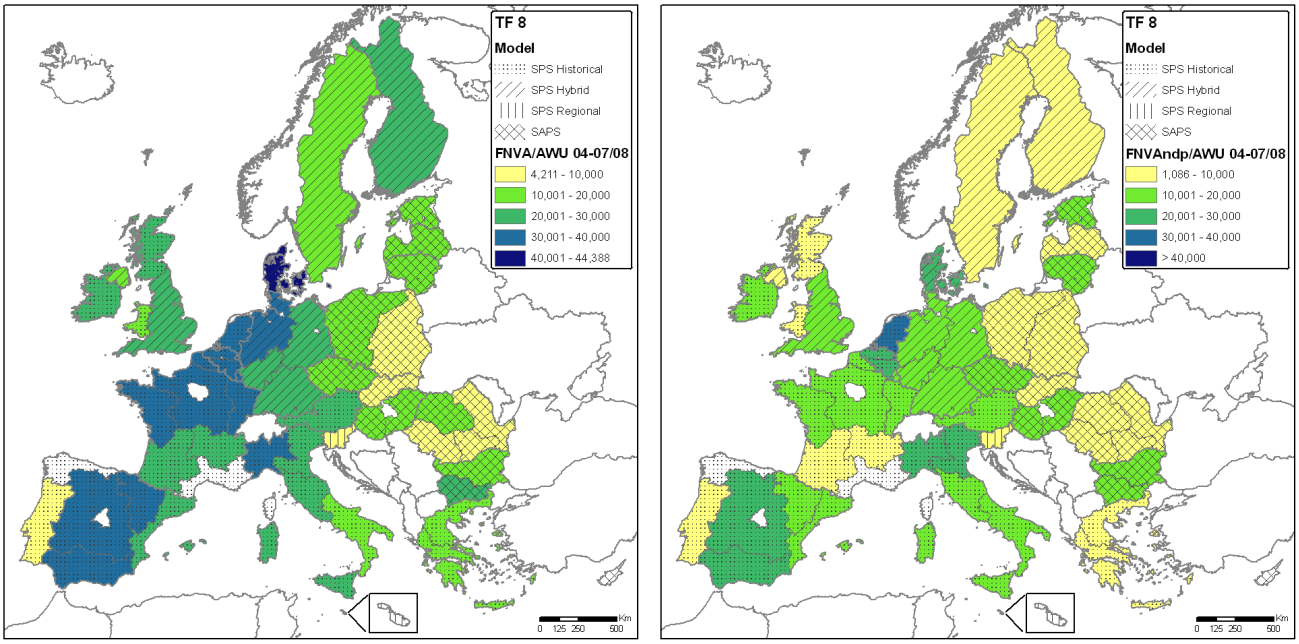
Mixed farms

The average income level in the EU27 (with direct payments) for the period 2004-07 was 17,999 PPS, the lowest of all types of farming analysed. The ratio between the highest level (Denmark, 44,388 PPS) and the lowest level (Romania Trei, 4,211 PPS) is 10.5.

The average share of direct payments on farm value added in the EU27 for the period was 42.0%. The ratio is higher than average in Finland, United Kingdom (all regions), France (all regions), Portugal, Sweden, Slovakia and Romania (all regions).

The maps below summarise the distribution by class of FNVA/AWU.

Fig. 27 – TF8: distribution by class of FNVA/AWU value (PPS)



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

In 23 macro-regions of the 51 analysed, the income level is below the Community average; of which 5 (of 35) are located in EU15 (all located in the South plus North Ireland) and 14 (of 16) in EU12 . Furthermore, in 18 macro-regions, all located in the EU15, the income is at least 50% greater than the Community average. Of these,7 macro-regions (FR B. Parisien, FR N. Pas-de-Calais, FR Est, IT Nord-Ovest, Netherlands, ES Sur and Denmark) exceed the Community average by over 100%. On the other hand, in 6 macro-regions, all located in the EU12, the level is at least 50% lower than the Community average (Slovenia, Romania, Slovakia and Poland).

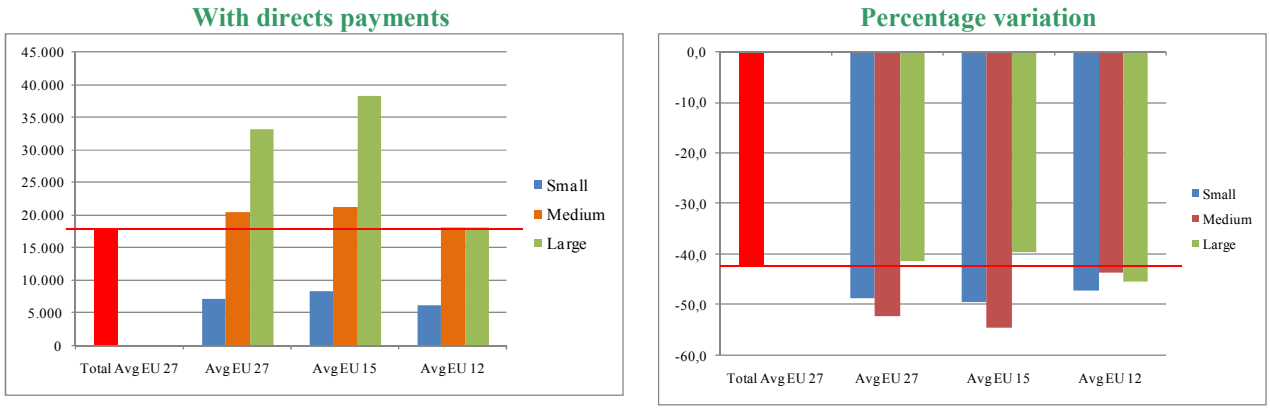
In the simulated situation, in a general context of diminishing FNVA/AWU levels, the effects in macro-regions are rather uneven:

- In 21 regions (of the 51 analysed) the FNVA/AWU value would go down by over 50%, with peaks of over 70% in FR Sud-Ouest, Portugal, Scotland, Wales and Finland (in the EU15), and in Slovakia and RO Macroregiunea Doi (in the EU12) .
- On the other hand, in 9 macro-regions the FNVA/AWU would fall by less than 30%, namely in BE Flamande, GR Centre-South, ES Centro and all Italian macro-regions (in the EU15), and in the two Bulgarian macro-regions (in the EU12).

The FNVA/AWU would not in any case have negative values (on average) in any of the macro-regions analysed. Finally, it is noted that the variations in level comparing the real situation and the simulated situation cannot be correlated to the implementation model adopted.

The deeper analysis by ESU classes shows at a global level a difference in the income between 33,315 PPS for large farms and 7,273 PPS for small farms (i.e. 26,043 PPS), the ratio between the two levels of the indicator (with aid) is thus 4.58. This ratio is repeated in the EU15 average (values being a little higher), but not in the same way in the EU12 average, where the level of the indicator in the Large class is practically the same as that of the Medium class.

Fig. 28 - TF8: FNVA/AWU with direct payments and percentage variation of FNVA/AWU between the simulated situation and the actual situation, average 2004-2007 (PPS)



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

Averages for the simulation of FNVA/AWU values without aid reflect almost exactly the same type of relations, even though absolute levels are down in all classes; the ratio between the two levels of the indicator would rise to 5.23. Thus, in the absence of aid, the gap would widen.

The following observations can be made as a result of the regional analysis.

	Small farms	Medium farms	Large farms
Regions with FNVA/AWU level below the EU27 average	100% of cases	41% of cases	14% of cases, all located in the EU12
Regions with simulated FNVA/AWU level below the EU27 average	100% of cases	52% of cases	14% of cases
Regions with negatives values for the simulated FNVA/AWU	Denmark, Sweden	UK Scotland	No case
Regions with FNVA/AWU level 50% below the EU27 avg. level	64.3% of cases Denmark negative	No case	No case
Regions where FNVA/AWU level exceeds 50% of the EU27 average	No case	18% of cases[65]	71% of cases
Minimum FNVA/AWU	Denmark (-1,859 PPS)	Netherlands (12,573 PPS)	Latvia (12,188 PPS)
Maximal FNVA/AWU	UK Wales (17,240 PPS)	Spain Centro (38,297 PPS)	IT Nord-Ovest (63,820 PPS)
Min. simulated FNVA/AWU	Denmark (-14,428 PPS)	UK Scotland (-2,363 PPS)	UK Scotland (6,941 PPS)
Max. simulated FNVA/AWU	Spain Sur (13,869 PPS)	Spain Centro (27,745 PPS)	IT Nord-Ovest (50,987 PPS)

[65] 8 regions: three of the six French regions, in all four Spanish regions and in Latvia

5.5.3 Net effects of direct payments in enhancing farm income: results deriving from the micro-econometric modelling

This section describes and comments the results deriving from the micro-econometric analysis. The methodology used in this analysis is described in chapter 4.1.3.2.

The developed regression models have been used to assess the effectiveness of both coupled and decoupled direct payments in enhancing farmers' income. This has been done by analysing the significance and the level of the estimated parameters for these two variables. The regression parameters estimate the impact of an additional Euro of direct payments on farm income. If parameters are statistically different from zero and positive in sign, it can be assumed that direct payments contribute to enhancing farm incomes. The magnitude of the parameters provides an estimated measure of this contribution

Note that the models include other variables in order to consider other factors explaining the level of farm income and in order to isolate the impact of direct payments from those of these factors. The rationale is that, keeping all other variables constant, the higher the direct payments coefficients estimates, the larger the share of payments that translates into farm income.

The description and discussion of the estimation results is preceded by synthesis of the overall quality of the estimation exercise. After the presentation of the results of the basic (or restricted) models (i.e. those assuming that the parameters for direct payments do not differ into the sample of farms) for the year 2007 we present the results for the unrestricted models (i.e. those used to verify if the parameters of direct payments differ in the sample of farms, e.g. farms located in regions where the SPS and the SAPS models are applied). A final paragraph provides the 2004 results which can, in some cases, give further explanations.

In order to facilitate the interpretation of the tables containing the estimation results, the following table provides the codes and a description of the variables introduced in the models (Tab. 16). The meaning of the variables has already been discussed in better detail in the section explaining the used methodology.

Tab. 16 – Regression model - variables description

Code	Definition	Measurement Unit
fnvaa	Farm net value added per agricultural work units (dependent variable)	Euro/AWU
cmoa	Estimate of the support from CMO measures (excluding direct and other payments)	Euro/AWU
cdpa	Coupled direct payments	Euro/AWU
ddpa	Decoupled direct payments	Euro/AWU
otha	Other payments including RD payments	Euro/AWU
ecsize	Farm economic size	ESU
assa	Unitary value of farm assets	Euro/AWU
nsm	Dummy variable to identify EU 10 Member States in 2004	0 or 1
constant	Constant of the regression	Euro/AWU
gdp	Unitary Gross Domestic Product	Euro/Person
lfacdpa	The same as cdpa but set to zero in non mountain-LFA farms	Euro/AWU
lfddpa	The same as ddpa but set to zero in non mountain-LFA farms	Euro/AWU
spscdpa	The same as cdpa but set to zero in farms in regions where the SAPS is applied	Euro/AWU
spsddpa	The same as ddpa but set to zero in farms in regions where the SAPS is applied	Euro/AWU

5.5.3.1 Overall quality of the estimations

For each model that has been developed for a particular type of farming, the tables report three columns. The first column refers to the level (i.e. magnitude) of the estimated coefficients. The second reports the probability that the estimated coefficient is equal to zero[66]. The third identifies the coefficients that can be considered statistically different from zero using the following symbols: ***: significant at 1%; ** significant at 5%; * significant at 10%. The commonly used approach is to set a significance level (e.g. 1% or 0.01) and then to consider a coefficient as statistically non significant (i.e. statistically equal to zero) when the probability level is higher than the significance level. If this is the case, the value of the estimated coefficients should not be considered as influencing the dependent variable (i.e. statistically equal to zero) even if the estimated parameter is not zero.

The overall quality of the regressions performed on the 2007 data is good in 5 of the 8 estimated models. Indeed, the estimates for farms specialised in horticulture, permanent crops and granivores are not very satisfactory given that the R^2s are lower than 0.56[67]. This result seems to be consistent with the results obtained in 2004 and with the fact that, in these types of farming, the role of direct payments in the generation of farm income is less important than in other sectors. In the other types of farming, the regression models seem to be able to explain most of the observed variability of farm net value added levels (*fnvaa*) given that the R^2s are always higher than 0.68 (Tab. 17).

The overall quality of the 2004 regression models seems also relatively good in all considered types of farming, with the only exception of horticulture and permanent crops. Indeed, the statistical parameter R^2 is always higher than 0.66, apart from the two aforementioned cases (Tab. 17).

This is not the case for the regressions applied to farms specialised in horticulture and permanent crops probably because, on average, the role of direct payments in the generation of farm income in these sectors is more limited than in the other types of farming. Indeed, this is reasonable given that two out of six explanatory variables refer to direct payments. This also explains why, in these two sectors, some of the estimated coefficients are not statistically significantly different from zero according to the performed t-statistic tests.

5.5.3.2 Estimation results of the basic models: year 2007

The variables expressing the support provided by coupled direct payments (*cdpa*) and decoupled direct payments (*ddpa*) show estimated coefficients that are statistically different from zero and positive in all considered cases (Tab. 17). This shows that direct payments contributed to enhancing the income of farmers and, comparing with the results obtained for 2004 (see § 5.5.3.4), that this role may have become even more important than in 2004, when some of the estimated coefficients were not significant (Tab. 19).

[66] This probability is computed on the basis of t-statistic tests developed by the statistical software for each estimated coefficient.

[67] As already explained in the methodology (§ 4.1.3.2), because of the presence of heteroschedasticity and outliers, the regressions have been developed by means of the robust regression approach. This approach tends to increase the R^2 values in comparison with Ordinary Least Squared. Therefore, a R^2 value lower than 0.6 is already suggesting a poor estimation result.

Tab. 17 - 2007 restricted model: Estimation results for all farm groups

TF code:	TF 1 Field crops			TF 2 Horticulture			TF 4 Permanent crops			TF 5 Milk			TF 6 Other grazing livestock			TF 7 Granivores			TF 8 Mixed farms			TF 1, 2, 4, 5, 6, 7, 8 Whole sample		
	Coef.	Prob.		Coef.	Prob.		Coef.	Prob.		Coef.	Prob.		Coef.	Prob.		Coef.	Prob.		Coef.	Prob.		Coef.	Prob.	
cmoa	1,270	0,000	***	1,194	0,000	***	0,484	0,001	***	2,489	0,000	***	0,468	0,000	***	0,228	0,000	***	0,510	0,000	***	0,394	0,000	***
cdpa	0,634	0,000	***	0,415	0,000	***	0,443	0,000	***	0,501	0,000	***	0,233	0,000	***	0,378	0,000	***	0,650	0,000	***	0,473	0,000	***
ddpa	1,199	0,000	***	1,282	0,000	***	0,604	0,000	***	0,894	0,000	***	0,334	0,000	***	1,198	0,000	***	1,484	0,000	***	1,207	0,000	***
otha	0,564	0,000	***	0,286	0,222		0,177	0,003	***	-0,038	0,199		0,278	0,000	***	0,251	0,011	**	-0,022	0,195		-0,200	0,000	***
ecsize	7,522	0,000	***	14,361	0,000	***	53,521	0,000	***	10,697	0,000	***	117,817	0,000	***	6,447	0,000	***	3,623	0,000	***	13,871	0,000	***
assa	0,003	0,000	***	0,027	0,000	***	0,010	0,000	***	0,017	0,000	***	0,001	0,058	*	0,001	0,128		0,005	0,000	***	0,006	0,000	***
gdp	156,05	0,000	***	418,84	0,000	***	350,68	0,000	***	-36,27	0,000	***	-35,84	0,000	***	261,60	0,000	***	66,02	0,000	***	237,81	0,000	***
constant	2553,43	0,000	***	424,04	0,209		658,94	0,023	**	3248,71	0,000	***	5313,35	0,000	***	2067,51	0,000	***	1701,62	0,000	***	2714,56	0,000	***
R^2	0,839			0,555			0,513			0,799			0,680			0,382			0,850			0,698		

Coef.: Value of the estimated coefficient; Prob.: Probability that the coefficient is not different from zero. ***: significant at 1%; ** significant at 5%; * significant at 10%.
For example, Prob. values lower than 0.01 suggests that the coefficient should be regarded as significantly different from zero at 1% significance.

Source: Agrosynergie regression estimates based on sample data EU-FADN-DG AGRI L-3

The coefficient for coupled direct payments (*cdpa*) is around 0.47 in the model for the whole farm sample, and it ranges from 0.23 in farms specialised in other grazing livestock to 0.63 in field crop farms.

The coefficient for decoupled direct payments (*ddpa*) is around 1.2 in the model for the whole farm sample, whereas the coefficients for single types of farming range from 0.33 in other grazing livestock farms to 1.48 in mixed farms (Tab. 17). The heterogeneity of the magnitude of the coefficients estimated for the different farm typologies is higher for decoupled payments than for coupled payments .

The estimation coefficients referring to CMO support (*cmoa)* are also statistically different from zero and positive in all considered cases. The *cmoa* coefficient is close to 0.4 in the model for the whole farm sample and, apart from one case, it ranges from 0.23 in farms with granivores to 1.27 in field crop farms. However, it reaches a very high value in dairy farms where, as it is well known, market support represents an important share of the overall support these farms receive .

The estimation results for the coefficients referring to support provided by other policies (*otha*) are very mixed. Apart from the model for the whole farm sample, in 3 out of 7 regressions developed for single types of farming, the coefficient is not statistically different from zero. However, in the models for farms specialised in field crops, permanent crops, other grazing livestock and granivores, the coefficients are positive and range from 0.18 to 0.56 (Tab. 17).

It is worth to note that the *otha* coefficient estimated for the whole farm sample is negative (for further details see QE 4). This result should be considered with caution given that, as explained, in this case the data comes from the aggregation of a large heterogeneity of types of farming.

The estimated coefficients for the other explanatory variables generally have the expected signs. The coefficients estimated for the variable referring to farm total assets (*assa*) are significantly different from zero and positive in all but two cases (considering a significance level of 5%). This shows that a high level of capital per labour unit is generally found in farms with relatively high levels of unitary farm value added (Tab. 17).

Positive coefficients for the variable referring to farm size (*ecsize*) are also found in all considered cases, showing the very important role this variable plays in determining the level of farm value added. This seems consistent with the hypothesis of the existence of increasing scale economies: larger farms generally have lower average production costs and better economic results. However, this may also be explained by the fact that larger farms generally rely more on capital than on labour in comparison with small size farms. Therefore, the denominator of the considered income indicator (*fnvaa*) is relatively lower than in smaller farms.

Finally, the estimated coefficients for the unitary gross domestic product (*gdp*) are positive in all but two cases. Indeed, negative coefficients are estimated for grazing livestock specialised farms (TF5 and TF6). Apart from these two cases, the unitary farm value added is positively correlated to the unitary gross product (Tab. 17).

5.5.3.3 Differences between farms located in regions where the SPS and the SAPS models are applied

The 2007 dataset has permitted to test if the coefficients for coupled and decoupled direct payments differ according to the Payment Scheme applied (i.e. SPS *vs.* SAPS). In this case, the analysis is based on the development of an unrestricted model suitable to test for such differences: this model has been estimated in each one of the 8 considered farm sample groups (7 types of farming and the whole sample).

These models include, together with variables *cdpa* and *ddpa*, also variables *spscdpa* and *spsddpa*. In this case the coefficients for the first set of variables (*cdpa* and *ddpa*) now refer to coupled and decoupled payments in the regions where the SAPS is applied. The coefficients for SPS regions can be found by summing the coefficients for the two sets of variables: *cdpa* and *spscdpa* for obtaining the coefficient for coupled payments; *ddpa* and *spsddpa* for decoupled payments. Therefore, if for example the coefficients for the second set of variables (*spscdpa* and *spsddpa*) are negative, the coefficients for SPS regions are lower than for SAPS regions.

It is important to underline that the differences in these two groups of farms can be due not just to the different payment scheme applied, but also to differences of these two groups of farms in terms of other factors that may not be captured by the models. Therefore, it should be avoided to assume that all possible differences are only due to the different ways of implementing the payment schemes.

The statistical tests, performed to assess whether these two coefficients do jointly differ in farms located in regions where the SPS and the SAPS have been applied (F-test), provide mixed results (Tab. 18). On the one hand, in 4 models for individual types of farming (horticulture, permanent crops, milk and granivore farms) the two coefficients appear to jointly differ in the two groups of regions. On the other hand, in three models developed for single types of farming (field crops, other grazing livestock and mixed farms) and in the model applied to the whole sample, the tests suggest that the coefficients in farms located in regions where SAPS and SPS are applied do not jointly differ (Tab. 18)[68].

[68] More formally, the results of the test do not allow to reject the hypothesis that the coefficients do not jointly differ in the two groups of farms.

Tab. 18 - 2007 unrestricted-SPS models: Estimation result for all farm groups

	TF 1 Field crops		TF 2 Horticulture		TF 4 Permanent crops		TF 5 Milk		TF 6 Other grazing livestock		TF 7 Granivores		TF 8 Mixed farms		TF 1, 2, 4, 5, 6, 7, 8 Whole sample	
	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
cmoa	1,244	0,000 ***	1,171	0,000 ***	0,414	0,005 ***	2,487	0,000 ***	0,468	0,000 ***	0,218	0,000 ***	0,507	0,000 ***	0,401	0,000 ***
cdpa	0,962	0,000 ***	0,768	0,404	-0,620	0,000 ***	-0,445	0,019 **	0,222	0,204	-0,135	0,000 ***	0,708	0,000 ***	0,871	0,000 ***
ddpa	1,679	0,000 ***	0,949	0,032 **	-1,944	0,000 ***	0,953	0,000 ***	0,163	0,046 **	2,680	0,000 ***	1,834	0,000 ***	1,627	0,000 ***
spscdpa	-0,346	0,000 ***	-0,338	0,715	1,159	0,000 ***	0,966	0,000 ***	0,007	0,970	1,134	0,000 ***	-0,047	0,611	-0,392	0,000 ***
spsddpa	-0,495	0,000 ***	0,574	0,214	2,592	0,000 ***	-0,057	0,546	0,174	0,031 **	-1,759	0,000 ***	-0,381	0,000 ***	-0,449	0,000 ***
otha	0,469	0,000 ***	0,280	0,235	0,342	0,000 ***	-0,030	0,313	0,284	0,000 ***	-0,169	0,089 *	-0,108	0,000 ***	-0,256	0,000 ***
ecsize	6,335	0,000 ***	14,537	0,000 ***	54,246	0,000 ***	10,910	0,000 ***	117,576	0,000 ***	10,990	0,000 ***	3,431	0,000 ***	12,740	0,000 ***
assa	0,003	0,000 ***	0,027	0,000 ***	0,011	0,000 ***	0,017	0,000 ***	0,001	0,066 *	0,001	0,298	0,005	0,000 ***	0,006	0,000 ***
gdp	243,97	0,000 ***	414,09	0,000 ***	308,38	0,000 ***	-40,69	0,000 ***	-42,80	0,000 ***	372,26	0,000 ***	117,85	0,000 ***	286,10	0,000 ***
constant	624,59	0,003 ***	488,57	0,153	1493,22	0,000 ***	3327,71	0,000 ***	5511,23	0,000 ***	-716,76	0,143	767,38	0,000 ***	1647,38	0,000 ***
R^2	0,839		0,559		0,548		0,800		0,680		0,427		0,850		0,698	
F stat^	0,10		23,86 ***		320,01 ***		28,33 ***		0,12		180,23 ***		0,09		0,18	

Coeff.: Value of the estimated coefficient; Prob.: Probability that the coefficient is not different from zero. ***: significant at 1%; ** significant at 5%; * significant at 10%.

^ Test for the joint significance of the coefficients for spscdpa and spsddpa : ***: significant at 1%; **: significant at 5%: *: significant at 10%. If significant, the coefficients jointy differ in the two groups of farms.

Source: Agrosynergie regression estimates based on sample data EU-FADN-DG AGRI L-3

Further insights, however, come from the examination of the individual coefficients of variables *spscdpa* and *spsddpa*.

The estimated coefficients for coupled payments in the SPS regions (*spscdpa*) are not significant in three types of farms, negative in one (field crop farms) and positive in the remaining three types of farms (Tab. 18). This means that, in the case of permanent crop, milk and granivore farms, the coefficients for SAPS regions are lower than in the SPS region indicating that coupled payments have a stronger effect on farm value added in the regions where the SPS is applied than in the regions where the SAPS is applied. It is nevertheless true that the model for the whole farm sample and for field crops farms suggest the contrary.

A different picture emerges from the coefficients of decoupled payments. In two cases the coefficients for *spsddpa* are not significant, in only two cases the coefficients are positive (permanent crops and other grazing livestock farms), whereas in four cases they are negative. These latter cases, which refer to farms specialised in field crops, granivores and mixed farms plus the model for the whole sample, the impact of decoupled payments on farm value added seems stronger in the SAPS regions than in the SPS regions (Tab. 18).

In spite of the results being mixed, it seems reasonable to conclude that, while the coefficients for coupled payments are in many cases lower in SAPS regions than in SPS regions, the coefficients for decoupled payments are more often higher in SAPS region than in SPS regions.

5.5.3.4 Estimation results of the basic models: year 2004

All variables expressing policy support, namely coupled direct payments (*cdpa*), decoupled direct payments (*ddpa*), the instruments of the CMO (i.e. price support) (*cmoa*) and other payments (*otha*) generally show positive estimated coefficients. Only in few cases the coefficients are not statistically significant.

Tab. 19 - 2004 restricted model: Estimation results for all farm groups

	TF 1 Field crops			TF 2 Horticulture			TF 4 Permanent crops			TF 5 Milk			TF 6 Other grazing livestock			TF 7 Granivores			TF 8 Mixed farms			TF 1, 2, 4, 5, 6, 7, 8 Whole sample		
	Coeff.	Prob.		Coeff.	Prob.		Coeff.	Prob.		Coeff.	Prob.		Coeff.	Prob.		Coeff.	Prob.		Coeff.	Prob.		Coeff.	Prob.	
cmoa	0,834	0,000	***	0,163	0,060	*	-0,094	0,489		0,993	0,000	***	0,645	0,000	***	0,189	0,000	***	0,868	0,000	***	0,552	0,000	***
cdpa	0,738	0,000	***	0,318	0,002	***	0,839	0,000	***	0,005	0,761		0,395	0,000	***	0,401	0,000	***	0,435	0,000	***	0,585	0,000	***
ddpa	2,231	0,000	***	4,618	0,000	***	-0,428	0,346		2,456	0,000	***	0,978	0,000	***	7,307	0,000	***	2,485	0,000	***	2,438	0,000	***
otha	0,259	0,000	***	0,341	0,229		0,838	0,000	***	0,378	0,000	***	0,326	0,000	***	0,077	0,550		0,324	0,000	***	-0,006	0,458	
ecsize	4,905	0,000	***	16,275	0,000	***	43,859	0,000	***	3,482	0,000	***	25,685	0,000	***	10,309	0,000	***	1,268	0,000	***	9,791	0,000	***
assa	0,000	0,212		0,033	0,000	***	0,012	0,000	***	0,001	0,009	***	-0,003	0,000	***	0,035	0,000	***	0,001	0,000	***	0,004	0,000	***
nsm	-5119,87	0,000	***	-8386,94	0,000	***	-5564,05	0,000	***	-1537,66	0,000	***	-3925,96	0,000	***	-8377,86	0,000	***	-3802,24	0,000	***	-5917,18	0,000	***
constant	6329,53	0,000	***	10768,45	0,000	***	6417,04	0,000	***	1278,35	0,000	***	5404,55	0,000	***	9054,63	0,000	***	4315,39	0,000	***	7173,46	0,000	***
R^2	0,795			0,350			0,529			0,797			0,694			0,665			0,898			0,714		

Coeff.: Value of the estimated coefficient; Prob.: Probability that the coefficient is not different from zero. ***: significant at 1%; ** significant at 5%; * significant at 10%.
For example, Prob. values lower than 0.01 suggests that the coefficient should be regarded as significantly different from zero at 1% significance.

Source: Agrosynergie regression estimates based on sample data EU-FADN-DG AGRI L-3

The coefficients for coupled direct payments (*cdpa*) are always statistically significant in all farm groups other than those specialised in milk production. Apart from this case, the estimated coefficients range from 0.318 (Horticulture) to 0.839 (Permanent crops) remaining always below the unitary value.

The estimated coefficients for decoupled direct payments (*ddpa*) are statistically different from zero in all cases, but in farms specialised in permanent crops, where the coefficient is not significantly different from zero. Other than in this case, the coefficients are largely positive and, apart from farms specialised in Other grazing livestock, higher than 2 (Tab. 19).

The fact that the coefficients are very high should be analysed considering that, in 2004, decoupled payments were only granted in the new Member States, where they had been introduced for the first time in that year. Therefore, the coefficients refer to this specific reality where, probably, the payments have had a very relevant positive impact on farm income. Note that the large positive impact of direct payments in this case can also be explained by the fact that the average income level in the period before the implementation of the 2003 reform in these farms was relatively low.

It is worth noting, that the levels of the estimated coefficients for decoupled payments in the different types of farming are relatively dissimilar: they range across a larger interval than the coefficients estimated for coupled payments.

The coefficients of CMO support other than direct payments (*cmoa*) are not significantly different from zero (even at a significance level of 5%) in the farms specialised in horticulture and in those specialised in permanent crops. Apart from these cases, the estimated coefficients range from 0.189 (Granivores) to 0.993 (Milk) (Tab. 19). The high level of this coefficient in the case of farms specialised in milk production (TF5) seems to be consistent with the still important role played by this type of policies in the milk sector.

The coefficients estimated for the other payments (*otha*, mainly rural development payments) are significantly different from zero in most cases, but in farms specialised in horticulture, in granivores and in the model applied to the whole sample. In all other cases the coefficients are positive and range between 0.259 (Field crops farms) and 0.378 (Milk farms), except in farms specialised in permanent crops where this coefficient reaches the level of 0.838.

The signs of the estimated parameters for all the remaining explanatory variables (the ones that do not refer to policy support) are generally very consistent with what was expected. The level of income per labour unit (*fnvaa*) is always positively correlated with farm economic size (*ecsize*) (Tab. 19). Also in the 2004 estimates, the amount of capital available per unit of labour (*assa*) is positively correlated with the unitary income level (*fnvaa*). Finally, the coefficients estimated for the dummy variable *nsm* are consistently negative and statistically significant (i.e. non-zero). The level of these parameters show how much the average unitary income level of farms belonging to the new Member States is lower than that of farms located in the EU15.

5.5.4 Effects of direct payments on farm income stability

This section reports the results of the analysis of the variability of farmers' incomes over the years 2001 to 2007 and the role played by direct payments in stabilising incomes. The analysis covers the macro-regions of the EU15 for which long enough income series are available. The analysis comprises two levels:

- the overall variability of farmers' income, measured through the coefficient of variation of FNVA per labour unit with direct payments, is compared across sectors, macro-regions and farm typology (e.g. income stability in small vs. medium and large size farms);

- the role played by direct payments as an income stabilising factor is analysed by comparing the coefficients of variation of the two income indicators gross and net direct payments (respectively, CVa and CVb).

The degree of variability of farmers' incomes is differentiated across sectors. Considering all EU regions, variability appears on average higher across farms specialised in Granivores and Field crops (the CVa is 31% and 19%, respectively). In all other sectors, the CVa ranges between 14-16%. The lowest income variability is found in the sector comprising all Mixed farms, possibly due to higher diversification of products and, therefore, of risk.

Differences in income variability are also found across regions within each sector. Only horticulture and other permanent crops show certain homogeneity, however in both cases we register high income variability in some regions of Italy and Spain.

A comparison of the average coefficients of variation of farm income in actual does not reveal any remarkable differences between regions applying the SPS Historic model and those applying Hybrid models.

The income stabilising effect of direct payments is immediately evident when looking at the bar charts in Fig. 29, which show higher variability of income computed by deducting direct payments (i.e. CVb>CVa) in the sectors interested by direct forms of support.

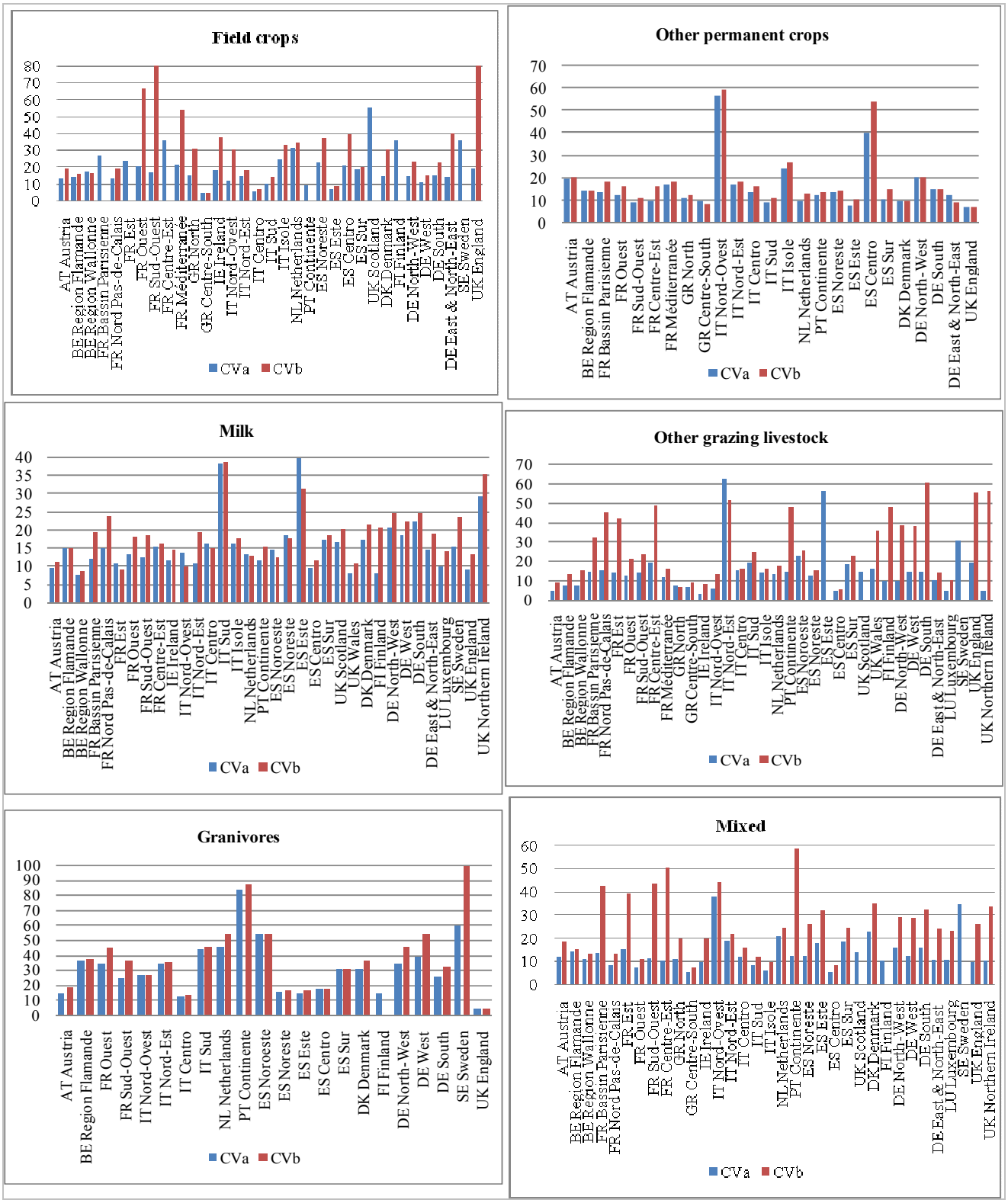
We observe a clear distinction between sectors in which direct payments are granted and those where they are relatively less important or do not occur at all: field crops, other grazing livestock and mixed farms in the first group; the milk sector, for which payments were introduced with the 2003 reform; horticulture[69], other permanent crops and granivores in the third group.

The largest effects of direct payments on income stability in the analysed period can be found in farms specialised in field crops (in particular, in England, Germany East & North-East, France Ouest and Sud-Ouest), other grazing livestock (Germany South, England, Northern Ireland, Finland and Portugal) and mixed farms (Portugal, France and Northern Ireland).

Specialised dairy farms represent a somewhat peculiar sector, as the effects of direct payments on income stability are mixed. In the regions where direct payments contribute to income stability, such an effect appears smaller compared to the previous three sectors. The largest difference between coefficients of variation of farm net value added per AWU net and gross direct payments (CVb-CVa) is around 10% in Finland, Sweden and FR Nord Pas-de-Calais. For most other regions these differences are smaller, suggesting a rather limited impact of direct payments on income stability. However, the milk sector is the only one showing decreasing income volatility in a number of regions when income is considered net of direct payments (Spain Este and Noroeste, Italy Nord-Ovest and Centro, France Est).

[69] As expected, income variability of farms specialised in horticulture does not change when considering FNVA/AWU net of direct payments. The analysis of the contribution of direct payments to income stability becomes irrelevant.

Fig. 29 - Coefficients of variation of FNVA/AWU (CVa) and $FNVA_{ndp}$/AWU (CVb) by region and sector (%)



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

Income variability of farms specialised in permanent crops does not change when considering FNVA/AWU without direct payments. Nonetheless, direct payments appear to have income stabilising effect - albeit a limited one - in Mediterranean regions where payments are granted to olive oil and table olives, citrus fruit for processing and some other fruit crops.

The income stabilising effects of direct payments are small also in the granivores sector. Here too, however, we find a diversity of situations. Member States for which the sector income appears more dependent on direct payments (probably due to the fact that these farms also produce cereals, etc. used for feed), are also characterised by relatively larger stabilising effect (France, Germany, Sweden, Denmark). However, there does not seem to exist a relationship between income dependency on direct payments and level of income stability.

The analysis shows also that, in general, farmers' income variability is higher in smaller size farms compared to larger farms in most of the types of farming considered (in particular, in farms specialised in field crops, milk, other grazing livestock and mixed farming) and across regions. Some exceptions are found, however, case by case within each sector.

Direct payments appear to have had differentiated effects on income stability across farm sizes in most sectors. In the other grazing livestock, granivores and mixed farms direct payments have a stronger income stabilising effect in smaller size farms. On the other hand, the impact of direct payments on income stability appears higher in large size farms specialised in field crops.

The main findings of the analysis are below summarised.

Crops	**Income volatility.** In most regions, income variability changes visibly depending on farm economic size: the volatility appears to be higher in small and medium size farms compared to large farms, the only exceptions being the southern regions of Spain and Italy, Belgium and the Netherlands In general, the highest income variability is found in small size farms of Finland, Sweden, Portugal and Spain Noreste, and in large size farms of Spain Centro.
	Role of direct payments on income stability. Overall, the impact of direct payments on income stability appears on average higher in large size farms. This occurs, in particular, in the large size farms of England, Sweden, Germany East & North-East and France Ouest, Sud-Ouest and Méditerranée. In the regions where income variability increases with decreasing farm size, the impact of direct payments appears to be more important in the smaller size farms.
Permanent crops	**Income volatility.** Income stability appears to change with economic size across a number of regions, however in a differentiated way with larger size farms showing higher stability in some regions, but lower other regions. The highest income volatility is found in small size farms of Italy Nord-Est, medium size farms of Spain Centro and Denmark, and large farms of Spain Sur
	Role of direct payments on income stability: fairly small, a differentiated impact on income stability across farm sizes can only be observed in few regions
Milk	**Income volatility:** higher in small compared to medium size farms and in medium compared to large size farms across Germany, Spain, the UK, Sweden, the Netherlands and Portugal. On the contrary, income volatility appears to increase with farm size in Austria and Denmark. French and Italian regions show mixed situations. In Ireland and Luxembourg income stability does not change according to farm size.
	Role of direct payments on income stability: there does not seem to be an unequivocal relationship between farm economic size and direct payments' impact on stability
Grazing livestock	**Income volatility.** A number of regions show remarkably higher income variability in small vs. medium and medium vs. large size farms (Netherlands, ES Noreste, IT Centro, England, Northern Ireland and Ireland). The opposite is true, however, in some Member States albeit with smaller income variability differences across farm sizes. The highest degree is found in medium size farms of the Netherlands and Portugal and in small farms of Northern Spain.
	Role of direct payments on income stability: the data show a rather diversified role of direct payments in income stabilisation across economic size classes and regions. In general, the effect is larger on smaller farms' income stability
Granivores	**Income volatility.** The analysis highlights a contrast between two groups of regions for which opposite levels of income variability are found in medium vs. large size farms (there are no small size farms for this sector in the FADN sample): higher income variability in medium size farms compared to large size farms in Belgium, the Netherlands, Germany (all macro regions) and England and vice versa in Italy (all regions) and France Ouest**.**

	The role played by direct payments in stabilising farmers' incomes is stronger for medium vs. large size farms, notably in the Netherlands and in the German regions, whereas differences across farm sizes appear to be negligible in the remaining regions**.**
Mixed farms	**Income volatility.** In half of the considered regions, income variability appears to decrease with increasing farm economic size (Austria, Greece, Northern regions of Italy, the Netherlands, Spain, Denmark, Sweden, Germany and UK England). The remaining regions do not show any noticeable differences in income variability across farm sizes, The largest degree of income volatility is found in small size farms of Italy (Northern regions) and Spain Sur, and in medium size farms of Sweden, the Netherlands and Denmark.
	The role of direct payments on income stability is differentiated according to farm economic size only in a small number of regions of France, Germany and Italy (Nord-Est). In these regions, the effect appears to be consistently larger in smaller size farms.

Informed views of the experts

We have asked the experts to help us interpret some of the results of the analysis concerning the effects of direct payments on income stability. In particular, what could be the reasons for high impact in large size farms (by ESU) specialised in field crops, when in the other sectors direct payments appear to have a larger effect on small size farms.

Most of the answers agree in the following explanations:

- Large size field crop farms have lower possibility for income diversification;
- In large farms the share of income in the total revenue is lower compared to smaller farms, therefore they are more sensitive to market fluctuations. As a consequence, a given amount of direct payments acquires an important stabilising effect.

5.5.5 The contribution of direct payments to the achievement of a fair standard of living for the agricultural community

The analysis aims to evaluate whether the standard of living characterising the persons engaged in agriculture can be considered as "fair", compared to the welfare conditions of the wider economy in a certain region. We recall that the analysis focuses on the level of farm business income, i.e. the income relative to the main activity of the persons engaged in agriculture[70].

It is also important to recall that the European Community has never defined the concepts of 'agricultural community' and 'fair standard of living' as they appear in Article 39 of the Treaty on the Functioning of the European Union. There are therefore still no clear concepts or criteria which can be applied to measure these variables.

In this evaluation, to assess the contribution of direct payments to the income objective, income generated by farming was compared to a benchmark value that represents a proxy of economic well-being of persons not necessarily employed in the agricultural sector. The used benchmark is the Gross Domestic Product (GDP) at current market prices, provided by Eurostat in the Regional Economic Accounts.

The GDP (or gross domestic income) is the market value of all final goods and services produced in a year and it is often positively correlated with the standard of living. Accordingly, regional GDP is a

[70] Given that harmonised statistics are not available throughout EU Member States, the analysis of farm household total income was done through a review of the available literature and published national or regional data (see §5.6).

measure of a region's overall economic output and it represents an overall income benchmark (i.e. income generated by all sectors of a regional economy) to be compared with farm incomes expressed in terms of value added generated by all production factors.

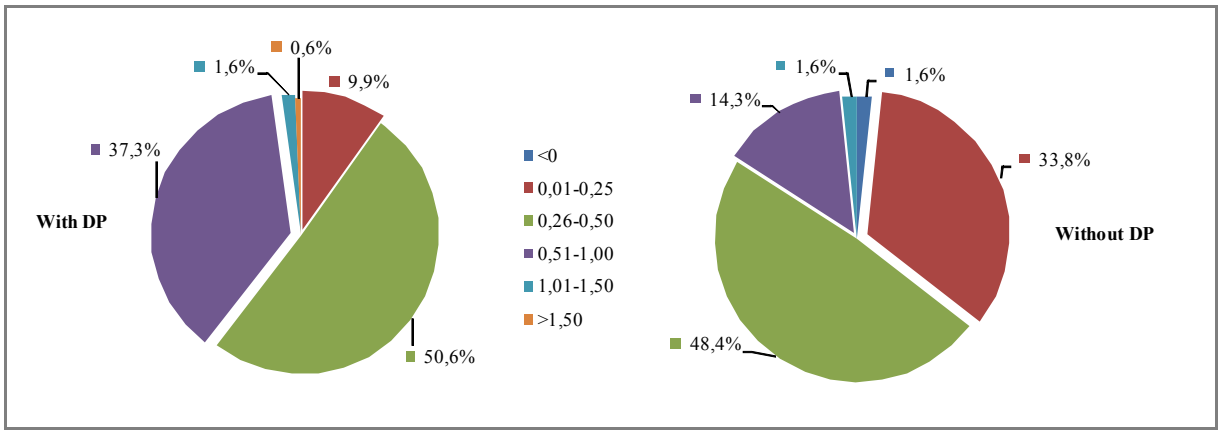
Therefore, the calculation of the ratio FNVA/AWU - GDP/employee at regional level, computed in the real and simulated situation (without direct payments) for the period 2004-2007, allowed to measure the level of economic welfare potentially determined by farming activities and the contribution of direct support on narrowing the gap between farmers' income and regional GDP per employee.

The analysis shows that in the set of EU27 Community regions and of sectors, the income of farmers is lower than the income for the set of all economic sectors (per labour unit, average 2004/2007).

In 60.5% of regions, average farm income per labour unit (2004-2007) is lower than half of the regional GDP per employee (the FNWA/AWU and GDP/employee ratio is between 0.01 and 0.50), and only in 2.2% of cases it is exceeded (ratio >1).

In the simulated situation, without direct payments, 84% of regions would have not reached the threshold of half of the regional GDP/employee.

Fig. 30 - Distribution % of EU regions by class of ratio FNVA/GDP per labour unit (avg. 2004-2007), with and without direct payments



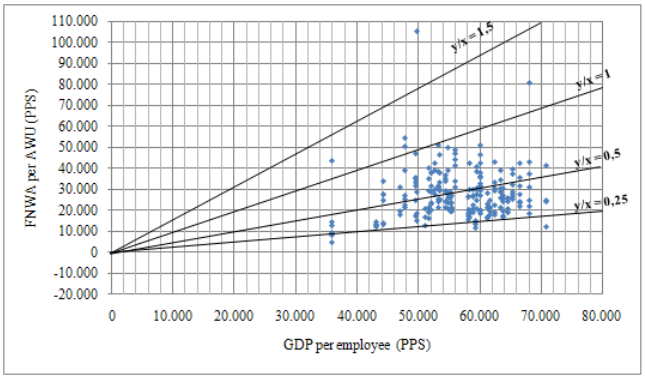
Source: Elaborations based on sample data EU-FADN-DG AGRI L-3 and Eurostat

In relation to these overall figures, for the same period 2004-2007 benchmark measurements in EU15 regions and EU12 regions do not show up substantial differences.

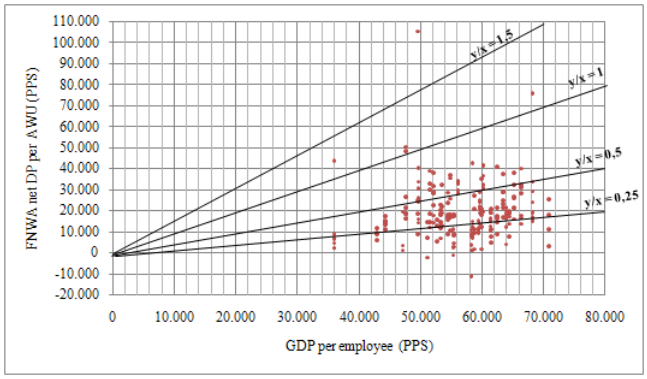
Farm income with direct payments did not reach half the regional GDP in 60% of EU15 regions and in 62% of EU12 regions. In the simulated situation (without direct payments) 82% of EU15 regions and 87% of EU12 regions would not have reached this threshold.

Fig. 31 – Distribution of Community regions by combination of FNVA/GDP values per labour unit (avg. 2004-2007), with and without direct payments

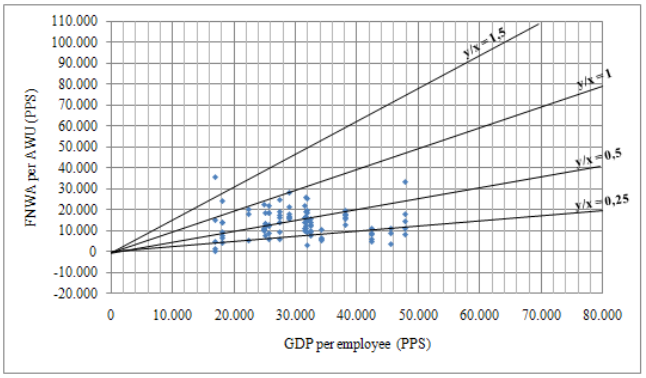
EU 15 with direct payments



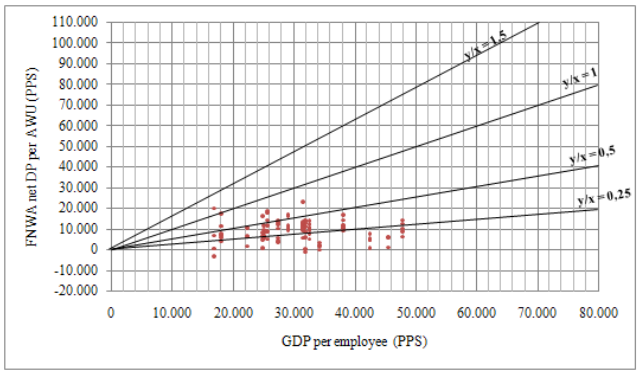
EU 15 without direct payments



EU 12 with direct payments



EU 12 without direct payments



N.B. lines define FNVA/GDP ratio levels

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3 and Eurostat

It should in any case be noted that the GDP value per employee in EU12 regions, even though calculations were done in PPS and apart from some exceptions (Malta, Slovenia, Cyprus), is much lower than in EU15 regions, standing at about half of the value. In this framework, in 20.4% of EU12 regions the agricultural income per labour unit with direct payments does not come up to one quarter of the benchmark (32.7% in the simulated situation).

Moving on to the analysis of sectors, the contribution of direct payments to bringing farmer income closer to that of all economic sectors may be summarised as follows:

- In the great majority of cases for all types of farming average regional farm income per worker does not reach the benchmark. However, the sectors having the largest number of regions with a low ratio (between 0.01 and 0.50) are two of the three sectors that are least supported, namely permanent crops and horticulture.
- Sectors having the largest number of regions with a medium/high ratio are granivores and field crops: in 59% and 57% of regions it exceeds the threshold of half (in granivores, in 13% of regions the ratio is > 1). As already mentioned, farms specialised in the granivore sector generally have a relatively higher average income per labour unit than other sectors, and at the same time receive a modest amount of direct aid. For field crops specialists this relative "wellbeing" compared with all sectors is chiefly attributable to direct support: in the simulated situation, net direct payments, regions having a ratio below half would double in number (from 22 to 44).

- In all four most supported sectors (field crops, milk, other grazing livestock and mixed farms), the absence of direct payments would cause, a further widening of the gap between farmers' income and regional GDP per employee, in a large number of regions for the perios 2004-2007. The simulations carried out without direct payments based on 2004-2007 data indicate that in the livestock sector farm income would not have reached half of the regional GDP in 100% of regions.
- In the other three sectors (horticultural, permanent crops and granivores), the simulated situation does not differ radically from the real situation because of the low level of direct payments.

Tab. 20 - Distribution % of EU regions by class of ratio FNVA/GDP per annual labour unit (avg. 2004-2007), with and without direct payments, per type of farming

Ratio FNWA/GDP (per annual work unit)

	Field crops	Horticulture	Permanent crops	Milk	Grazing livestock	Granivores	Mixed
<0	0%	0%	0%	0%	0%	0%	0%
0,01-0,25	8%	5%	18%	6%	16%	0%	14%
0,26-0,50	35%	73%	74%	42%	51%	41%	47%
0,51-1,00	55%	22%	8%	50%	33%	46%	39%
1,01-1,50	2%	0%	0%	2%	0%	8%	0%
>1,50	0%	0%	0%	0%	0%	5%	0%

Ratio FNWAnetDP/GDP (per annual work unit)

	Field crops	Horticulture	Permanent crops	Milk	Grazing livestock	Granivores	Mixed
<0	2%	0%	0%	2%	6%	0%	0%
0,01-0,25	35%	11%	21%	26%	65%	11%	53%
0,26-0,50	49%	70%	74%	52%	29%	38%	35%
0,51-1,00	14%	19%	5%	18%	0%	38%	12%
1,01-1,50	0%	0%	0%	2%	0%	11%	0%
>1,50	0%	0%	0%	0%	0%	3%	0%

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3
For each sector the ratio class in which the largest number of regions are recorded is highlighted

The comparison of the various sectors supported to varying degrees by direct aid, in the actual and simulated situations (by deducting direct payments), leads one to conclude that in the set of Community regions direct payments helped reduce the gap between average farmers' income and Gross Domestic Product (GDP) per employee for the period 2004-2007.

This contribution varies from sector to sector and from region to region, as shown in the two graphs below.

Fig. 32 - Field crops: ratio FNVA/GDP per annual labour unit across EU regions (avg. 2004-2007), with and without direct payments

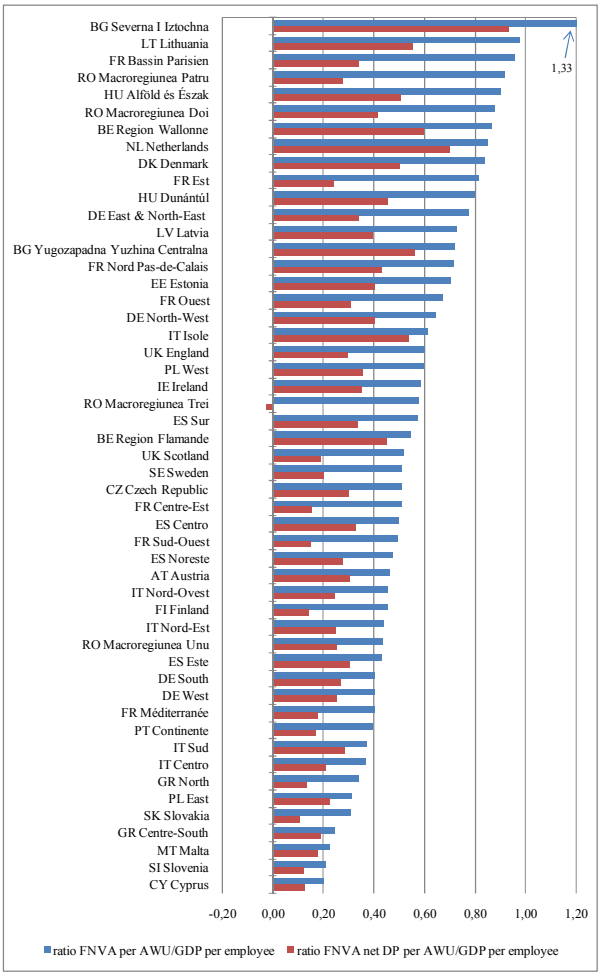
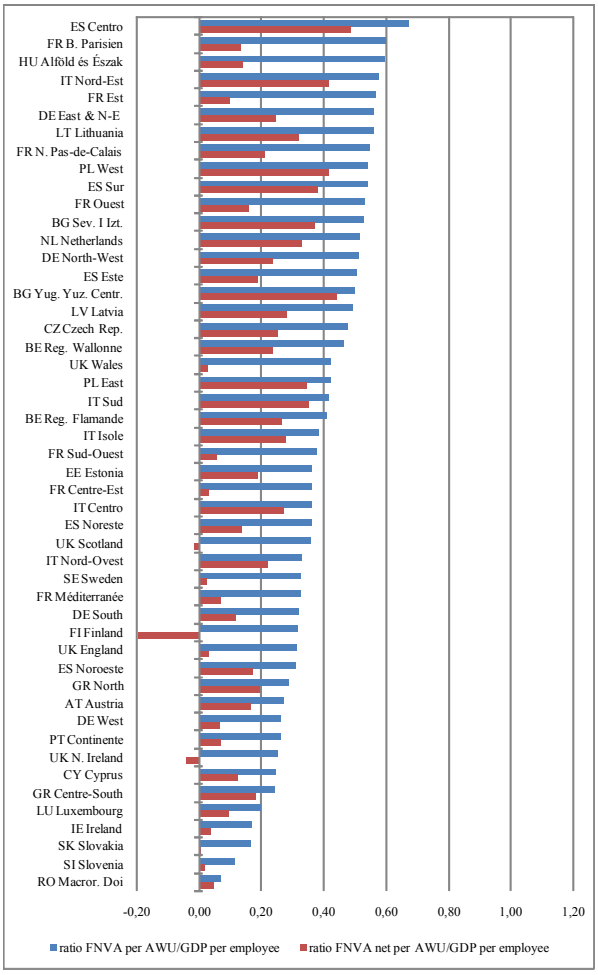


Fig. 33 – Other grazing livestock: ratio FNVA/GDP per annual labour unit across EU regions (avg. 2004-2007), with and without direct payments



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

The comparison between the ranking of regions (in terms of FNVA/GDP ratio) in the actual situation with the ranking of regions in the simulated situation makes it possible to identify those regions in which direct payments enable farmers' income to move closer to the regional GDP. These regions are: Finland (all sectors except milk), France (in particular farms specialised in field crops, milk, other grazing livestock and mixed farms), Scotland (field crops, grazing livestock and mixed farms), Sweden (field crops, grazing livestock), Wales (grazing livestock, mixed farms), Hungary (horticultural, grazing livestock), Latvia (other permanent crops, milk).

Measurement by groups of farms broken down by economic size class confirms previous analyses, showing the existence of a relationship between the value of the FNVA/GDP ratio and the economic size of farms.

The analysis highlights the fact that in some regions direct payments appear to have an over-compensatory effect on the incomes of farmers of medium and large farms, pushing the value of the ratio above one. This aspect is tied up with the efficiency of the system of direct payments, and will thus be further studied in EQ3.

Tab. 21 - Distribution % of EU regions by class of ratio FNVA/GDP per annual labour unit (avg. 2004-2007), with and without direct payments, per class of economic size

Ratio FNWA/GDP	Small size		Medium size		Large size	
	Gross DP	Net DP	Gross DP	Net DP	Gross DP	Net DP
<0	1,3%	5,7%	-	1,9%	-	0,5%
0,01-0,25	61,6%	79,2%	11,1%	43,3%	1,1%	12,4%
0,26-0,50	35,2%	14,5%	61,9%	45,6%	23,7%	51,1%
0,51-1,00	1,9%	0,6%	24,8%	9,3%	67,2%	32,3%
1,01-1,50	-	-	2,2%	-	8,1%	3,8%
> 1,50	-	-	-	-	-	-

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3 and Eurostat

For each sector the ratio class in which the largest number of regions are recorded is highlighted

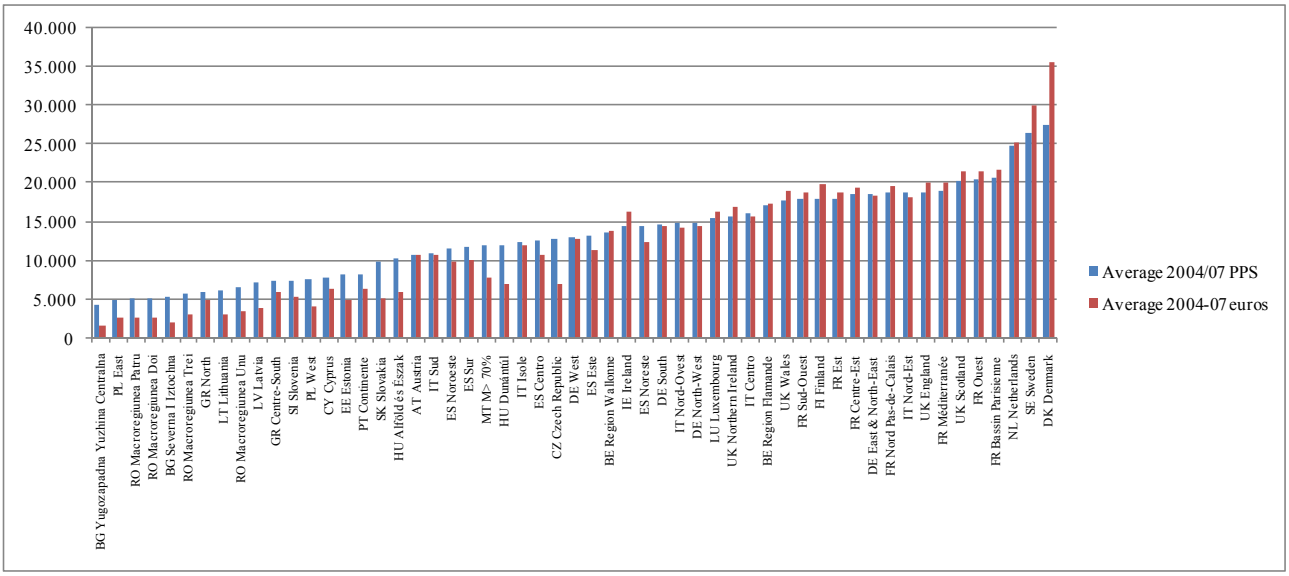
5.5.5.1 Family farm income from an opportunity-cost perspective

The analysis has the aim of assessing whether and to what extent direct payments enable family units operating on a farm to attain an income (FFI/FWU) corresponding to at least the paid agricultural employment. Should this level not be reached, it would cease to be convenient to carry on the activity, as it would be more convenient to be employed elsewhere. The benchmark used is the average wage of farm employees calculated at a regional level for all sectors (source: FADN, for calculation and limits see § 5.2).

It should be stressed that the FFI/FWU value does not correspond exactly to work remuneration, as it also includes remuneration of capital and profit. Having said this, a value for the ratio of (FFI/FWU)/regional average wage of farm employees amounting to 1 (or lower) indicates a fragile situation in which either family labour or capital is under-remunerated.

Furthermore, the calculated regional average wage of farm employees is very uneven from region to region, as it is shown in the graph below.

Fig. 34 – Annual average unit wage of farm employees in EU27 regions, in PPS and in Euros (avg 04-'07)



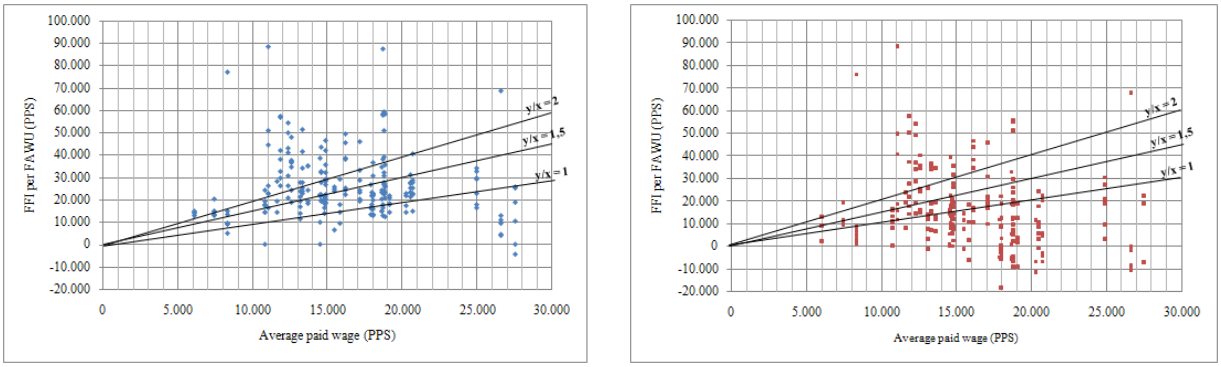
Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

These remarks should be borne in mind when interpreting results.

The analysis shows that for the set of EU15 Community regions and sectors, family farm income (inclusive of remuneration from employment, capital and profit) exceeds the average wage of farm employees in 80% of cases (average for 2004/2007). In 47% of cases, the ratio exceeds 1.5.

In the simulated situation, without direct payments, 43% of regions would reach the benchmark and just 24% of cases would have a ratio in excess of 1.5.

Fig. 35 – Distribution of EU15 regions by combination of values FFI/average wage of farm employees per annual labour unit (avg. 2004-2007), with and without direct payments



N.B. lines define levels of FNVA/GDP ratio

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

Data for EU12 regions should be treated with due caution, since FFI/FWU levels among regions/sectors are very uneven, in many cases considerably above the median. It should also be noted that the average regional wage of farm employees in EU12 regions, even though calculations were done in PPS and with the exception of the Czech Republic and Hungary, is much lower than in EU15 regions, about one third.

Having said this, in the set of EU12 regions family farm income exceeds the average wage of farm employees in 77% of cases, and in 62% of cases it is more than double. In the simulated situation, without direct payments, the picture would be less critical than for the EU15: 51% of cases would reach the benchmark, and 43% of cases would have a ratio in excess of 1.5.

In all four most supported sectors (field crops, milk, other grazing livestock and mixed farms), in a large number of regions, the simulation without direct payments indicate that the farm income per family unit (remuneration of employment, capital and profit) would fall below the remuneration of paid employment:

- in the field crops and milk sectors: with aid, 89% and 83% respectively of regions exceed the benchmark threshold, without aid the figure would drop to 31%.
- the livestock sector posted the highest percentage of EU15 regions in which the real FFI/FWU ratio does not attain the benchmark threshold (36%), but regions having a ratio below 1 would more than double in number (78%) in the absence of direct payments.
- in horticulture and permanent crops, the simulated situation does not differ significantly from the actual situation. The granivore sector appears to be in an intermediate position.

The comparison of the actual and simulated situations thus makes it possible to state that in more supported sectors, direct payments have played a crucial role in supporting the income of family units working on farms to a level that at least corresponds to that of the average wage of farm employees in the reference region.

5.5.6 Effects of the 2003 reform on the income of farmers

This part analyses the effects of the 2003 reform in relation to the role of direct payments on farmers' income. The aim of the analysis is to verify whether the changes in income observed from the pre to the post-reform conditions could be attributable to the main changes introduced through the reform on the direct payments system.

As detailed in section 2, the reform of the CAP led to changes to income support instruments. The instruments used until 2004 (per hectare payment, headage payment, price support) have gradually been dropped in favour of a single decoupled payment, not bound to production level (thus, in principle, production decisions are allowed to be adjusted depending on market demand).

The terms of implementation of the single payment are not uniform among member States, Regulation 1782/2003 gave to Member States room for manoeuvre in application of the new rules: choice of the date of the application, choice of the extent of decoupling (some sectors), choice of how to distribute the regional/national amount and how to calculate the reference amount (see Tab. 1 Overview of the implementation).

On the latter point in particular, i.e. the model adopted for calculating and applying the single payment scheme, we briefly recall that in Member States applying the historic model (Austria, Belgium, France, Greece, Ireland, Italy, Netherlands, Portugal, Spain, UK-Scotland, UK-Wales), direct aid is granted only to farmers that already received aid prior to the reform, while in States applying the hybrid model all farmers receive direct aid.

Therefore, the statistical analysis looked at two sub-periods (pre-reform 2001-2004 and post-reform 2006-2007)[71], classifying the results by the model adopted for applying the single payment scheme and the composition of aid (coupled, decoupled). The analysis was conducted in EU15 regions by comparing for each region average values of income levels, specifically:

- levels of income (FNVA/AWU) prior to and after the reform
- percentage variations between the average FNVA/AWU level in the post-reform period and in the pre-reform period
- comparison of pre- and post-reform farmers income with the relative overall regional income

For each type of farming, the analysis was carried out at an overall level (all farms) and by classes of economic size. In this latter case the analysis covers macro-regions for which it was possible to calculate the average for both sub-periods. This constraint further reduced the number of regions that could be used for the analysis. The results obtained should thus be viewed with due caution.

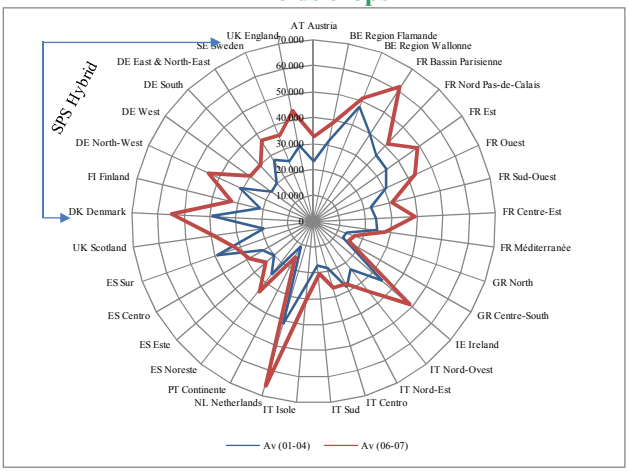
The results of the overall analysis show in the period post-reform a rise in the average level of income in all type of farming considered, even though this increase is not uniform.

On average, it was about 34% for field crops specialists, 10.6% for horticulture sector, 15.5% for permanent crops, 31.6% for milk, 13.8% for other grazing livestock, 12.6% for granivores and 24.1% for mixed farms. In each type of farming this increase referred to most macro-regions. It is also noted that in the various sectors there are some macro-regions that posted an increase greater than 50%.

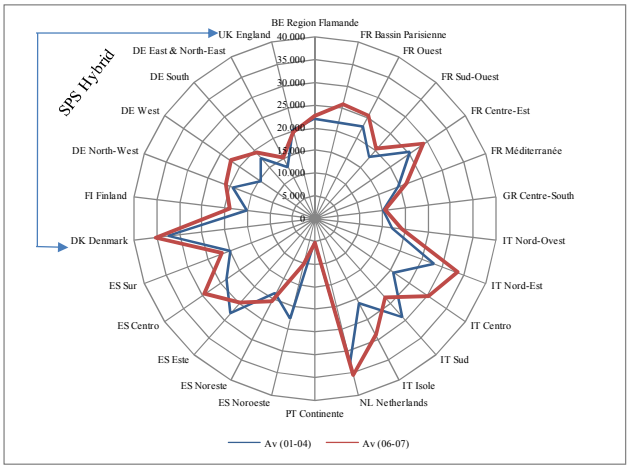
[71] The exclusion of 2005 is due to the fact that it represents a transition year, in which some of the Member States introduced the SPS (i.e. AT, BE, DE, DK, IE, IT, LU, PT, SE, UK) , but others did not until 2006 (i.e. ES, FI, FR, GR, NL).

Fig. 36 - FNVA/AWU average 2001-04 and average 2006-07 in the EU15 regions

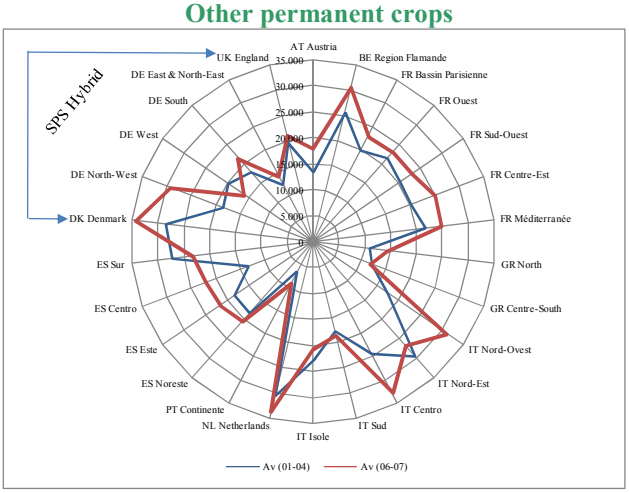
Fields crops



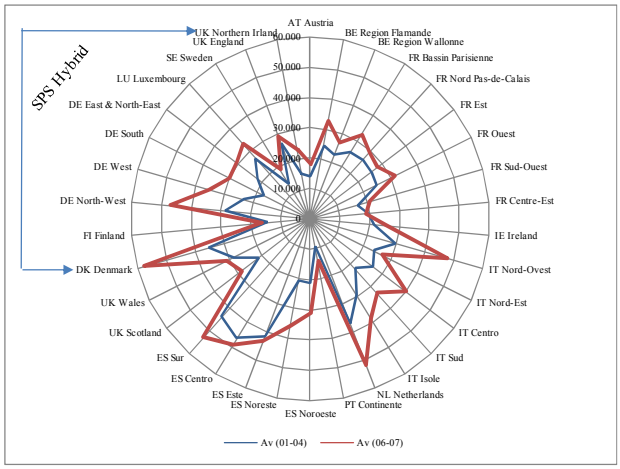
Horticultural



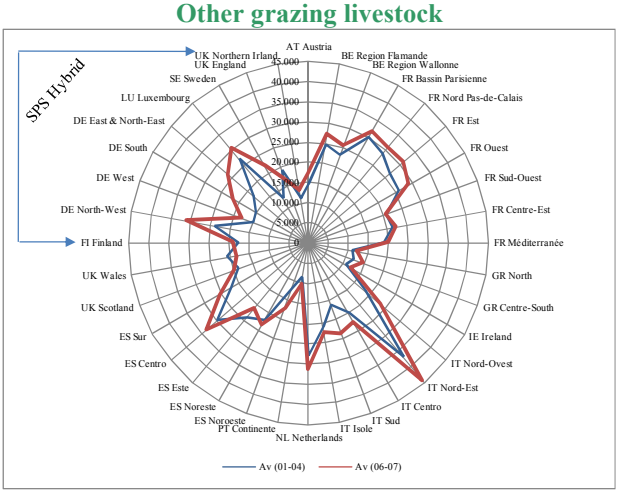
Other permanent crops



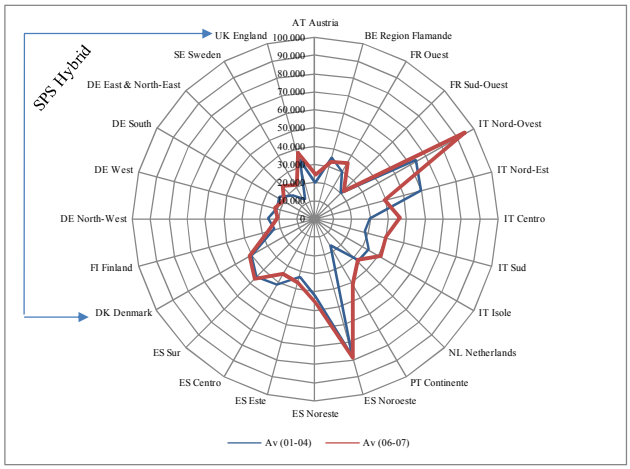
Milk

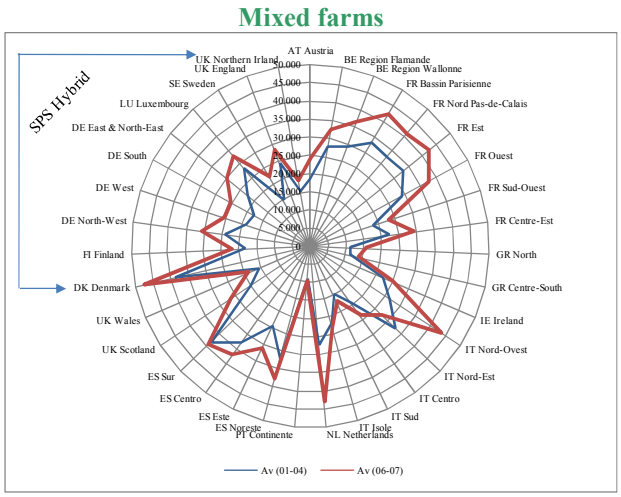


Other grazing livestock



Granivores





Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

In addition to a possible effect of the change of the support system from coupled to decoupled aid, these rises (albeit with the highlighted differences) appear to be the combined effect of several other factors. In particular:

- the improvement of market conditions in some sectors (for example in the cereals and protein plants sector, because of the large rise in international prices in 2007, which has also had an impact on the market conditions of other sectors);
- the evolution (as already mentioned at the beginning of the analysis) of the structural context of samples used, in particular the general fall in AWU/ha which (presumably) has brought about a rise in (average) labour productivity.
- other short-term factors (positive or negative) that may have affected some macro-regions/sectors (favourable/unfavourable climate conditions, etc.).

The simulation analysis did not make it possible to separate the effect of the reform from other factors that may have influenced the growth phenomenon.

Informed views of the experts

Concerning the fact that FNVA/AWU has generally increased after the reform in comparison with the period before, we have suggested to the experts some factors that could have influenced this growth. We have asked the experts to rank the factors in order of importance. The results are presented in the following table.

Importance	
1°	Improvement of market conditions in some sectors (for example in the cereals and protein plants sector, because of the large rise in international prices in 2007, which has also had an impact on the market conditions of other sectors).
2°	A more market oriented farm activity as consequence of the introduction of decoupling following the CAP 2003 Reform.
3°	The general fall, in the period 2004-2007, in AWU/ha which (presumably) has brought about a rise in (average) labour productivity.
4°	The overall stability of wages, in the period 2004-2007, relative to the average growth of the total output/AWU

Among other factors that could have influenced the increase, experts mentioned also that there was a will of a number of farmers to diversify their gainful activities (e.g. rural tourism, direct sale, renewable energy, etc.).

It is noted that only in a small number of macro-regions the FNVA/AWU has fallen compared with the pre-reform period. This has happened most frequently in three sectors: horticultural (15% of macro regions), other permanent crops (19%) and granivores (25%). It is recalled that, in farms belonging to these sectors, the level of direct support is relatively low, consequently income levels depend more on market conditions, products and phenomena[72].

In keeping with these growth trends, in the post-reform period almost all EU15 macro-regions saw a fall in their degree of dependence on direct payment, with two exceptions:

- milk: all macro-regions raised their level of dependence on direct payments (an effect of the introduction of direct payments), in particular in France, Portugal, North-East Spain, United Kingdom, Netherlands, Ireland.
- other grazing livestock: in more than half the regions, after the reform direct payments have played a bigger role on average income, chiefly in: United Kingdom (except for North Ireland), Finland, France, Netherlands.

Further analysis comparing regions shows that there is no connection between the changing level of income and the implementation models chosen by member States (historic SPS, hybrid SPS). Similarly, there appears to be no connection between the methods of payment of direct aid (decoupled/coupled) and the changing share of direct payments on FNVA/AWU values. In some cases, the study of the situations prior to and after the CAP reform gives a non-uniform picture of regions, with different trends that in any case are not attributable to the reform and/or the SPS model adopted and/or the level of decoupling.

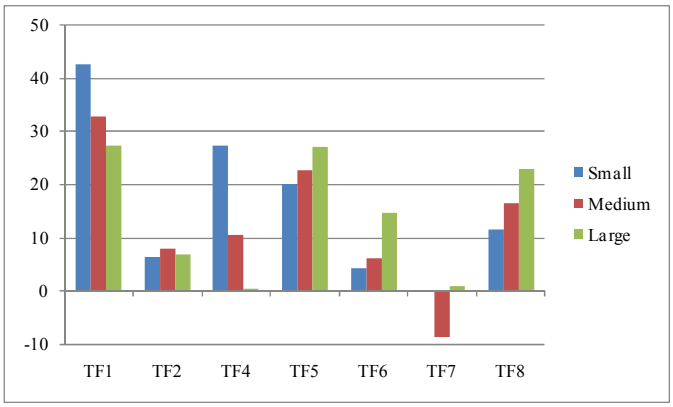
These conclusions are in keeping with the findings of the analysis on the variability of farmers' income: the comparison of the average coefficients of variation of farm income does not reveal any remarkable differences between regions applying the SPS historic model and those applying hybrid models.

The results of the analysis by class of economic size confirm that between the pre-reform period and the period following the reform the income levels grew in almost all ESU classes and type of farming.

Exceptions are Medium farms specialised in granivores sector, whose average fell by 8% after the reform (but as explained above, this situation is not attributable to the reform); furthermore, in the same sector, the growth for large farms was negligible.

There does not appear to be a rule correlating the average growth of the income value after the reform with ESU classes. Growth indeed is directly proportional to dimension in the cases of TF5, TF6 and TF8, while growth is inversely proportional to size in TF1 and TF4.

Fig. 37 - % variation (Avg. (06-07)/Avg. (01-04)) FNVA/AWU average by ESU class, by type of farming



Source : Elaborations based on sample data EU-FADN-DG AGRI L-3

[72] Also to be noted, in general, that in TF7 farms the large rise in production costs in 2007 (price of buying cereals) was not proportionally transferred to the sale price of reared animals. This would justify the higher incidence of macro-regions (compared with other TF) that have suffered a decline in farm income.

Although in general most macro-regions post positive changes to farm income per labour unir, quite a few undergo a decline, which is sometimes quite large compared with the pre-reform period. Most negative variations in percentage terms are observed in horticultural and permanent crops, namely in the medium class, in all ESU classes of granivores, in other grazing livestock, namely in the small class (38% of regions analysed) and in the medium class (34%), in mixed farms, namely in the small class (27% of regions analysed). It should however be noted that, in most cases, the fall in FNVA/AWU values more frequently affects only some regions, all located in southern Member States in the EU15, in particular Italy and Spain. So for these regions the drop in income after the reform appears to be almost systematic, while in other regions it appears to be related more to particular situations tied up with the specific sector/size.

On the other hand, the analysis highlights the fact that in some types of farming, in some ESU classes of regions analysed, there have been income increases greater than 50%:

- In field crops, in 4 regions (of the 16 analysed) in the small class (Sweden, Denmark, Italy Nord Est and Portugal); 33% of regions in the medium class, all located in Member States in the centre-north of the EU15); 6 regions (of the 27 analysed) in the large class (FR Bassin parisien, FR Est, Netherlands, Scotland, DE North-West and ES Centro).
- In milk sector, 2 regions (of the 8 analysed) in the small class (Sweden and IT Sud); 21% of regions in the Medium class (Sweden, ES Noreste, Portugal and all four German regions); 4 regions (of the 25 analysed) in the large class (DE South, DE North-West, IT Centro and Denmark).
- In other grazing livestocks, 4 regions (of the 16 analysed) in the small class (UK North Ireland, Sweden, ES Noroeste, IT Nord-Est)

In the end, in most regions and sectors, in the period after the reform there was not only a general rise in the level of the farm income per labour unit (FNWA/AWU in PPS, average for 2006/2007 vis-à-vis average for 2001-2004), but also an improvement in the ratio between farm income per labour unit and regional GDP/employee (average for 2006/2007 compared with the average for 2001-2004). This was so even though in all regions there was a positive percentage variation of GDP per employee.

Fig. 38 – Distribution of EU15 regions by class of FNWA/GDP ratio per labour unit, for the pre-reform and post-reform periods

	Pre-reform	Post-reform
<0	-	-
0,01-0,25	5,2%	4,1%
0,26-0,50	73,1%	66,9%
0,51-1,00	20,7%	26,9%
1,01-1,50	0,7%	1,7%
> 1,50	0,3%	0,3%

Source : Elaborations based on sample data EU-FADN-DG AGRI L-3 and Eurostat

The analysis by sector revealed that:

- for farms specialised in field crops, the ratio improved in 31 out of 33 regions
- for mixed farms, the ratio improved in 21 out of 24 regions
- for farms specialised in milk, the ratio improved in 19 out of 23 regions
- for farms specialised in other permanent crops, the ratio improved in 15 out of 29 regions
- for farms specialised in horticulture, the ratio improved in 13 out of 25 regions
- the ratio worsened only for the granivore sector, in 13 out of 20 regions

The comparison of regions according to the SPS model adopted (historic and hybrid) does not give clear indications, especially in the three sectors that historically did not receive direct support for specific production.

5.6 Level, composition and variability of farm household income across the EU and role of agricultural policies in its generation

Direct payments provided by the CAP have an effect not only on farm income (i.e. farm business income), but also on farm household total income. Because the capability to consume goods and services of farm families depends on the latter, it is important to analyse the evolution of farm household income.

Unfortunately, data on total income of farm households are not collected in a systematic and harmonised way throughout the EU. To overcome this lack of homogeneous data, an analysis of the existing literature has been carried out. This analytical tool is specifically aimed at analysing the available information on the following topics:

- Level of farm household income. This analysis is aimed at exploring: difference between farm and non-farm households income levels; its evolution over time; the income distribution and incidence of low income cases among farm households; the heterogeneity of farm household income levels among farm types.
- Composition of farm household income. This analysis is especially focused on the contribution of farm business income and off-farm income on the total income of farm households, including as well its evolution over time.
- Role of agricultural policies in the generation of farm household income.
- Variability over time of both farm household income and farm income.

The considered studies and statistics generally cover only few of these topics. Therefore, the findings (especially for the last two points) are often sparse and limited to some Member States.

The analysis looks at the studies and statistics available for single Member States or, in some case, for groups of Member States. The considered studies and statistics, the limitations and the findings arising from the literature review have been presented in detail in chapter 4.1.4.

It is important to recall that the results of the literature review on total farm household incomes suffer from at least three main limitations: 1) heterogeneity of data available across Member States, 2) heterogeneity of methodological approaches used in the considered analyses, 3) the large heterogeneity of situations that can be found also within each Member State according to the types of farms being examined.

However, studies specifically investigating the role of direct payments in stabilising and enhancing the farm household incomes are not available and the information available on this issue is very limited. Nevertheless, the literature covers some important topics related to farm household incomes, thus providing a background of knowledge that is useful for interpreting the findings of the quantitative analysis of farm income data (i.e. FADN).

5.6.1 Level of farm household income

5.6.1.1 Differences between farm and non-farm household income levels

The average farm household income level often differs from that of non-farm households. However, while in some cases the latter is higher than the former, in some other cases the opposite is true.

According to the OECD (2003) study, the average farm household income (FHI) in the Netherlands, Denmark, France, Finland and Belgium was higher than the average income of all households in the mid-1990s. The opposite was however true for farm households in Germany, Ireland, Italy, Spain and Greece, whereas the income level of farm households was similar to the income of all households in Poland and Sweden (see Tab. 22). The study by Henry de Frahan *et al.* (2008) shows a slightly different picture: in this case, the ratio between the income of farm households and that of all households is higher than one in the United Kingdom, Germany and Luxemburg, around one in Ireland, Italy and Finland, but lower than one in France.

More up-to-date studies show that average farm household income is lower than that of all households in Greece, Ireland, Romania and in some regions of Slovenia, whereas the opposite is true in France, Italy and Poland.

Tab. 22 - Relative level of Farm Household Income (FHI/AllHI levels): approximate figures for the latest available data (%).

Source:	OECD, 2003	Henry de Frahen et al. (2008)^	National Studies^^	National Statistics^^
Belgium	130			
Denmark	175			n.a.
Germany	95	145		
Greece	80		83	
Spain	90			
France	155	90	105	
Ireland	95	115	95	n.a.
Italy	90	110	125	
Luxembourg		130		
The Netherlands	>200		n.a.	
Austria			n.a.	n.a.
Poland	100			140
Romania				80
Finland	135	105	n.a.	
Sweden	98			
Slovenia			60	
United Kinghdom	n.a.	145		

n.a.: not available; ^ data refers to 1994

^^ National studies and statistics sources: Greece: Karanikolas and Zografakis, 2009; France: Delame and Thomas, 2006; Guillemin and Legris, 2006; Ireland: Central Statistics Office, 2007; Italy: Salvioni and Colazilli, 2006; Poland: Central Statistical Office, 2008; Romania: Romanian Institute of Statistics, 2008; Slovenia: Möllers, Fritzsch, Buchenrieder, 2008

However, it is important to recall that the relative position of FHI level sometimes changes according to the considered data set and methodology used and the considered period. Therefore, different studies may show different results. Nevertheless, the review shows that in a number of Member States, an income gap between farm households and other types of households still exists.

5.6.1.2 Evolution over time of the relative level of farm household income

Few studies provide data for several years and this allows to establish if a trend can be envisaged. The limited available data suggest that a positive trend of the level of FHI relative to non-farm household income has been experienced in most of the cases (see Tab. 23).

According to Henry de Frahan *et al.* (2008), FHI has grown from the mid of 1980s and the mid of 1990s in Germany, Ireland, United Kingdom and, to a lesser extent, in France while in Luxembourg this has declined. A clear trend cannot be seen for the other considered EU Member States.

Furthermore, up-to-date evidence of a positive trend over time exists for Greece, Italy, Poland and Romania, except for the last available data (2006 and 2007) (see § 5.3.2.1.2).

Tab. 23 - Trend of the relative level of Farm Household Income level (qualitative indicator)

	Henry de Frahan et al. (2008)^	National Studies ^^	National Statistics ^^
Germany	+		
Greece		+	
France	+/=	-	
Ireland	+	n.a.	n.a.
Italy	=	+	
Luxembourg	-		
Poland			+
Romania			+/-
Finland	+/=	n.a.	
United Kingdom	+		

"+": positive trend; "-": negative trend; "=": no clear trend; "n.a." not available

^: It refers to the period 1984 – 1994; ^^: It refers to different years (last available data of each study/statistics; national studies and statistics sources: Greece: Karanikolas and Zografakis, 2009; France: Delame and Thomas, 2006; Guillemin and Legris, 2006; Italy: Salvioni and Colazilli, 2006; Poland: Central Statistical Office, 2008; Romania: Romanian Institute of Statistics, 2008;

These sparse results show that, in most of the considered countries where data is available, on average, the differences between farm and non-farm household incomes are narrower than in the past. Indeed, farm household incomes across EU Member States have shown an improvement that has been often explained by a process of diversification of income sources and, in particular, by an increase of the role of income generated by off-farm activities (OECD, 2009).

5.6.1.3 Income distribution and incidence of low income in farm households

Apart from the average level of household income, the distribution of income within different populations should be considered. Indeed, studies by the OECD (2003) and Henry de Frahan *et al.* (2008) show that the incidence of low income households is often higher in the farm population than in the non-farm population. According to the OECD (2003), this is the case in Denmark, France, Hungary, Italy, the Netherlands, Poland, Spain and the United Kingdom.

Both studies also report that the intensity of poverty[73] is higher in farm households, if compared with other households. According to the OECD (2003), the difference in the levels of income between low-income households and the average values of all households is higher in farm households than in the aggregate of all households, at least in Denmark, Finland, France, Hungary, Ireland, Italy and Poland.

In France, Guillemin and Legris (2009) report that in 2003 the share of households below the poverty line is 15.9% in farm households, while just 6.3% in all households and that this share has increased from 1997, when it was 13% in farm households. Furthermore, the share of farm households below the poverty line is way higher than average in farm households with only farm activities than on pluri-active farm households (26% *vs.* 9.3%) (Guillemin and Legris, 2009). This shows that the income condition of part of farm households has not improved and is still very negative.

Evidence from the studies conducted in France and Greece allows to conclude that off-farm income reduces the unequal distribution of income in farm households because high levels of farm business income often come together with low levels of off-farm income and *vice versa* (Butault, Delame,

[73] This term generally refers to the difference in the levels of income between low-income households and the average values of all households.

Lerouvillois, 2005; Karanikolas and Zografakis, 2009). These results are corroborated with the finding that farm households in which the relative importance of farm business income is relatively high are also found more frequently in low-income categories (OECD, 2003).

This allows to conclude that off-farm income can play a very important and positive role in enhancing the income of the agricultural community.

5.6.1.4 Heterogeneity of farm household income levels among households with different types of farm organisation

FHI levels vary inside the population of farm households according to how they are organised. In particular, part-time farming is often reported to have relatively higher FHI than full-time farming. This is clearly the case of Denmark where part-time farmers have an average FHI level of 112% that of all farm households (Statistics Denmark – LHUS, 2010), and Finland, where part-time farmers have an average FHI level of around 120% that of other groups of farm households (Puurunen, 2005). In Ireland, the total income of farm households with off-farm jobs, is around twice as big as the one reported for the households that do not have off-farm jobs, because of the relevant contribution of off-farm income (O Brien and Hennessy, Undated). However, this is not the case in Austria where the level of income of farm households mainly relying on farm incomes is around 112% that of farm households mainly relying on off-farm incomes (BMLFUW, 2010).

These results suggest that diversification strategies based on looking for off-farm income opportunities can be very effective in terms of enhancing the income of the agricultural community. Indeed, the increase in the share of farms managed on a part-time basis has probably been one of the main drivers of the positive trend observed in the relative income condition of farm households.

5.6.2 Composition of farm household income

The literature reports evidence of a large degree of heterogeneity of situations in terms of composition of farm household incomes. Part of this heterogeneity can be explained by considering that different definitions of farm households are used in EU Member States. In particular, it is very important to stress that some Member States classify “farm households” by using a “narrow” definition, while others do it by using a “broad” definition . The first consider that an household can be classified as “farm household” if the share of income coming from farming exceeds a given threshold level that is, generally, fixed at 50% of the FHI. The “broad” definition, generally, allows to classify an household as “farm household” whenever some of the FHI is coming from farm activities.

For this reason, when analysing the role of farm income in generationg the overall farm household income, it is necessary to consider the national figures distinguishing between the countries using these two very different definitions of farm households.

In countries where the “broad” definition of farm households is applied, the relative contribution of farm income to the household income ranges from 27% in Finland to 42% in Denmark. Where the “narrow” definition of farm households is applied, the relative contribution of farm income to the household income is clearly higher and ranges from 54% in Austria to 80% in Germany.

Tab. 24 - Relative share of farm business income in farm household income. Latest available data (%). Approximate figures

Source:	OECD (2003)		OECD (2009)			National Studies or Statistics	
	Level	Def. FHI^	Level	Def. FHI^	Trend^^	Level	Trend^^
Belgium	70	N					
Denmark	45	B	42	B	-	35	n.a.
Germany	80	N	80	N	-		
Greece	60	N				50	n.a.
France	70	N	53	N	-	53	n.a.
Ireland	45	B	32	B	-	33-65^^^	n.a.
Italy	60	N				32	n.a.
The Netherlands	65	N	74	N	+/=	72	-
Austria			54	N	-	58	+
Poland	70	N	67	N	-		
Finland	30	B	27	B	-/=	n.a.	n.a.
Sweden	25	B					
Slovenia						30	n.a.
United Kinghdom	50	B	40	B	-		

^: "B" Broad definition and "N" Narrow definition of farm household
^^: "+" positive trend; "-" negative trend; "=" no clear trend; "n.a." not available
^^^: Figures differ according to the source.

Large differences in the contribution of farm income to the total income of farm households exist also in full-time and part-time farms. As expected, the farm business income (FBI) represents a way higher share of FHI in full-time farms than in part-time farms as it is shown by the data of Austria, Greece, Denmark and France.

- In Austria the relative contribution of FBI is 80.2% and 13.9% in farm households mainly based on farm activities and mainly based on off-farm activities, respectively (BMLFUW, 2010).
- In Greece, the relative contribution of FBI is 55% in the group of "Farm households" (i.e. where the household head reports an occupation in agriculture or fishing), albeit 23% in "Pluri-active farm households" (Karanikolas and Zografakis, 2009).
- In Denmark, whilst in the average of all farm households around 34.7% of household income is generated by the farm business, in the sub-sample of part-time farms this ratio is only 7.7% (Statistics Denmark – LHUS, 2010).
- In France, in the sub-sample of farm households with off-farm activities, the contribution of farm income is 38%, whereas it is around 62% in the average of all farm households (Delame and Thomas, 2006).

Further differences can be found if the sample refers to all farm households or to "professional farmers" (i.e. when farms are larger than a given threshold level). For example, in England, where the study refers to this group of farmers, the contribution of FBI to the generation of FHI is higher than 70% (DEFRA, 2010).

Differences in the contribution of farm business income to the total income of farm households exist also according to the production specialisation of farms. In Denmark the relevance of FBI is generally higher in livestock farms than in crop farms, reaching 48.7% and 58.4% in Cattle farms and Pig farms, respectively (Statistics Denmark – LHUS, 2010). However, this is not the case of specialised livestock farms in Austria where FBI accounts for a share of FHI very similar to the average of all farms (LGB, 2010).

Few studies report data on the income composition for more years. However, a decline of the share of household income deriving from agriculture is reported for Denmark, Germany, France, Ireland, Austria, Poland and the United Kingdom, whereas such a trend cannot be detected in the case of the Netherlands and Finland (OECD, 2003 – see table 258). Other data report a small decline of the relative importance of FBI in the Netherlands, but a limited increase in Austria (Berkhout and van Bruchem, 2007 and 2010; LBG, 2010).

These findings suggest that the relative importance of the farm business income in generating farm household income is declining over time and vary widely among farm households. For these reasons, the effect of policy support provided by agricultural policy on household income can change over time and can differ very much among farm households. For example, it is likely that this effect is more limited in part-time than in full-time farm households given that, in the former group, farm income represents a smaller share of household total income than in the latter group. However, it is important to remark that, in some specific groups of farm households, even if the role of farm business is limited, policy support (including direct payments) can play a very important role in the generation of farm business income and, in this way, of farm household income.

Informed views of the experts

The opinion of the experts is almost unanimous: the farm household total income has increased over the time and the income gap between farm households and all households became narrow.

This is generally attributed to the growth of the role of income generated by off-farm activities. According to the most of the experts, the phenomenon is related to the agricultural activity ("farmers try to diversify their income in order to be prepared for a time in which there will be no more direct payments" ; higher price variability) but also to broader economic and social reasons (the opportunities and sources of employment in many rural areas have increased in the last decade; the new generation of farmers is in general much better educated than their parents).

Nevertheless, experts underline that not only the role of income generated by off-farm activities increased but also the farm business income. This growth is related to the CAP support, to the improvement of market conditions (higher prices) and to the structural change which leads to bigger farm units. With reference to the CAP support, it has been recalled that the diversification of agriculture income sources (such as agri-tourism) has been developed because of the support provided by the 2nd Pillar, to create a reliable source of income in the long run.

In one case, the expert clearly pointed out that in his country the improvement of the farm household income is explained by the improvement of the farm business income, because of the higher specialisation on farm.

5.6.3 Role of agricultural policies in the generation of farm household income

Unfortunately, only few studies report data on the relative importance on the role of agricultural policies on farm household income.

- The last part of the study by Henry de Frahan et al. (2008) analyses the factors that influence the ratio of average farm household income to average non-farm household income in the considered OECD countries (including 8 EU Member States). One of the analysed factors is support provided by farm direct payments. This analysis shows that the relative level of farm household income is positively but weakly correlated to the amount of direct payments. Therefore, the authors conclude that: "farm household incomes are weakly influenced by farm payments" (Henry de Frahan et al, 2008: page 20).

- In Austria, farm public funds74 are very important, representing around 64% of the income coming from agricultural and forestry in the latest available years. This seems very consistent with the fact that this is a country with many mountain regions where the market component of FBI is limited and, without policy support, the FBI could be very low. However, the role of such public funds varies according to the production specialisation of the farms. It is relatively more important in farms with some of the land used for forestry activities, cash crop farms and forage-growing farms, whereas it is relatively less important in intensive livestock farms and permanent crop farms.
- In Greece, agricultural subsidies and compensations represent 13.2% of the FHI in the group of "Farm households" while, because of the less important role played by FBI, they account for around 5,1% in "Pluri-active farm households" and 3.9% in "Marginal farm households" (Karanikolas and Zografakis, 2009). However, the importance of agricultural subsidies and compensations can also be appreciated considering what share of farm business income they account for. This type of public funds represent 24% and 22% of FBI in "Farm households" and in "Pluri-active farm households", while 58.2% of FBI in "Marginal farm households" (Karanikolas and Zografakis, 2009). Thus, this shows that the household income level of this latter group of farm households is very much influenced by agricultural subsidies and compensations even if here the FBI represents just a limited share of the total household income.
- In the Netherlands, subsidies generate around 4.4% of gross farm returns (Berkhout and van Bruchem, 2007 and 2010). The available data show that this ratio did not changed over the 2004-2009 period. This suggests that, in this case, the 2003 reform of the CAP has not changed, on average, the overall relative level of support. The study also provides interesting results on the distribution of this subsidies among farms in the Netherlands. In 2006, around ¼ of the holdings did not receive any payments, whereas only 15% of the holdings received an amount of payments larger than 25000 Euro per holding per year. This latter group of holdings globally receives more than 50% of the overall amount of payments, showing a very high concentration of payments recipients. Finally, these payments represent more than ½ of the income of this group of holdings (Berkhout and van Bruchem, 2007).
- The analysis developed for the German federal state of Hesse has shown that, in the considered period (2000-06), the average support per farm is not negligible (around 16000 Euro per farm), and that around 40% of it is due to CAP direct payments, but that the overall CAP support has decreased over the considered period (Elsholz and Harsche, 2008). This is explained by the authors as the result of agricultural price reductions caused in that period by CAP reforms, while they do not mention whether this can be caused by the 2003 reform of the CAP direct payment scheme.

The sparse and limited available data do not permit to draw solid conclusions on the role of agricultural policies on farm household income. The literature points out that the support can be very important especially on some specific types of farm households and that this is provided by means of different policy instruments, including direct payments. In the Netherlands, these have been found to be very much concentrated in a relatively limited number of recipients where they account for a large share of farm income. Finally, direct payments seems to influence positively but weakly the relative level of farm household incomes in a group of OECD countries.

[74] This includes direct payments granted by means of CMO measures (including SPS payments from 2005), Environmental payments, compensatory allowances and other public funds also granted by the National Government.

5.6.4 Variability over time of both farm household total income and farm business income

Few studies have analysed the variability of Farm Household total Income (FHI) and Farm Business Income (FBI) over time. However, here the results are very homogeneous and consistent among the different countries.

- Evidence that the variability of FBI is higher than that of the total income of farm household is reported by the OECD (2003): the coefficients of variation75 calculated in the 1990s in Denmark and the United Kingdom for farm income are around two times that of farm household income (OECD, 2003).
- The study by DEFRA (2010) in England underlines the high variability of farm household income from year to year and states that this variability is due to the high volatility of farm business that, in the considered type of farm households (i.e. "professional"), generates a large portion of the overall farm household income.
- A study developed in France (Butault, Delame, Lerouvillois, 2005) shows that farm business income has a larger variability over time than the income from off-farm activities.
- Salvioni (2005) provides some figures showing that, in a selected Italian farm sample, the variability of the income of farm households is higher than that of all households.
- Finally, Elsholz and Harsche (2008) also have shown that, in a group of farms located in the German federal state of Hesse, the overall CAP support generates stabilisation of farm revenues but, according to the study: "while the HEKUL, a second-pillar program [an agro-environmental measure], and the MPS [Market Price Support] stabilise farmers revenues, the Direct Payments do not" (Elsholz and Harsche, 2008: page 9)76.

These sparse results suggest that the variability of farm income, that is due to the characteristics of the agricultural production, is partially compensated by a lower variability of off-farm incomes. This suggests that off-farm incomes can play an important and positive role in the stabilisation of farm household income. Therefore, the trend envisaged towards a growing relative importance of off-farm income in the generation of farm household income can also be seen as a tool for reducing and better managing income variability over time.

This also suggests that in the households where off-farm incomes generate a large share of the overall household income (e.g. part-time farms) there is a more limited scope for policies stabilising farm income than in those farm households (e.g. full-time and/or "professional" farms) where FBI still represents a large share of the whole household income.

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75 Standard deviation divided by the average for the period.

76 Text in squared brakets is not in the origianl paper but has been added to explain the meaning of the used acronyms.

5.7 Evaluation judgement

The evaluation question required to assess to what extent direct payments have contributed to achieving a fair standard of living for the agricultural community, by way of enhancing the income of farmers and decreasing income variability over time.

The definition of farmers' incomes is not straightforward, as agricultural households often have a total income that is formed from agricultural and non-agricultural income. Unfortunately there are no harmonised statistics providing information about off-farm income at EU level and for individual Member States. Therefore, we focused our attention on farm business income, for which available statistics (sources: EUROSTAT and FADN) were able to satisfy the analytical requirements. Nevertheless, we considered important to analyse, in a qualitative way, the literature available on farm household total income.

A. FARM BUSINESS INCOME

A1. Analysis of income effects of direct payments at macro-economic level

Macro-economic analysis has been used mainly for measuring the net effects of direct payments in terms of level and stability of agricultural income per labour unit. The analysis has been carried out at the NUTS II level, using data from the EU regional statistics provided by Eurostat. Since these data do not allow to disaggregate the contribution of the different types of agricultural payments to the factor income, we have integrated the more detailed subsidy data available from the CATS database (Clearance of Audit Trail System, provided by DG Agri). This operation resulted in the computation of a new factor income variable, here termed Corrected Factor Income (CFI).

Statistical analysis shows a linear correlation (2004 and 2007) between the level of EU agricultural payments (i.e. the payments both of I and II Pillar) and the level of corrected factor income. The index of subsidies' relative intensity at the regional level shows that 60% of the regions has a subsidies' relative intensity lower than the system mean. Moreover, the number of regions characterized by a level of subsidies' intensity higher than the system mean decreases between 2004 and 2007.

In this picture, the econometric results shows that in all analysed years (2007, 2006 and 2004), the parameter estimates for the direct payments variables are statistically significant and positive in sign. Therefore, we can state that direct aid contributes to enhancing the income of farmers (i.e. CFI). The effects of coupled aids on CFI appear to be stronger than those produced by decoupled aids (years 2006 and 2007). Such a result seems to be confirmed by the analysis conducted on the sample sub-divided in two different economic groups: regions with a share of total GDP produced by the agriculture lower / higher than the median value..

Probit regression was applied to investigate the role of direct aid in stabilising the CFI over the observation period. The results have to be evaluated taking into account the statistical validity and the limitations of the model. Thus, we can conclude that decoupled payments provide a positive and robust contribution to the stability of income (i.e. of CFI). On the other hand, we are not able to draw unequivocal conclusions as to the effect of coupled payments.

A2. Analysis of income effects of direct payments at micro-economic level

At micro-economic level, the analysis is based on farm data from the FADN database (EU-FADN-DG AGRI L-3). The variable representing the income of farmers was Farm Net Value Added per Annual Work Unit (FNVA/AWU). The effect of direct payments on farmers' income was analysed across 55 Community macro-regions within the framework of seven types of farming and by class of economic size.

The main issues of the evaluation question were:

a) role of direct payments in enhancing the income of farmers (statistical methods and econometric analysis)
b) role of direct payments in stabilising the income of farmers (statistical methods and econometric analysis)
c) role of direct payments in allowing farmers to achieve an income level able to guarantee a fair standard of living (comparison of farmers income with an overall income benchmark)
d) effects of the 2003 reform on the income of farmers

- **The role of direct payments in enhancing the income of farmers: findings and conclusions**

The statistical analysis to assess the role of direct payments in enhancing the income of farmers (the farm business income) has been done on the basis of the 2004-2007 average. The FNVA/AWU was computed by converting the values into Purchasing Power Standard (PPS) values, in order to take into account differences in purchasing power across Member States.

The first finding is that, even though calculations were done in PPS, there is a big difference between the farm income per labour unit of EU15 Member States and that of EU12 Member States: the average FNVA/AWU value of the EU15 is double the average FNVA/AWU value of the EU12 regions.

The analysis of the share of direct payments on farm value added (2004-2007) indicates that direct support have played a particularly important role in generating income in grazing livestock specialist farms, especially in the EU15 (49.7% EU27; 51.1% EU15 and 42.4% EU12). This type of farming is followed by field crops and mixed farms, with an incidence that was basically the same in EU15 and EU12. Direct aid is also important in farms specialised in milk production (30.1%). In the two sectors for which the share of direct payments is the lowest, i.e. horticulture and permanent crops, average incomes are lower than the average income in the farm sector overall.

In the simulated situation (2004-2007, direct payments not included), the removal of direct support would have led to a 27% fall in average income value, slightly less in the set of EU15 Member States.

The analysis highlights strong differences between regional average incomes in all analysed sectors (coefficients of variation > 40%). However, in the absence of direct payments, the variability would have increase in all sectors, and in a particularly important way in those sectors where the share of direct payments on income is the highest (field crops, milk sector, other grazing livestock and mixed farms). Therefore, in particular in these sectors it is possible to conclude that direct payments have also played a role in strengthening the cohesion between regions.

In more detail, the analysis conducted on farms from the FADN sample broken down by class of economic size[77] shows the existence of a close and direct relationship between the level of the individual income and the economic size of farms.

In general, Small size farms have a lower average income per labour unit. Considering that the analysis has allowed to establish that family farms are concentrated in the Small class of farms, it is possible to conclude that, on average, family farms have relatively lower income per labour unit.

In the simulations (by deducting direct payments from average farm income for the period 2004-2007), the gap between small and large farms would have increased, in particular in field crops specialized farms (the ratio between the average level of income of large farms and small farms goes

[77] Three classes of ESU: small, up to 16 ESU; medium, from 16 to 100 ESU; large, greater than 100 ESU. One ESU corresponds to a farm's Standard Gross Margin (SGM) of 1.200 Euro/year.

from 3.9 in the actual situation to 4.4 in the simulated situation) and in mixed farms (from 4.6 to 5.2). It is therefore possible to conclude that direct payments have allowed a reduction of the existing gap between the average farm income per labour unit of small and large farms.

The application of econometric models at micro-economic level, using FADN data, allowed to estimate the net effects of direct payments on farmers' incomes[78] differentiating across the seven analysed types of farming.

The variables expressing the support provided by coupled and decoupled direct payments show estimated coefficients that are statistically different from zero and positive in all considered cases: seven type of farming and whole sample, years 2004 and 2007 (please refer to Tab. 19 and Tab. 20 for specific results per type of farming). The positive role that direct payments play in the generation of farm income is also confirmed by the fact that the corresponding variables, together with the other considered independent variables, allow to explain a large share of the variability of the considered income level (i.e. Farm Net Value Added per unit of labour).

These results confirm that direct payments contributed to enhancing the income of farmers. Comparing the results obtained for 2007 with the results 2004, this role may have become even more important.

The regression parameters estimate for coupled payments lay around 0.5 (whole sample, 2007), the regression parameters estimate for decoupled payments are higher and around 1.2. The coefficient for decoupled direct payments is greater than the one of coupled direct payments in all sectors, which means that one additional Euro of decoupled support translates into an increase of income greater than one additional Euro of coupled support.

Both regression models, macro and micro, estimate the positive effect of direct payments on income. However, estimations show different relative effectiveness of coupled and decoupled direct payments. If in the micro model decoupled aids seem to be more effective, in the macro model the opposite is true. These difference could be due to the fact that these analyses have been developed at two different levels: the macro model has been developed at aggregate regional level and the micro model at individual farm level. In any case, the combined reading of the two analysed does not allows to express a judgment on this issue.

Further on, analysis according to the type of payment scheme applied (i.e. SPS vs. SAPS) has been performed by means of the unrestricted-SPS models in 2007. The results suggest that the effectiveness of direct payments may be slightly higher in SAPS farms than in SPS farms.

- **The role of direct payments in stabilising the income of farmers**

The contribution of direct payments to farm income stability was measured by comparing the coefficients of variation (CV) of farmers' income computed with and without direct payments (EU 15, 2001-2007). The analysis covered the macro-regions of the EU15 for which long enough income series were available. The trend component was removed from the time series in order to separate long-term changes caused by exogenous factors.

[78] We recall that econometric approach has been used to identify the statistical relationships between income level and a number of explanatory variables expected to influence farmers' income (e.g. direct payments, market interventions, economic or social factors, etc). Thus, regression models allowed to assess the effectiveness of direct payments (i.e. the net effect) in terms of enhancing the income of farmers. The regression parameters estimate the impact of an additional Euro of direct payments on farm income. If parameters are statistically different from zero and positive in sign, it can be assumed that direct payments contribute to enhancing farm incomes. The magnitude of the parameters provides an estimated measure of this contribution

The analysis allows concluding that direct payments have made a positive and robust contribution to thestability of the income of farmers. As already observed, also in this case the largest effect on income stability is shown in sectors most supported by direct payments (field crops, other grazing livestock and mixed farms). Consequently, in sectors with a lesser share of direct payments in the total farm business income, incomes show an higher variability (es. farms specialised in granivores), as they are more exposed to product and factor market conditions.

Nevertheless, within each sector, the analysis highlighted a diverse contribution of direct support on income stability according to the economic dimension of the farms: larger in small farms than the other two classes. This is particularly true in some sectors (other grazing livestock, granivores and mixed farms), whereas it is less true in others (in particular in field crops sector).

In other words, the absence of direct payments would have made farmers' income volatility even higher in the smaller farms (small compared to medium and large size farms and medium compared to large size farms), that already have the lowest farm income stability in the actual situation compared to larger size farms.

- **The role of direct payments in ensuring a fair standard of living for the agricultural community**

One of the key objectives of the CAP is "to ensure a fair standard of living for the agricultural community". However, the European Community has never defined the concepts of 'agricultural community' and 'fair standard of living' as they appear in Article 39 of the TFEU Treaty. There are therefore still no clear concepts or criteria which can be applied to measure these variables.

In this context, to assess the contribution of direct payments to the income objective, the analysis had to compare farm income with an income variable to be used as benchmark. For the purpose of this evaluation, the examination of the available income measures in the official EU statistics (e.g. basic national minimum wage, annual gross earnings, industrial mean earnings, Gross Domestic Product) and considerations about comparability issues led to choosing the Gross Domestic Product (GDP) per employee as a benchmark (Eurostat, average 2004-2007).

Indeed, it is commonly accepted that income is an appropriate proxy to measure the standard of living. We recall that in this case the analysis focuses on farm business income, i.e. the income generated by the main activity of farmers. Accordingly, regional GDP is a measure of a region's overall economic output and it represents an overall income benchmark (i.e. income generated by all sectors of a regional economy) to be compared with farm income expressed in terms of value added generated by all production factors.

The analysis was carried out at regional level for each sector. The ratio was computed in the real and simulated situation (farm income computed by deducting direct payments) for the period 2004-2007, for the period 2001-04 (pre-reform) and the period 2006-07 (post reform). The original values expressed in Euros were converted into PPS values.

The analysis shows that in most cases across EU, farm income per labour unit is lower than GDP/employee (average for period 2004-2007). In 60.5% of regions the farm income is lower than half of the regional the GDP/employee. Conversely, only in 2.2% of regions the farm income exceed the regional benchmark. In the simulated situation, without direct payments, 84% of regions would have not reached half of the regional GDP.

Moving on to the analysis by sector, the contribution of direct payments to bringing average regional farm income per labour unit closer to the regional GDP per employee varies from sector to sector and from region to region. In all four most supported sectors (field crops, milk, other grazing livestock and mixed farms), the simulations carried out without direct payments and based on 2004-2007 data show

that the absence of direct aid would have caused a further widening of the gap between farmers' income and GDP per employee in a large number of regions. In the livestock sector farm income per labour unit would not have reached half of the regional GDP/employee in 100% of regions.

Further on, the analysis by class of economic size shows that, even in the presence of direct payments, in 98,1% of regions average farm income for small farms is lower than half of the GDP/employee (period 2004-2007). Concerning medium farms, 73% of regions do not reach the threshold of half of the benchmark. In the group of large farms, the average farm income in the EU regions is lower than half of the benchmark in 24,8% of regions.

These results lead to conclude that direct payments have helped reduce the gap between average farmers' income and Gross Domestic Product (GDP) per employee for the period 200-2007.

A further analysis was conducted with a view to assessing whether in the analysed period and to what extent direct payments make it possible for the family labour units to attain an income (FFI/FWU) corresponding to at least the average wage of farm employees calculated at a regional level for all sectors (source: FADN farms). Should this level not be reached, it would cease to be convenient to carry on the activity, as it would be more convenient to be employed elsewhere[79].

Bearing in mind some limitations, the comparison of the actual and simulated situations makes it possible to state that in the more supported sectors (field crops, milk, other grazing livestock and mixed farms), direct payments have played a crucial role for the period 2004-2007. In these sectors, the simulations without direct payments indicate that farm income per family unit would have fallen below the remuneration of paid employment in the reference region, in a large number of regions (35.4%). In the livestock sector the farm income per family unit would not reach the remuneration of paid employment in 78% of regions.

- **The effects of the 2003 reform on the income of farmers**

The aim of the analysis was to verify whether the changes in farm income observed after the reform could be attributable to the main changes introduced through the reform of the direct payments system. Due to data availability, the analysis was conducted solely for the EU15 macro-regions by comparing average values for the period 2001-04 (pre-reform) and the period 2006-07 (post reform) in each sector.

In the period following the implementation of the reform, farm income per labour unit has increased in all types of farming and in almost all ESU classes, even though this increase is not uniform. Farm income has increased more than the GDP per employee. Therefore, the gap between farm income and regional GDP per employee became narrower. However, the simulations did not make it possible to separate the effects of the reform from other factors that may have influenced the growth phenomenon, such as the improvement of market conditions in some sectors, the general fall in the average number of annual work units per hectare, (which presumably has brought about a rise in labour productivity), or other short-term factors.

The analysis does not highlight any differences in income growth related to the implementation model of the reform chosen by member States (historic SPS, hybrid SPS).

[79] It should be stressed that the FFI/FWU value does not correspond exactly to work remuneration, as it also includes remuneration of capital and profit. Therefore, a value of the ratio amounting to 1 (or lower) indicates a fragile situation in which either family labour or capital is under-remunerated

B. FARM HOUSEHOLD TOTAL INCOME

Direct payments not only affect farm business income, but also farm household total income. In principle, it was therefore important to analyse the evolution of farm household income, for which, as already mentioned, there are no available EU official statistics. To overcome this shortcoming, an analysis of the existing literature (studies and statistics available for single Member States and, in some case, for groups of Member States) has been carried out.

It is important to underline that the literature review suffers from some limitations, related to:

- differences in the definition of households and farm households
- differences in the measurement of farm household income
- the lack of up-to-date studies and statistical data on farm household income

Bearing in mind these limitations, the overall results of the review are summarised below.

- In some Member States the average farm household income (FHI) was higher than the average income of all households. The opposite was however true in other Member States. However, in Member States where the FHI is lower that the average income of all households, the gap is generally small.
- In most of the considered Member States where data is available, on average, the differences between farm and non-farm household incomes are narrower than in the past. Indeed, farm household incomes across EU Member States have shown an improvement that has been often explained by a process of diversification of income sources and, in particular, by an increase of the role of income generated by off-farm activities (OECD, 2009)
- The incidence of low income households is often higher in the farm population than in the non-farm population. Farm households in which the relative importance of farm business income is relatively high are also found more frequently in low-income categories.
- Part-time farming is often reported to have relatively higher FHI than full-time farming. Consequently, diversification strategies based on looking for off-farm income opportunities can be very effective in terms of enhancing income. Indeed, the increase in the share of farms managed on a part-time basis has probably been one of the main drivers of the positive trend observed in the relative income condition of farm households.
- The relative importance of the farm business income in generating farm household income is declining over time and vary widely among farm households. For these reasons, the effect of policy support provided by agricultural policy on household income can change over time and can differ very much among farm households. For example, it is likely that this effect is more limited in part-time than in full-time farm households given that, in the former group, farm business income represents a smaller share of household total income than in the latter group. However, it is important to remark that, in some specific groups of farm households, even if the role of farm business is limited, policy support (including direct payments) can play a very important role in the generation of farm business income and, therefore, of farm household income.
- The sparse and limited available data do not permit to draw solid enough conclusions on the role of agricultural policies on farm household income.
- The variability of farm income, due to the intrinsic characteristics of agricultural production, is partially compensated by lower variability of off-farm incomes. This suggests that off-farm incomes play an important and positive role in the stabilisation of farm household income.

6. ANALYSIS OF THE DIFFERENTIATED ROLE OF DIRECT PAYMENTS ON FARMERS' INCOME ACCORDING TO FARM LOCATION AND TYPE OF ORGANISATIONAL FORM OF HOLDINGS (EQ1B)

6.1 Comprehension and interpretation of the evaluation question

This part of the answer to EQ1 deepens the microeconomic analysis. The aim is to investigate the contribution of direct payments to the level and the stability of farmers' income according to: the farm location and to the type of organisational form of holdings. Subsequently, it is to measure the role of direct payments in achieving a fair standard of living of the agricultural communities.

Farm location: an element distinguishing farms within the same sector and region is their location or not in less favoured areas (LFA) as defined by Reg. (EC) No. 1257/1999). Farms can be also classified taking into account their organisational form. According to this criteria, we can distinguish between Individual farms, Partnerships and Other types (see § 4.1.1.1).

6.2 Methodological approach, data sources and limits

For the analysis concerning the typology "farm location", FADN farms have been classified according to whether they are located in Less Favoured Areas (LFAs) or not, using the FADN variable A39[80]. For this typology, the analysis is based on the comparison between farmers' income in three groups of areas: the first group considers all farms located in non LFA areas, the second group considers all farms located in LFA areas and the third group is a sub-group of the second, i.e. considers only mountain LFA areas. This comparison should allow to investigate whether direct payments contribute to reduce the gap between LFA and non-LFA farmers' income.

The analysis focuses on the comparison of the average 2004-2007 farmers' income in LFA areas and in the subgroup of mountain LFA areas and the average 2004-2007 farmers' income in non-LFA areas. In order to isolate the effects of direct payments on farm income in LFA areas, the FNVA/AWU has been calculated by removing the LFA compensatory allowance.

It is important to stress that the absence of some regions may be attributable to the inadequacy of the FADN sample (number of farms fewer than 15). It is worth mentioning that the entire territory of Malta and Luxembourg is classified as LFA (therefore the comparison with non LFA areas in the same Member State/region is not possible). The number of regions by type of farming and location (non LFA, LFA and mountain LFA) on which the analysis was developed is summarised in the table below.

Tab. 25 - Number of regions and macro-regions considered in the analysis by location

	Non LFA	LFA	Mountain LFA
TF1- Field crops	37	40	21
TF2 - Horticulture	13	16	7
TF4 - Other permanent crops	20	24	16
TF5 - Milk	35	42	21
TF6 - Other grazing livestok	33	43	21
TF7 - Granivores	16	22	8
TF8 - Mixed	34	39	18

[80] Variable A39 is coded according to the following: 1= not in less-favoured areas; 2= in less-favoured not mountain areas (i.e. areas characterised by specific handicaps); 3= in less-favoured mountain areas and 4= no significant area in the member state or region. Therefore we have considered Not LFA, areas classified under codes 1 and code 4 and we have considered total LFA areas those classified under codes 2 and 3. Mountain LFA areas are those classified under code 3.

Concerning the organisational form of holding, the FADN sample was split up into three organisational forms (variable A18): Individual farms; Partnerships; Other types. The analysis focuses on the comparison of the average 2004-2007 farmers' income of these three organisational forms.

Again, it should be stressed that for many combinations of region/sector the number of farms (in particular partnerships and other types of organisational form) was fewer than 15, preventing their use in the analysis. For some regions data are available only for one organisational form, the comparison is thus not possible. For other regions the comparison was possible only for sectors where there are at least two types of organisational forms. Furthermore, in no EU12 country there was a sufficient number of partnership farms. The comparison was thus possible (if applicable) only among Individual farms and other types of organisational form.

To assess the net effects of direct payments on farmers' income we have used the results deriving from the micro-econometric modelling. The *unrestricted-LFA model* has been developed in order to test if the coefficients for the variables referring to coupled and decoupled payments statistically differ in the farms located in mountain LFA and the others (in this case "others" are non LFA farms plus all the other LFA farms not mountain). The methodology applied to this part of the analysis has been detailed in § 4.1.3.2.

Income variability and the stabilising role of direct payments according to farm location (LFA) and type of farm organisation were assessed using the same methodology already explained in § 5.2.

It is important to note, however, that there are some regions for which the analysis of income stability is not performed. This occurs in the farm location typology when all farms in a region are non-LFA and in the case all farms are individual. Such cases do not need to be analysed as they are already considered in the overall analysis per region and type of farming. Moreover, there are instances in which it is not possible to assess the impact of direct payments as one of the calculated coefficients of variation (CVa and CVb) is not reliable. This happens when one of the two income series (usually the FNVA without direct payments/AWU) presents negative values, which result in out-of-range variation coefficients.

The last step of the analysis compared the average 2004-2007 FNVA/AWU (calculated in PPS and without the compensatory allowance in the case of LFA farms) with and without direct payments with GDP/employee (source: Eurostat). For the typology "farm location", we have also analysed whether direct payments allow family farms units to reach an income (FFI/FWU, net of the compensatory allowance given only to LFA farms) at least equal to the average wage of farm employees. (cf methodology illustrated in § 5.2).

6.3 Judgment criteria and indicators

In order to reply to this part of the question, we base our judgement on the following criteria:

Criteria and indicators
Judgment criterion no. 1 **Over the examined time period, the role played by direct payments on the farmers income was different according to the farm location**
Comparison of actual and simulated FNVA/AWU (in PPS, average 2004-2007) between farms located in non LFA areas, in LFA areas and in the subgroup mountain LFA areas
DP/FNVA ratio (average 2004-2007) in the region of the EU27 of the farms located in non LFA areas, in LFA areas and in the subgroup mountain LFA areas
Informed views of the experts

Criteria and indicators
Estimated regression parameters for variable DP with respect to farm location
Comparison of the coefficients of variation calculated on FNVA with direct payments and on FNVA net of direct payments (EU15, 2001-2007) with respect to farm location
Comparison of FNVA/AWU in PPS (average 2004-2007) with and without direct payments with GDP/employee in PPS (average 2004-2007), with respect to the farm locations
Comparison of FFI/FWU in PPS (average 2004-2007) with and without direct payments with average regional paid wages in PPS (average 2004-2007), with respect to the farm locations
Judgment criterion no. 2 **Over the examined time period, the role played by direct payments on the farmers income was different according to the type of organisational form of holdings**
Comparison of actual and simulated FNVA/AWU (in PPS, average 2004-2007) of the three types of organisational form in the regions of the EU27
Comparison of the coefficients of variation calculated on FNVA with direct payments and on FNVA without direct payments (EU15, 2001-2007) with respect to the types of organisational form
Comparison of FNVA/AWU in PPS (average 2004-2007) with and without direct payments with GDP/employee in PPS (average 2004-2007), with respect to the types of organisational form

6.4 Effects of direct payments on the income of farmers according to farm location

6.4.1 Comparison of farmers' income level by farm location at EU level

The analysis of the average values (2004-2007) of the FNVA/AWU at EU level of non LFA areas, LFA areas and of the subgroup mountain LFA areas by type of farming confirms that, in the real situation (with direct payments), farm income per labour unit in LFA areas is lower than farm income in non LFA areas: the ratio between the two averages is of 0.88:1. Furthermore, the analysis shows that the farm income in the subgroup of mountain LFA areas is also, on average, lower (and even lowest respect the LFA areas as a whole) than the farm income in non LFA areas: the ratio is 0.81:1.

This is true for all types of farming with the exception of granivores specialized farms[81] which show higher income levels in comparison with other types of farming mainly in LFA and mountain LFA areas. Obviously this value has an important weight on global average values.

The highest gap between income in non LFA areas and income in LFA areas is observed on other grazing livestock farms (ratio is 0.76:1). Concerning the gap between income in non LFA areas and income in the subgroup mountain LFA areas the biggest difference is shown again by other grazing livestock farms (0.66:1) followed by field crops farms (0.70:1) and by milk specialised farms (0.72:1).

We can also note that the level of farmers' income in the three locations is, in the case of other permanent crops, on average, quite comparable. Indeed the ratio between the average LFA level and the non LFA level is 0.91:1 that raises to 0.93:1 in the case of the subgroup mountain LFA areas.

[81] Regarding TF granivores it should be recalled that, as already mentioned, the FNVA/AWU particularly high average value is due to the activity of pig farming for ham production in some Italian and Spanish (mountain) regions.

Tab. 26 - FNVA/AWU and FNVAndp/AWU by farm location, by type of farming (EU 27, average 2004-2007, PPS,%)

	Non LFA	LFA	Mou LFA	LFA/Non LFA	Mou LFA/Non LFA
With DP					
TF1 – Fieldcrops	25.351	21.008	17.728	0,83	0,70
TF2 – Horticulture	20.506	16.420	17.975	0,80	0,88
TF4 – Other permanent crops	16.755	15.290	15.658	0,91	0,93
TF5 – Milk	27.391	22.676	19.664	0,83	0,72
TF6 – Other grazing livestock	21.786	16.525	14.357	0,76	0,66
TF7 – Granivores	29.803	32.163	34.123	1,08	1,14
TF8 - Mixed	23.000	20.212	13.780	0,88	0,60
Average	**23.513**	**20.613**	**19.041**	**0,88**	**0,81**
Without DP					
TF1 – Fieldcrops	14.699	9.323	10.029	0,63	0,68
TF2 – Horticulture	20.156	15.441	16.983	0,77	0,84
TF4 – Other permanent crops	15.930	11.435	12.030	0,72	0,76
TF5 – Milk	19.356	15.428	13.499	0,80	0,70
TF6 – Other grazing livestock	10.426	5.125	5.775	0,49	0,55
TF7 – Granivores	26.497	27.555	30.359	1,04	1,15
TF8 - Mixed	13.136	9.532	7.308	0,73	0,56
Average	**17.171**	**13.405**	**13.712**	**0,78**	**0,80**
Δ% (not including DP/with DP)					
TF1 – Fieldcrops	-42%	-56%	-43%		
TF2 – Horticulture	-2%	-6%	-6%		
TF4 – Other permanent crops	-5%	-25%	-23%		
TF5 – Milk	-29%	-32%	-31%		
TF6 – Other grazing livestock	-52%	-69%	-60%		
TF7 – Granivores	-11%	-14%	-11%		
TF8 - Mixed	-43%	-53%	-47%		
Average	**-26%**	**-36%**	**-32%**		

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

The simulated situation (without direct payments) show a decrease of farm income for all the three locations and for all types of farming although in different proportion. The decrease would be very important, both in LFA and in the subgroup mountain LFA areas, for other grazing livestock, for field crop farms and for mixed farms.

In the simulated situation (without direct payments), the gap between LFA areas and non LFA areas for farms of all sectors would increase (with the exception of granivores specialized farms). The ratio between the two averages would become 0.78:1 in the simulated situation against 0.88:1 in the real. This increase would be however diversified among types of farming. The difference would increase mainly for those types of farming that receive higher direct support: field crops, other grazing livestock and mixed farms.

Concerning the gap between farmers' income in the subgroup mountain LFA areas and farmers' income in non LFA areas, we can see that in the simulated situation, the gap would remain on average almost the same (0.81:1 in the actual situation against 0.80:1 in the simulated situation). Therefore it seems that farmers in non-mountainous-less-favoured areas are, in general more sensitive to direct payments than mountain LFA farmers. However, this result, obtain at EU27 level, can be influenced by the fact that the subgroup mountain LFA is more represented in EU15 Member States than in EU12 Member States (characterised mostly by LFA areas). Indeed, we observe that, in all types of farming, the average income of the subgroup mountain LFA of EU15 Member States is higher than the average income of non LFA areas and of LFA areas of the EU12 Member States.

6.4.2 Comparison of farmers' income by location at macro-regions level

As we can see in the table below, the situation described above is quite diversified among macro-regions. The average values of income per type of farming hides the existence of a large range of values among macro-regions both considering the farm location and the type of farming.

	FNVA/AWU (average 2004-2007)	Non LFA areas	LFA areas	Mountain LFA areas
TF1	**Min. value**	CY Cyprus (9.358 PPS)	SI Slovenia (1.930 PPS)	SI Slovenia (-10.142 PPS)
	Min. simulated value	SK Slovakia (3.814 PPS)	FI Finland (-4.630 PPS)	SI Slovenia (-11.712 PPS)
	Max. value	FR B. Parisienne (53.099 PPS)	FR Est (46.015 PPS)	IT Isole (38.437 PPS)
	Max. simulated value	IT Isole (28.882 PPS)	IT Isole (27.172 PPS)	IT Isole (33.120 PPS)
TF2	**Min. value**	PT Continente (6.893 PPS)	PT Continente (889 PPS)	PT Continente (-1.807 PPS)
	Min. simulated value	PT Continente (6.802 PPS)	PT Continente (812 PPS)	PT Continente (-1.116 PPS)
	Max. value	IT Nord-Est (36.283 PPS)	ES Centro (32.087 PPS)	IT Nord-Est (29.090 PPS)
	Max. simulated value	IT Nord-Est (36.177 PPS)	ES Centro (30.495 PPS)	IT Nord-Est (29.073 PPS)
TF4	**Min. value**	CY Cyprus (4.854 PPS)	CY Cyprus (2.615 PPS)	CY Cyprus (2.978 PPS)
	Min. simulated value	CY Cyprus (2.745 PPS)	CY Cyprus (357 PPS)	CY Cyprus (1.082 PPS)
	Max. value	IT Centro (29.899 PPS)	IT Centro (34.150 PPS)	IT Nord-Ovest (29.533 PPS)
	Max. simulated value	IT Centro (28.895 PPS)	IT Centro (33.197 PPS)	IT Nord-Ovest (29.036 PPS)
TF5	**Min. value**	PL East (11.415 PPS)	SK Slovakia (1.299 PPS)	SK Slovakia (-672 PPS)
	Min. simulated value	FR Sud-Ouest (-1.655 PPS)	SK Slovakia (3.019 PPS)	SK Slovakia (-4.654 PPS)
	Max. value	IT Nord-Ovest (51.706 PPS)	ES Sur (56.519 PPS)	IT Isole (61.483 PPS)
	Max. simulated value	IT Sud (42.843 PPS)	ES Sur (49.691 PPS)	IT Isole (52.520 PPS)
TF6	**Min. value**	SI Slovenia (3.559 PPS)	SK Slovakia (595 PPS)	SK Slovakia (1.377 PPS)
	Min. simulated value	UK Northern Irland (-4.691 PPS)	FI Finland (-19.383 PPS)	FI Finland (-20.103 PPS)
	Max. value	IT Nord-Est (43.550 PPS)	ES Centro (32.975 PPS)	ES Centro (38.995 PPS)
	Max. simulated value	IT Sud (36.854 PPS)	ES Centro (23.865 PPS)	ES Centro (29.548 PPS)
TF7	**Min. value**	HU Alföld és Észak (7.287 PPS)	LV Latvia (10.745 PPS)	FI Finland (15.293 PPS)
	Min. simulated value	HU Alföld és Észak (3.534 PPS)	FI Finland (1.531 PPS)	FI Finland (-788 PPS)
	Max. value	ES Noroeste (72.066 PPS)	ES Noroeste (117.172 PPS)	ES Este (54.014 PPS)
	Max. simulated value	ES Noroeste (72.066 PPS)	ES Noroeste (116.881 PPS)	ES Este (49.568 PPS)
TF8	**Min. value**	PT Continente (6.646 PPS)	SK Slovakia (2.752 PPS)	SK Slovakia (-34 PPS)
	Min. simulated value	UK Scotland (1.447 PPS)	FI Finland (-7.426 PPS)	FI Finland (10.456 PPS)
	Max. value	IT Nord-Ovest (43.204 PPS)	ES Sur (40.019 PPS)	ES Sur (29.210 PPS)
	Max. simulated value	IT Nord-Ovest (33.743 PPS)	ES Sur (27.163 PPS)	IT Isole (19.946 PPS)

Also concerning the comparison between the income of the farmers located in LFA areas and the income of farmers located in non LFA areas, the analysis at regional level shows that the situations are very diverse among the analysed macro-regions. In fact in all types of farming there are macro-regions where income of farmers located in LFA areas is higher than the income of farmers located in non LFA areas as well as macro-regions where income of farmers of the subgroup mountain LFA areas is higher than income of farmers located in non LFA areas.

However, the number of regions where income of farmers located in LFA areas (and the number of regions of the subgroup mountain LFA) is higher than income of farmers located in non LFA areas is always less than 50% of the total number of regions analysed and for some types of farming seems to be an exception (TF2 and TF4).

	(number of regions)	TF1	TF2	TF4	TF5	TF6	TF7	TF8
A. Actual situation	Regions where LFA farmers' income > Non LFA farmers' income	12 out of 37	2 out of 12	5 out of 20	7 out of 35	8 out of 33	7 out of 16	12 out of 35
	Regions where Mou LFA farmers' income > Non LFA farmers income	6 out of 20	2 out of 6	2 out of 14	3 out of 17	6 out of 15	2 out of 5	5 out of 17
B. Simulated situation	Regions where LFA farmers' income > Non LFA farmers' income	4 out of 37	2 out of 12	4 out of 20	8 out of 35	7 out of 33	8 out of 16	6 out of 35
	Regions where Mou LFA farmers' income > Non LFA farmers income	5 out of 20	2 out of 6	2 out of 14	3 out of 17	3 out of 15	2 out of 5	5 out of 17
LFA Areas (B-A)		-8	0	-1	+1	-1	+1	-6
Mountain LFA areas (B-A)		-1	0	0	0	-3	0	0
Number of LFA regions for which the gap increases respect non LFA regions when removing direct payments		31 out of 37	No changes	11 out of 20	23 out of 35	25 out of 33	7 out of 16	30 out of 35
Number of Mountain LFA regions for which the gap increases respect non LFA regions when removing direct payments		14 out of 20	No changes	9 out of 14	8 out of 17	10 out of 15	2 out of 5	10 out of 17

The main evidence is that in the simulated situation (by deducting direct payments) the gap would increase (in terms of number of regions) between farmers' income in LFA areas and farmers' income in non LFA areas and between farmers'income of the subgroup mountain LFA and farmers' income of non LFA areas. On average (considering all regions accross all sectors) in the simulated situation the gap would have increased, compared with the real situation, in 72% of the LFA analysed regions and in 60% of the mountain LFA regions.

Again, the gap would increase in LFA regions mainly for those types of farming that receive higher direct support: field crops (gap would increase in 84% of the LFA regions) and mixed farms (86%), followed by other grazing livestock (76%) and milk (66%) specialised farms specialised farms. Concerning the mountain LFA areas, the major gap increases are observed in the case of field crops farms (70% of the regions analysed) and other grazing livestock specialised farms (67%).

On the basis of the results of the analysis (for the period 2004-2007), we can conclude that the income of farmers located in LFA areas and mountain LFA areas, apart from some exceptions, is more dependent from direct payments than the income of farmers located in non LFA areas. Indeed, in the simulated situation (without direct payments) the gap between the farmers' income of LFA areas and, in a lesser measure, in mountain LFA areas respect the farmers' would have increased. Therefore we can affirm that direct payments have reduced the existing differences between farmers' income of non LFA areas and LFA and the subgroup Mountain LFA areas.

6.4.3 Net effects of direct payments in enhancing income of farmers: results deriving from the micro-econometric modelling

In this section we describe the results deriving from the micro-econometric analysis. The regression analysis has been performed in a way to test whether the estimated coefficients for coupled and decoupled direct payments for those farms located in mountain Less Favoured Areas do differ from those not located in such areas (i.e. non LFA areas plus LFA areas other than mountain LFA areas). The approach used has been already presented in the section of this report explaining the methodology.

The comparison of the results of the *restricted* and the *unrestricted-LFA* models allows testing the joint significance of the two regression coefficients for the instrumental variables *lfacdpa* and *lfaddpa*[82]. This allows to determine if, in that year, the coefficients for coupled and decoupled payments jointly differ in the farms located in mountain-LFA areas.

The results show that in the regression for all types of farming, the effects of direct payments on farm value added differ in farms located in mountain-LFA and in the other farms. Indeed, in all regression models developed on single types of farmings the F test suggests that the coefficients stimated for coupled and decoupled payments jointly differ in these two groups of farms (Tab. 27). However, the results of the models for which the overall quality of the regression results are not very satisfactory (i.e. low R^2), such as it is the case of horticulture, permanent crops and granivores farms, should be analysed with some caution.

[82] When the test statistic is larger than the critical value, it is possible to reject the null hypothesis, concluding that the set of coefficients of the two variables is statistically significant (i.e. coefficients differ between mountain-LFA and other farms). The last line of Tab. 26 reports the level of the computed F-statistics and, by using the signs ***, ** and *, it identifies when they are significant at the 1%, 5% or 10% level.

Tab. 27 - 2007 unrestricted-LFA models: Estimation results for all farm groups

	TF 1 Field crops		TF 2 Horticulture		TF 4 Permanent crops		TF 5 Milk		TF 6 Other grazing livestock		TF 7 Granivores		TF 8 Mixed farms		TF 1, 2, 4, 5, 6, 7, 8 Whole sample	
	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
cmoa	1,263	0,000 ***	1,187	0,000 ***	0,460	0,002 ***	2,461	0,000 ***	0,498	0,000 ***	0,228	0,000 ***	0,509	0,000 ***	0,391	0,000 ***
cdpa	0,723	0,000 ***	0,249	0,024 **	0,411	0,000 ***	0,559	0,000 ***	0,224	0,000 ***	0,382	0,000 ***	0,679	0,000 ***	0,606	0,000 ***
ddpa	1,205	0,000 ***	1,373	0,000 ***	0,604	0,000 ***	0,907	0,000 ***	0,309	0,000 ***	1,183	0,000 ***	1,482	0,000 ***	1,180	0,000 ***
lfacdpa	-0,133	0,003 ***	0,506	0,034 **	0,209	0,122	-0,220	0,003 ***	-0,204	0,000 ***	-0,594	0,001 ***	-0,251	0,000 ***	-0,298	0,000 ***
lfaddpa	-0,221	0,000 ***	-1,080	0,136	-0,009	0,892	0,360	0,000 ***	0,496	0,000 ***	2,471	0,000 ***	0,435	0,000 ***	0,085	0,000 ***
otha	0,579	0,000 ***	0,382	0,109	0,337	0,000 ***	-0,089	0,004 ***	0,275	0,000 ***	0,033	0,750	0,005	0,791	-0,183	0,000 ***
ecsize	7,342	0,000 ***	14,511	0,000 ***	53,592	0,000 ***	10,885	0,000 ***	114,680	0,000 ***	6,856	0,000 ***	3,670	0,000 ***	14,230	0,000 ***
assa	0,003	0,000 ***	0,027	0,000 ***	0,010	0,000 ***	0,017	0,000 ***	0,001	0,010 *	0,001	0,114	0,005	0,000 ***	0,005	0,000 ***
gdp	159,07	0,000 ***	417,65	0,000 ***	352,11	0,000 ***	-38,58	0,000 ***	-30,20	0,003 ***	252,67	0,000 ***	54,55	0,000 ***	239,66	0,000 ***
constant	2500,78	0,000 ***	424,61	0,208	584,50	0,043 **	3158,19	0,000 ***	4806,23	0,000 ***	2175,42	0,000 ***	1722,76	0,000 ***	2657,55	0,000 ***
R^2	0,841		0,557		0,519		0,800		0,684		0,393		0,851		0,698	
F stat^	164,00 ***		11,09 ***		51,97 ***		18,53 ***		56,73 ***		41,23 ***		33,47 ***		0,18	

Coeff.: Value of the estimated coefficient; Prob.: Probability that the coefficient is not different from zero. ***: significant at 1%; ** significant at 5%; * significant at 10%.

^ Test for the joint significance of the coefficients for lfacdpa and lfaddpa : ***: significant at 1%; **: significant at 5%: *: significant at 10%. If significant, the coefficients jointy differ in the two groups of farms.

Source: Agrosynergie regression estimates based on sample data EU-FADN-DG AGRI L-3

Caution is also needed in order to interpret the fact that the F test performed on the regression for the whole sample does not allow to conclude that the estimated coefficients jointly differ in farms located in mountain-LFAs and the other farms. This is because this model is developed on data that derives from the aggregation of datasets from heterogeneous groups of farms. Indeed the t-tests developed on single coefficients (*lfacdpa* and *lfaddpa*) suggest that each of them is significantly different from zero[83].

In the aggregate model and in all types of farming, the coefficients for coupled direct payments referring to mountain LFA farms (*lfacdpa*) are negative, with two exceptions (i.e. permanent crop farms, where the coefficient for *lfacdpa* is not significant, and in horticulture farms, where the coefficient is significant but only at the 5% level). Thus, apart from the previously mentioned cases, the coefficients are lower in mountain LFA farms than in other farms showing that, in most of the cases, mountain LFA farms seem less able to transform the coupled payment into an increase of value added. This may occur because farms located in mountain LFAs face higher production costs than other farms: therefore, increasing the production of those activities receiving the payments requires a relevant increase of production costs. In other words, **it is likely that the distortive nature of coupled payments has a larger negative impact on farm economic results in mountain LFAs than in other areas**.

A different situation occurs for decoupled direct payments. In most cases decoupled direct payments seem to be more effective in contributing to increase farm value added in mountain LFA farms than in farms located in other areas. Indeed, the estimated coefficients for decoupled direct payments in mountain LFA (*lfaddpa*) are positive in five models: milk, other grazing livestock, granivores, mixed farms, whole sample. The three other models, however, gave different results: the estimated coefficient is not significant in the case of horticulture and permanent crop farms and is negative in the case of field crop farms.

6.4.4 Effects of direct payments on farm income stability

The results suggest differentiated income variability depending on farm location. The analysis, however, presents mixed results: income variability is higher in LFAs/mountain LFAs in farms specializing in field crops, other permanent crops and granivores. *Vice versa*, dairy farms as well as those specializing in other grazing livestock and mixed farming are characterized by higher income volatility in non-LFAs.

The analysis shows sensibly larger effects of direct payments on income stability in LFAs in comparison to non-LFAs. The analysis by region shows that, direct payments appear to contribute considerably to the stability of incomes in mountain LFAs of certain regions, notably Finland[84] (field crops, milk and other grazing livestock), FR Centre Est (other grazing livestock and mixed farming), Portugal (mixed farming) and various Italian regions in different sectors.

The comparison between farms located in mountain LFAs and in non-LFAs at sector level does not produce homogeneous results, either because direct payments do not appear to have any income stabilising effects (i.e. other permanent crops) or they do not have larger stabilizing effects on LFAs and mountain LFAs in most regions (i.e. milk), or they have very similar effects in both LFAs and non-LFAs (i.e. granivores), or they have a higher income stabilising effect in mountain LFA areas (i.e. field crops).

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[83] This result can occur because the tests for the joint significance of the coefficients and for the significance of each coefficients are different in nature (Wooldridge, 2009).

[84] The whole of Finland is designated as LFA. The areas of Finland north of the 62nd parallel are designated "mountain LFA".

	Income variability and effect of direct payments on income stability
Field crops	Income variability is generally higher in LFAs and mountain LFAs compared to non-LFAs (exception of FR Centre-Est). In Portugal and Spain there does not appear to be a difference in the income variability between LFA and non-LFA regions. The regions showing sensibly higher income volatility in mountain LFAs are IT Nord-Est, GR North and ES Noreste. The largest direct payments' effect on income stability is found in the mountain LFAs of Finland. Direct payments weigh remarkably more in mountain LFAs compared to non-LFAs in Italy (Nord-Est, Centro and Isole), ES Noreste and Austria. German regions show a large effect of direct payments in LFAs compared to non-LFAs. The stabilizing effect of direct payments is larger in non-LFAs compared to LFAs in GR North, and compared both to LFAs and mountain LFAs in IT Nord-Ovest and ES Centro.
Other permanent crops	Income variability is sensibly higher in LFAs (total or mountain) compared to non-LFAs in the southern Mediterranean regions specialised in olives and citrus fruit: GR Centre-South, IT Centro and Sud, ES Sur. In these regions, however, direct payments do not appear to have a noticeable income stabilizing effect.
Milk	The regions showing higher income variability in LFAs and mountain LFAs are those of Southern Italy, ES Noreste, Sweden and Northern Ireland. However, there are only few regions where variability is sensibly higher in LFAs (IT Isole, Sweden, UK Scotland and Northern Ireland). In many other regions, vice versa, farmers incomes appear less stable in non-LFAs (Austria, Belgium, Germany, Northern and Central regions of Italy, ES Este). In general, direct payments do not appear to greatly contribute to farmers' income stability in LFAs and mountain LFAs, with the exception of Finland and Sweden. In this sector, on the other hand, direct payments seem to have an negative effect on income stability in some of the examined regions (FR Est, IT Isole, PT Continente, ES Noroeste and Noreste).
Other grazing livestock	Incomes in farms specializing in other grazing livestock (i.e. beef, sheep & goat) seem to be on average more stable than they are in farms specialized in field crops. The coefficient of variation of FNVA/AWU with direct payments of farms located in LFAs or mountain LFAs is generally below 20% with few exceptions: IT Nord-Est (highly specialized in beef fattening), Sweden and ES Noroeste. Apart from IT Nord-Est and FR Bassin Parisienne, in a number of regions income variability is higher in farms located non-LFAs (IT Sud and Nord-Ovest, PT Continente, ES Noreste and Centro, England, FR Ouest). Direct payments seem to have a noticeable income stabilizing effect in farms located in the LFAs of Finland, most German regions, Northern Ireland, and some French regions.
Granivores	The highest level of income variability is found in the LFAs of IT Nord-Est, IT Sud and Germany (CVa > 30%) and in mountain LFAs of IT Nord-Est, IT Sud and Austria. The difference in income variability between non-LFAs and LFAs is noticeable in a number of regions. However, a differentiated effect of direct payments on income stability in LFAs and non-LFAs (CVb-CVa) can be seen only for two regions: DE South and North-West.
Mixed farms	The largest income variations in LFAs for this type of farming are found in Spain. In general, income variability appears to be contained between 10% and 20% (CVa). Income variability is higher in LFAs only in few regions (FR Est and Ouest, ES Este and Germany). In the remaining French regions, in all Italian regions, in Portugal, Scotland and Sweden we find higher income volatility for farms located in non-LFAs. Nonetheless, direct payments appear to have a stabilizing effect in some LFAs proportionately more than in non-LFAs (FR Bassin Parisienne, Est, Ouest and Sud-Ouest, Portugal and Germany).

6.4.5 Contribution of direct payments to the achievement of a fair standard of living for the agricultural community

In this section we analyse the ratio between FNVA/AWU and GDP/employee (average 2004-2007), with and without direct payments, for the LFA and the mountain LFA areas. In the light of the previous analysis it is not surprising that in all regions and across sectors, the farm income per AWU of LFA areas and of mountain LFA areas is, in general, lower in comparison to the GDP/employee. In 72% of cases (reaching 81.3% for mountain LFA regions), the average farm income per labour unit of LFA regions does not reach half of the reference GDP: the ratio (FNWA / AWU)/(GDP / employee) is comprised between 0.01 and 0.50 - and only in 2.7% cases the LFA average agricultural income (0.9% for mountain LFA areas) exceeds the regional GDP.

In the simulated situation (without direct payments), the average regional farmers' income would not reach half of the regional GDP/employee in in 89% of the LFA regions and in 91% of the mountain LFA regions. Concerning farms in non LFA areas, farm income not reach half of the reference GDP in 55% of regions, in 81% of regions in the simulated situation.

Fig. 39 - Distribution % of EU LFA regions by class of ratio FNVA/GDP per annual labour unit (avg 2004-2007), with and without direct payments

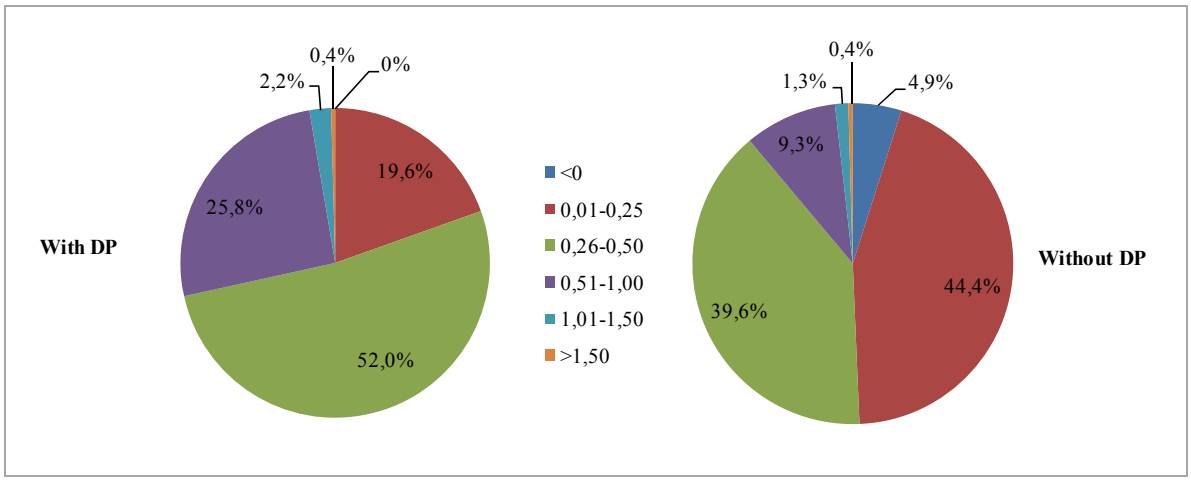


Fig. 40 - Distribution % of EU mountain LFA regions by class of ratio FNVA/GDP per annual labour unit (avg 2004-2007), with and without direct payments

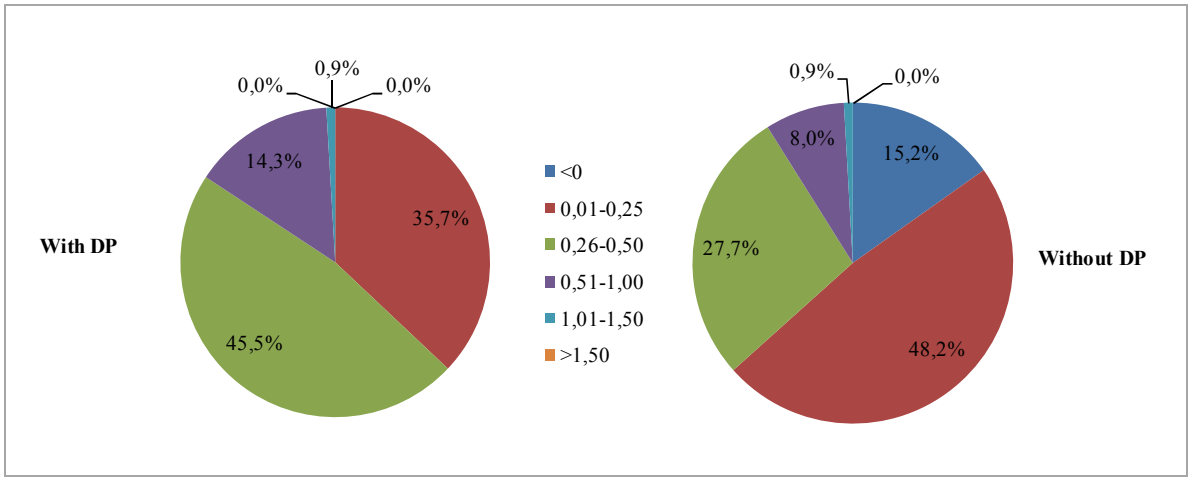
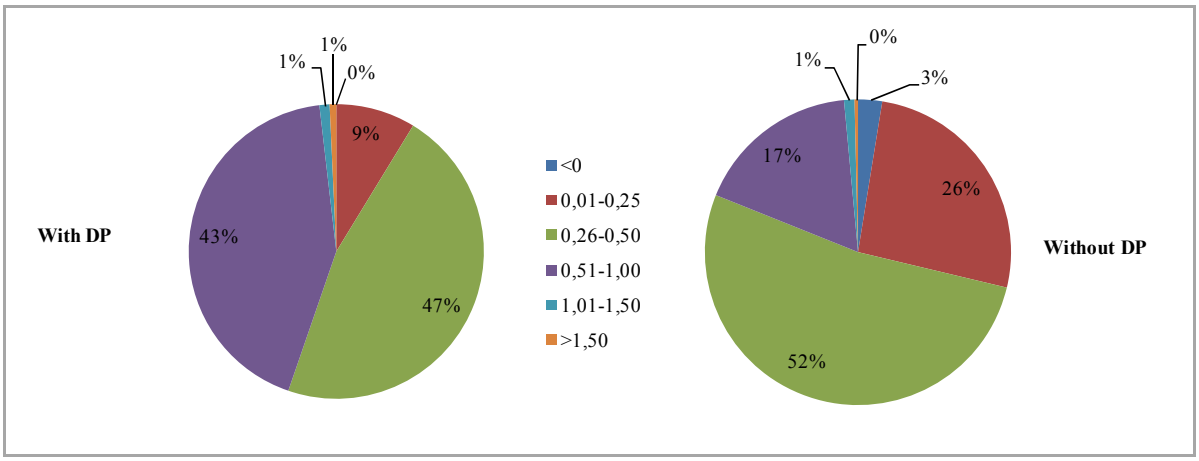


Fig. 41 - Distribution % of EU Non LFA regions by class of ratio FNVA/GDP per annual labour unit (avg 2004-2007), with and without direct payments



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3 and Eurostat

Concerning the **LFA areas**, the analysis by type of farming shows the extent to which direct payments contribute to reduce the gap between farm income and regional GDP:

- in the actual situation, the sectors that show the highest number of regions with a low ratio (class 0.01 – 0.50) are horticulture and other permanent crops;
- on the contrary the sectors with the highest number of regions with a ratio that goes above the half of the GDP (> 0.50) are: granivores[85] and field crops, respectively 45% and 40% of the regions. For which concerns field crops specialised farms, direct payments contribute largely to this result. In fact in the simulated situation the percentage of regions with a ratio > 0.50 would become 5%;
- the number of regions with an average farm income below half of the benchmark passes from 72% in the real situation to 89% in the simulated situation. This increase is particularly high for sectors most supported by direct payments: field crops specialised farms and mixed farms, followed by milk farms and other grazing livestock farms.

The situation of **mountain LFA areas**, does not presents significant differences respect the LFA areas, even if the situation is, for certain types of farming, more remarkable. Indeed:

- the sectors that show the highest number of regions with a low ratio (class 0.01 – 0.50) are again horticulture, followed by grazing livestock farms and by permanent crops and mixed farms.
- on the contrary the sectors with the highest number of regions with a ratio that goes above the half of the GDP (> 0.50) are: granivores (in a highest extend respect LFA areas - 63% of the regions - which is due to the production of pig farming for mountain ham production), milk farms (24% of the regions) and field crops (in a lesser extend respect the total LFA group of regions, 19% of the regions). Concerning milk farms and field crops specialised farms direct payments contribute largely to this result. In fact in the simulated situation the percentage of regions with a ratio > 0.50 becomes 14% in the case of milk farms and 5% in the case of field crops farms.
- in general in all sectors, the simulated removal of direct payments would have caused an increase from 81% to 91% of the number of regions with an average farm income below half of the benchmark. This increase is, however, less important than in the total LFA group of regions and the sectors that would loose more positions are field crops and milk farms.

With regards to **Non LFA areas**, again the sectors that show the highest number of regions with a low ratio (class 0.01 – 0.50) in the real situation are permanent crops and horticulture, followed by grazing livestock farms and by mixed farms. Conversely, sectors with the highest number of regions with a ratio that goes above the half of the GDP (> 0.50) are field crops (62% of the regions), followed by milk and granivores (both 60% of the regions. Concerning filed crops and milk farms the percentage of regions with a ratio > 0.50 becomes 18% in the case of field crops farms and 28% in the case of milk farms. Therefore, direct payments contribute largely to this result.

[85] Again, as already explained in § 5.5.2 and in § 6.4.1, specialised granivores farms, also in LFA areas, have in general an average income per AWU relatively higher respect other types of farming and do not benefit from DP for granivore specific activity.

Fig. 42 - Distribution % of EU LFA and mountain LFA regions by class of ratio FNVA/GDP per labour unit (avg 2004-2007), with and without direct payments, per type of farming

	Field crops		Horticulture		Permanent crops		Milk		Grazing livestock		Granivores		Mixed	
	Gross DP	Net DP	Gross DP	Net DP	Gross DP	Net DP	Gross DP	Net DP	Gross DP	Net DP	Gross DP	Net DP	Gross DP	Net DP
LFA AREAS														
<0	0,0%	7,5%	0,0%	0,0%	0,0%	0,0%	0,0%	7,1%	0,0%	7,1%	0,0%	0,0%	0,0%	5,1%
0,01-0,25	17,5%	57,5%	18,8%	25,0%	29,2%	45,8%	21,4%	38,1%	21,4%	38,1%	4,5%	13,6%	20,5%	69,2%
0,26-0,50	42,5%	30,0%	81,3%	75,0%	66,7%	54,2%	47,6%	40,5%	47,6%	40,5%	50,0%	45,5%	51,3%	20,5%
0,51-1,00	40,0%	5,0%	0,0%	0,0%	4,2%	0,0%	26,2%	11,9%	26,2%	11,9%	36,4%	31,8%	28,2%	5,1%
1,01-1,50	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	4,8%	2,4%	4,8%	2,4%	4,5%	4,5%	0,0%	0,0%
>1,50	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	4,5%	4,5%	0,0%	0,0%
MOUNTAIN LFA AREAS														
<0	4,8%	14,3%	14,3%	14,3%	0,0%	0,0%	4,8%	19,0%	0,0%	28,6%	0,0%	12,5%	5,6%	11,1%
0,01-0,25	23,8%	42,9%	14,3%	28,6%	43,8%	50,0%	42,9%	42,9%	47,6%	57,1%	0,0%	0,0%	44,4%	77,8%
0,26-0,50	52,4%	38,1%	71,4%	57,1%	50,0%	50,0%	28,6%	23,8%	47,6%	9,5%	37,5%	25,0%	44,4%	11,1%
0,51-1,00	19,0%	4,8%	0,0%	0,0%	6,3%	0,0%	19,0%	9,5%	4,8%	4,8%	62,5%	62,5%	5,6%	0,0%
1,01-1,50	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	4,8%	4,8%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
>1,50	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
NON LFA AREAS														
<0	0%	2%	0%	0%	0%	0%	0%	5%	0%	10%	0%	0%	0%	0%
0,01-0,25	4%	26%	16%	16%	9%	14%	5%	14%	18%	51%	0%	13%	11%	41%
0,26-0,50	34%	54%	59%	63%	77%	80%	35%	53%	41%	33%	40%	33%	48%	50%
0,51-1,00	60%	18%	25%	22%	14%	6%	60%	28%	41%	5%	47%	40%	41%	9%
1,01-1,50	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	7%	10%	0%	0%
>1,50	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	7%	3%	0%	0%

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3 and Eurostat

For each type of farming is highlighted the class with the highest number of regions

The comparison of the rankings of the LFA regions (in terms of FNVA/GDP) in the real situation and in the simulated situation, allows to identify the regions where direct payments covers the most the gap between farmers' income and the reference GDP. These regions are: the French regions (mainly in the cases of field crops, milk, other grazing livestock, and mixed farms), Finland (field crops, horticulture and mixed farms), Germany (field crops, other grazing livestock), Hungary (other permanent crops, other grazing livestock, granivores), Lithuania (filed crops), Latvia (milk, granivores), Malta (granivores) , Scotland (other grazing livestock and mixed farms), Sweden (field crops and other grazing livestock), Spain (other permanent crops and mixed farms), England and Wales (other grazing livestock).

The changes (actual situation vs. simulated situation) in the ranking of the mountain LFA regions would have concerned mainly other grazing livestock sector. In particular Czech Republic, ES Noreste, FR Sud-Ouest, FR Centre-Est and Finland are the ones losing more positions in the simulated situation. Furthermore, ES Noreste and FR Centre-Est lose also positions for which concern mixed type of farming.

In conclusion, the comparison between the actual situation and the simulated situation without direct payments allows to conclude that,direct payments contributed to reducing the gap between average farmers' income in farms located in LFA area and in the subgroup of mountain LFA areas and the regional GDP per employee. Non LFA regions show also a situation of lowest income respect the regional GDP but less critical compared with the situation of LFA areas and mountain LFA areas.

6.4.5.1 Family farm income from an opportunity-cost perspective

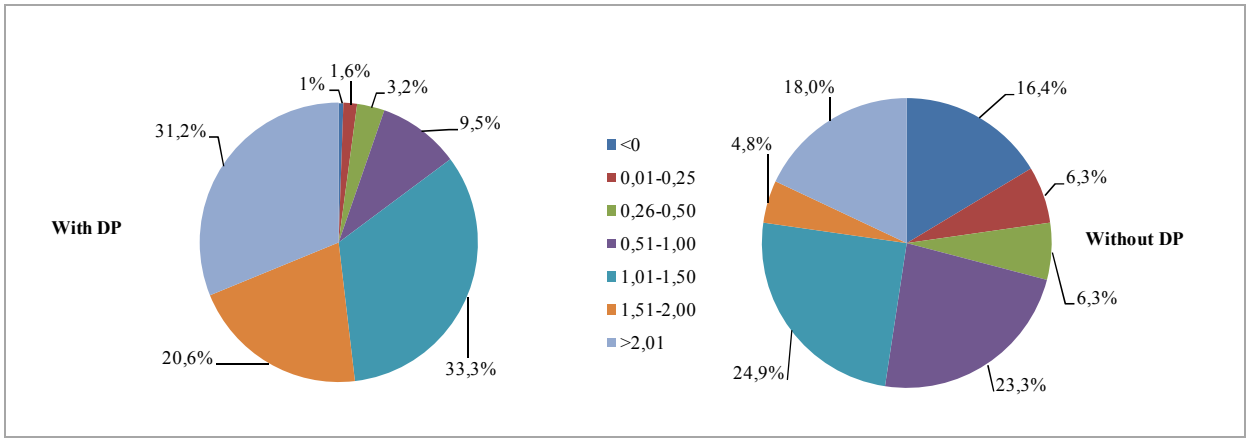
This section aims at assessing to what extent direct payments allow family farm units to reach an income (FFI/FWU) at least equal to theaverage wage of farm employees. In the analysis of the results it is important to bearing in mind the considerations about FFI (see 5.5.5.1) related to the fact that it includes also the return on capital and profit.

For the same reasons already illustrated in § 5.5.5.1, the analysis must distinguish between EU15 and EU12.

The analysis highlights that in the set of EU15 non LFA regions, all sectors considered, the average regional farm income per family labour unit (2004-2007) is higher than the average wage of farm employees in 85% of regions and that in 52% of regions the ratio (FFI/FWU)/ average wage of farm employees is higher than 1,5.

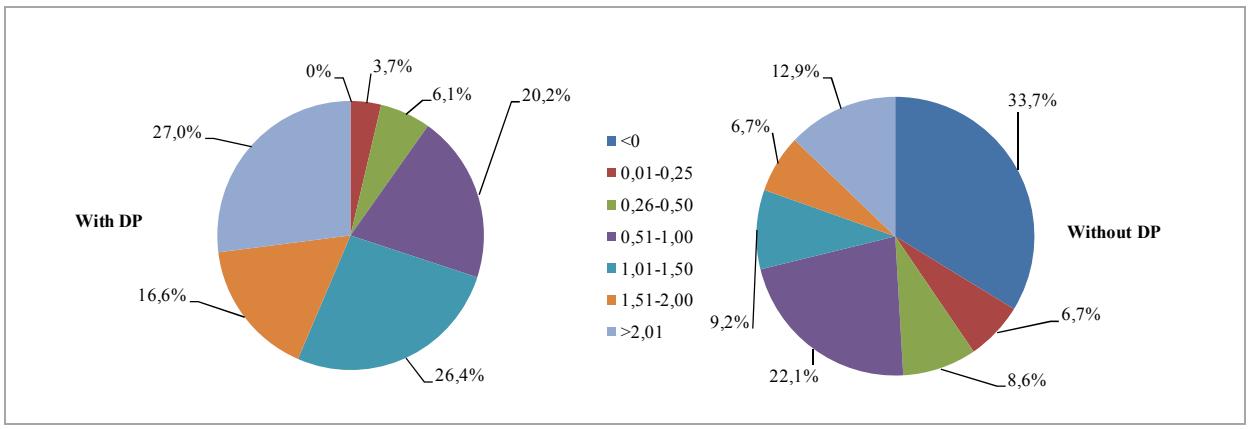
In the LFA regions the farm income per family labour unit is higher than the average wage of farm employees in 70% of regions and that in 44% of regions the ratio (FFI/FWU)/ average wage of farm employees is higher than 1,5. Conversely, there are 30% of the regions for which the average family farm income does not attain the average wage of farm employees[86].

Fig. 43 - Distribution % of EU15 Non LFA regions by class of ratio FFI/ average wage of farm employees (avg 2004-2007), with and without direct payments



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3, Eurostat

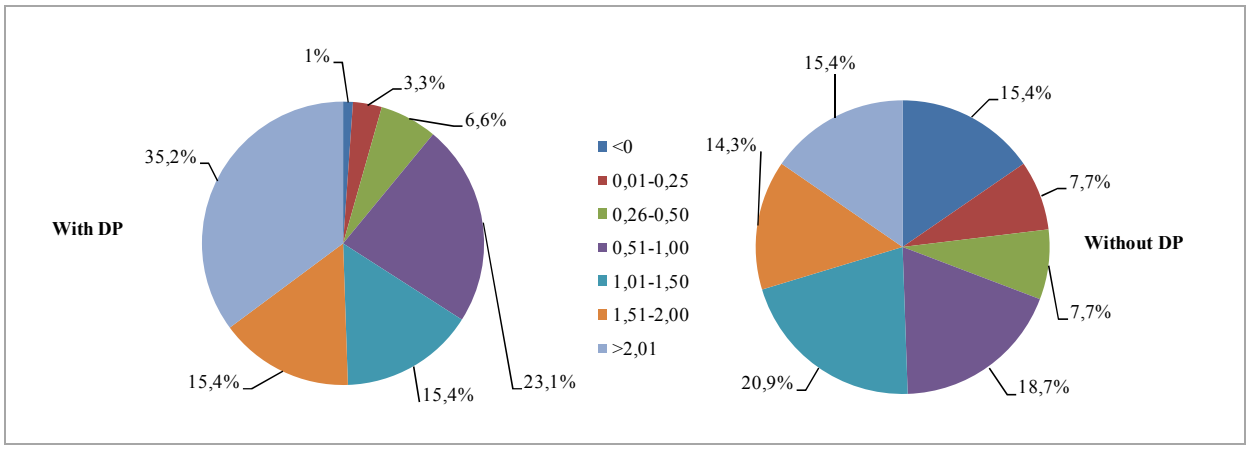
Fig. 44 - Distribution % of EU15 LFA regions by class of ratio FFI/ average wage of farm employees (avg 2004-2007), with and without direct payments



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3, Eurostat

[86] At sector level the analysis shows that in the other grazing livestock sector, 52% of the regions exceeds the benchmark and only 6% does it if we simulate the removal of direct payments; in field crops and mixed sectors only 15% of regions would show a family farm income exceeding the regional average wage of farm employees and in the milk sector only 26% of the regions.

Fig. 45 - Distribution % of EU15 mountain LFA regions by class of ratio FFI/ average wage of farm employees (avg 2004-2007), with and without direct payments



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3, Eurostat

The situation is quite similar in the subgroup mountain LFA areas, where the average farm income per family labour unit is higher than the average wage of farm employees in 66% of regions and in 30% of regions the ratio is higher than 1,5.

In the set of EU12 non LFA regions family farm income is higher than the remuneration of farm workers in 79% of the cases (all types of farming considered) and in 72% of the cases the ratio is more than the double. In the LFA regions, family farm income is higher than the remuneration of farm workers in 70% of the cases and in 51% of the cases the ratio is more than the double. If we consider the subgroup mountain LFA regions, only in 38% of the cases the family farm income is higher than the regional average wage of farm employees[87].

In the simulated situation (2004-2007, farm income ciomputed by deducting direct payments), if we consider EU15 LFA regions only 29% of regions would reach the benchmark (-41 percentage points respect the real situation), and only 51% in the EU15 subgroup mountain LFA[88]. In the non LFA regions, 48% of regions would be able to have a family farm income reaching the paid agricultural wages.

In the EU12 non LFA regions 40% of regions in the simulated situation would not reach the benchmark. In LFA regions, in 65% of regions the family farm income would not reach the regional average wage of farm employees, and the EU12 subgroup mountain LFA[89] areas show a dramatic decrease of the number of regions having a family farm income higher than the average wage of farm employees: only in 5 % of the cases the ratio would be greater than 1.

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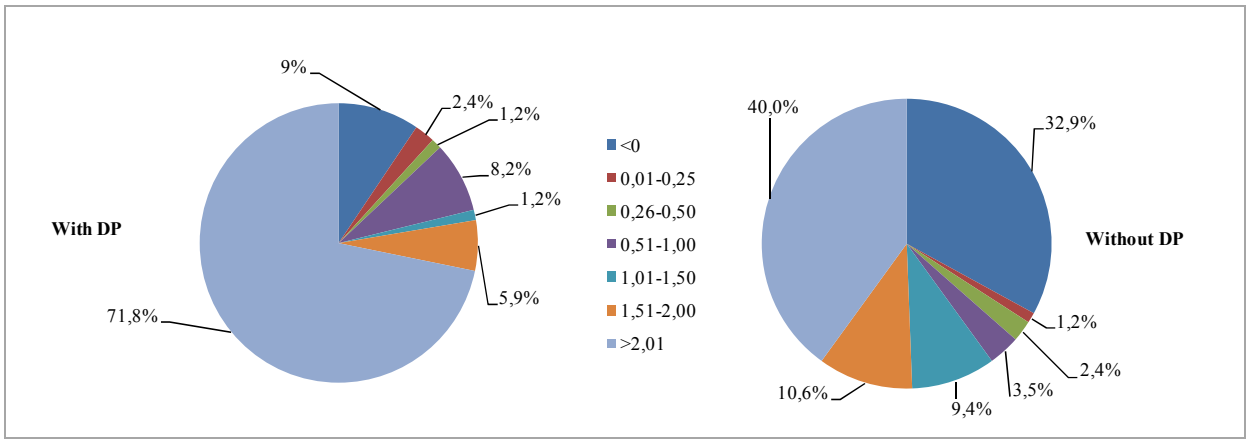
87 At sector level the analysis shows in mixed sector 82% of the regions would not reach the benchmark against 27% in the situation with direct payments; in filed crops and other grazing livestock sectors we would pass from 30% of the regions presenting a family farm income lower than the regional average wage of farm employees to 70%.

88 Concerning mountain LFA areas in the EU15 Member States, the sectors that would mainly be affected by the removal of direct payments are other grazing livestock and mixed which would show a increase of the number of cases with a ratio lesser than 1: from 41% of the regions to 65% in the grazing livestock sector and from 38% to 68% of the regions in the mixed sector. It is worth to mention that in mountain LFA areas the removal of direct payments have a more limited effect respect to LFA areas on the ratio (FFI/FWU)/ average wage of farm employees.

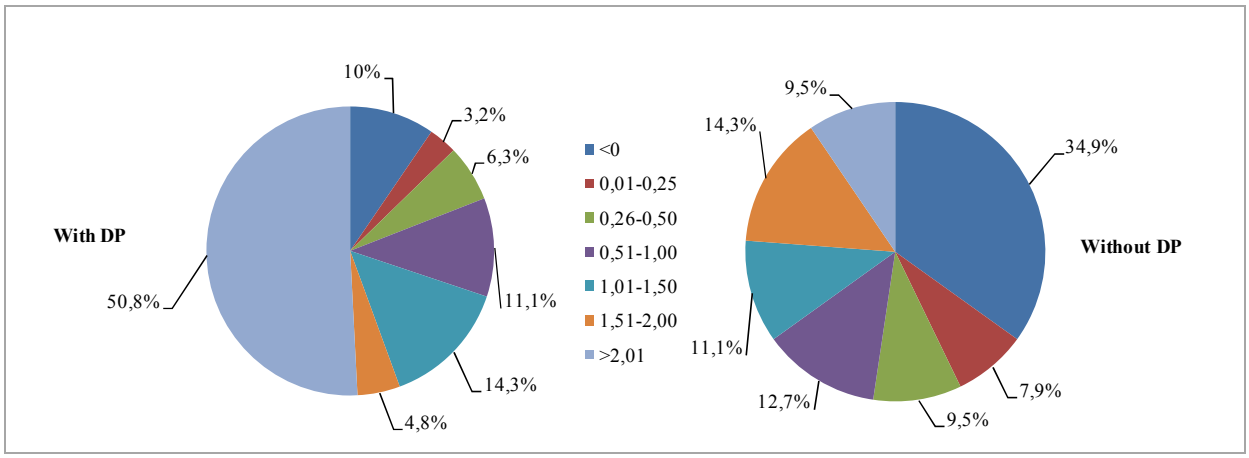
89 The simulated situation at sector level shows a strong situation in the EU12 mountain LFA areas. In fact, 80% of the regions of the field crops sector and 100% of the regions of milk, other grazing livestock mixed sectors would present a family farm income lower than the average wage of farm employees.

Fig. 46 - Distribution % of EU12 Non LFA regions by class of ratio FFI/ average wage of farm employees (avg 2004-2007), with and without direct payments



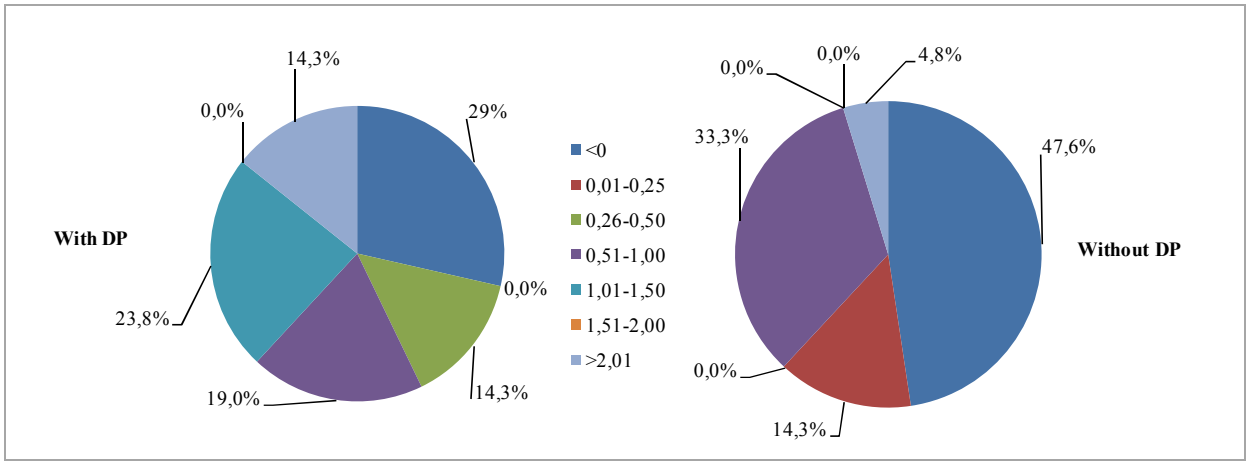
Source: Elaborations based on sample data EU-FADN-DG AGRI L-3, Eurostat

Fig. 47 - Distribution % of EU12 LFA regions by class of ratio FFI/ average wage of farm employees (avg 2004-2007), with and without direct payments



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3, Eurostat

Fig. 48 - Distribution % of EU12 mountain LFA regions by class of ratio FFI/ average wage of farm employees (avg 2004-2007), with and without direct payments



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3, Eurostat

In conclusion, we can affirm that direct payments have largely contributed to allow family farm units of all the three analysed areas to reach an income (FFI/FWU) at least equal to labour opportunity cost, to a larger extent in LFA and in the subgroup mountain LFA areas compared to non LFA areas.

6.5 Effects of direct payments on the income of farmers according to organisational form of holdings

The analysis was conducted on the average FNVA/AWU (expressed in PPS), period 2004-2007 for EU25, and 2007-2008, estimated for Romania and Bulgaria, in the real situation (with direct payments) and in the simulated situation (without direct payments).

Before showing the results of the analysis, we believe it is necessary to briefly illustrate existing relations between the organisational form and the average workforce per farm. In all types of farming and all groups of Member States (EU15 and EU12) the average number of AWUs per farm grows when passing from Individual form to Partnership and from Partnership to Other types. It is noted that this growth is particularly relevant for the EU12 Member States.

Apart from the (average) farm income levels of the three organisational forms in the different sectors, the findings of the analysis highlight some interesting points which, taken horizontally, can almost be defined as canonical rules. In particular:

- For the EU15 in all sectors the average income of individual farms is lower than the average level of farms organised as partnerships, and the average level of income of farms organised as partnerships is lower than farms having other types of organisational form. The ratio between the average income of farms having other types of organisational forms and individual farms is 1.50 for fields crops; 1.58 for horticulture; 1.47 for permanent crops ; 1.60 for milk farms; 2.02 for grazing livestock ; 1.79 for granivores; 1.64 for mixed farms. From these results we can say that in the other types of organisational form the dimension of the labour factor is optimised in relation to farm activities, resulting in a higher level of efficiency. On the other hand, it may be said that in individual farms the dimension of the labour factor is excessive, and efficiency lower (with a consequent lower income per labour unit). Partnerships are between these two situations.

- For the EU12 the situation is completely different: in the other types category the FNVA/AWU value is a little below or above the average level attained by Individual farms. The ratio between the farm income levels of other forms and Individual farms is 0.54 in the case of granivores; 0.80 for horticulture; 0.84 for permanent crops; 0.86 for milk; 1.06 for field crops; 1.26 for mixed farms. These results lead to state that, in the case of horticulture, permanent crops, milk and above all granivores, in the (large) Other type farms there is evidence of surplus labour, leading to a lower average value of farm income per unit of labour

- For the EU15, the loss of farm income per labour unit following the simulated removal of direct payments is always greater in individual farms and always lower in farms having other types of organisational form (farms organised as partnerships lie somewhere in-between). Indeed in the simulated situation, the ratios for horticulture, permanent crops and granivores sectors would remain almost the same. In the other types of farming, the ratios between the average income of farms having other types of organisational form and individual farms become 1.67 for fields crops; 1.84 for milk farms; 2.28 for mixed farms; 3.85 for grazing livestock

- For the EU12, in the simulated situation (by deducting direct payments from the average FNWA/AWU for period 2004-2007) the ratio of farm income levels between farms having other types of organisational forms and individual farms would be worse for granivores (0.39) and for milk specialised farms (0.74), but remain similar for all other sectors considered

The observations made for average levels (EU15 and EU12) are confirmed in the regional analysis. The table below gives the regions where:

- the FNVA/AWU level of Partnerships is greater (1) or less (0) than that of Individuals
- the FNVA/AWU level of Others is greater (1) or less (0) than that of Partnerships
- the FNVA/AWU level of Others is greater (1) or less (0) than that of Individuals.

Tab. 28 - Regions where the FNVA/AWU level is: Partnership > Individual, Other > Partnership, Other > Individual. Regions where the opposite is true

		TF1			TF2			TF4			TF5			TF6			TF7			TF8		
		Partner > Indiv	Other > Partner	Other> Indiv	Partner > Indiv	Other > Partner	Other> Indiv	Partner > Indiv	Other > Partner	Other> Indiv	Partner > Indiv	Other > Partner	Other> Indiv	Partner > Indiv	Other > Partner	Other> Indiv	Partner > Indiv	Other > Partner	Other> Indiv	Partner > Indiv	Other > Partner	Other> Indiv
SPS Historical	BE Reg. Flamande				1																	
	FR B. Parisienne	1	0	0	1						1			1						1		
	FR N. Pas-de-Calais	1									1									1		
	FR Est	1									1			1						1		
	FR Ouest	1			1						1			1			1			1		
	FR Sud-Ouest	1			1			1			1			1						1		
	FR Centre-Est	1						1			1			1						1		
	FR Méditerranée	1			1			1						1								
	IT Nord-Ovest	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
	IT Nord-Est	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1
	IT Centro	1	0	1			1	1	1	1				1	1	1	1			1	1	1
	IT Sud	1	1	1			1	1		1			1	1	1	1				1	0	1
	IT Isole	1	0	1	1	1	1			1	1			1	1	1	1					
	NL Netherlands	1			1	1	1	1			1			1			1	1	1	1		
	PT Continente		1	1			1			1			1			1						1
	ES Noroeste										1	1	1									
	ES Noreste	1									1			1			1					
	ES Este							1	0	0	0											
	ES Centro		1	1			1		1	1						1						0
	ES Sur	1	1	1			1			1	1											
SPS Hybrid	DK Denmark			1			1						1					1	1			1
	FI Finland				1																	
	DE North-West	1									1									1		
	DE West	1									1									1		
	DE South	1			1						1						1			1		
	DE East & N-E	1	0	0							1	0	0			1				1	0	1
	SE Sweden	1									1									1		
	UK England			1			1			1									1			
	UK N. Ireland										1			0								
SAPS	BG Sev. I Izt.									0												
	BG Yug. Yuz. Centr.			1			1			0												
	CZ Czech Rep.			0									0			0			1			0
	EE Estonia			1									1									1
	HU Dunántúl			0						1									0			0
	HU Alföld és Észak			0						0			0						0			0
	LT Lithuania			0																		0
	LV Latvia			0									0						1			0
	PL West			0																		1
	RO Macror. Doi			0																		
	RO Macror. Trei			1																		
	RO Macror. Patru			1																		
	RO Macror. Unu			1																		
	SK Slovakia			0												0						0

1 The condition analysed occurs

0 The condition analysed does not occur

The only case in which a systematic exception appears (i.e. the exception occurs in all sectors of the region for which data are available) is DE East & North-East (region of the former DDR), where the structure and characteristics of farms are more similar to those of most EU12 Member States.

6.5.1 Effects of direct payments on farm income stability

The analysis shows that income variability often differs between individual farms, partnerships and other types of holdings. However, there does not seem to be a pattern by which income variability is consistently higher (or lower) in one of the three groups.

A closer examination by type of farming shows that in many regions, differences in the level of income variability across the three types of farm organisation are generally small, with some exceptions:

- Field crops: in Sweden individual farms are characterized by higher income variability, whereas in IT Isole income variability is sensibly higher in partnerships.
- Other permanent crops: in the region IT Sud farmers' incomes appear sensibly less stable in farm partnerships than in other two types, whereas in ES Centro individual farms suffer from less stable incomes.
- Milk: Germany presents a rather heterogeneous situation, with noticeably lower income stability in individual farms of DE North-west and South and in partnerships of DE East & North-East. On the other hand, in IT Nord-Ovest income stability is lower in the other types of farm.
- Other grazing livestock: Farmers' income is less stable in individual farms of FR Est and in partnerships and other farms in IT Isole.
- Granivores: the only noticeable difference in income variability across farm organisational types is found in the Netherlands, with higher variability in other types of farm.
- Mixed farms: income stability is much lower in partnerships compared to individual farms in IT Centro.

In general, **direct payments appear to have a larger income stabilizing effect in Individual farms and Partnerships, compared to the Other farm type** (albeit, the Other type of farm organisation is less common across regions and sectors). This is true, in particular, across French regions and in DE East & North-East for farms specializing in field crops (only Partnerships), milk and other grazing livestock and in mixed farms. Further differences in direct payments effects can be found between Individual farms and Partnerships in specific sectors. Overall, direct payments seem to have a relatively more important income stabilizing effect on Individual farms in the dairy, other grazing livestock and mixed sectors.

6.5.2 Contribution of direct payments to the achievement of a fair standard of living for the agricultural community

The previous analysis has highlighted the existing difference between EU12 regions and EU15 regions, showing an opposite position between Individual farms (income relatively lowest in the EU15 and relatively highest in the EU12) and Other farm types (income relatively highest in the EU15 and relatively lowest in the EU12). These differences are reflected also in the analysis of the ratio between average farm income per labour unit and regional GDP per employee. .

Fig. 49 - Distribution % of EU regions by class of ratio FNVA/GDP per labour unit (avg 2004-2007), with and without direct payments, per organisational form and group of Member State

Ratio FNWA/GDP		Individual		Partnership		Other types	
		With DP	Without DP	With DP	Without DP	With DP	Without DP
EU 15	<0	0,0%	1,9%	0,0%	1,0%	0,0%	0,0%
	0,01-0,25	10,4%	42,2%	1,0%	20,0%	1,6%	9,8%
	0,26-0,50	61,1%	44,5%	41,0%	55,0%	18,0%	36,1%
	0,51-1,00	27,0%	10,4%	55,0%	22,0%	68,9%	50,8%
	1,01-1,50	1,4%	0,9%	3,0%	2,0%	9,8%	3,3%
	> 1,50	0,0%	0,0%	0,0%	0,0%	1,6%	0,0%
EU 12	<0	0,0%	0,0%			2,3%	2,3%
	0,01-0,25	28,6%	41,8%			22,7%	36,4%
	0,26-0,50	37,4%	44,0%			47,7%	54,5%
	0,51-1,00	30,8%	12,1%			27,3%	6,8%
	1,01-1,50	3,3%	2,2%			0,0%	0,0%
	> 1,50	0,0%	0,0%			0,0%	0,0%

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3, Eurostat

Concerning the EU15 regions (all sectors), in 72% of regions the farm income per working unit of the individual farms does not reaches half of the GDP/employee. In the simulated situation, without direct

payments, it would became 87% of regions (in 42.2% of regions would not even reach one fourth of the GDP/employee). The analysis shows also that in some EU15 regions, in particular for farms having other types of organisational form, direct payments seem to have an over-compensation effect, pushing the value of the ratio above the unity.

Conversely, in the majority of the EU12 regions, the farms having other types of organisational form record the lowest ratio between farm income and GDP/employee: in 72.2% of regions, the farm income per labour unit does not reaches the half of the reference GDP/employee (93.2% of regions in case of removal of the direct payments).

6.6 Evaluation judgement

This part of the evaluation question 1 invited to investigate whether direct payments contribute to enhancing and stabilizing farmers' income in a differentiated way according to the farm location and to the organisational form of holdings and thus contribute to achieve a fair standard of living.

A. Farm location

For this typology, the analysis is based on the comparison between farm income per labour unit in three groups of areas: the first group considers all farms located in non LFA areas, the second group considers all farms located in LFA areas and the third group is a sub-group of the second and it considers only farms located in mountain LFA areas. This comparison should allow to investigate whether direct payments contribute to reduce the gap between LFA and non LFA farmer's income.

In the first instance, the comparison (FNVA/AWU, net of the compensatory allowance) has highlighted that, at EU level on average in the period 2004-2007, the level of the income of farmers located in LFA and in mountain LFA areas is lower than non LFA farmers' income: respectively around -12% and -19%.

On the basis of the results of the simulation without direct payments, we can conclude that:

- In the analysed period (2004-2007), the income of farmers located in LFA areas and the income of farmers located in the subgroup mountain LFA areas, apart from some exceptions, are more dependent on direct payments than the income of farmers located in non LFA areas. Indeed, the simulated removal of direct payments would have led to an increase of the gap between farmers' income of LFA areas and farmers' income of non LFA.
- Therefore, direct payments have reduced the existing differences between farmers' income in non LFA areas and in LFA areas and the subgroup of mountain LFA areas.
- Concerning farmers' income of the subgroup mountain LFAareas, in the simulations (without direct payments) the gap with non LFA farmers' income would have remained almost the same. It seems that farmers' income in LFA areas other than mountain areas, are in general more sensitive to direct payments. However, this result, obtained at EU27 level, can be influenced by the fact that the subgroup mountain LFA is more represented in EU15 Member States (higher average income) than in EU12 Member States (characterised mostly by LFA areas with the lowest incomes).

Direct payments appear to have contributed more to income stability in LFAs than in non-LFAs, in particular, in the types of farming most supported through direct payments: for farms specialised in field crops, other grazing livestock and in mixed farms 50% or more of the analysed regions show an increase of the coefficient of variation in the absence of direct payments that is larger in LFAs and/or mountain-LFAs compared to non-LFAs. On the other hand, in farms specialised in granivores and other permanent crops, direct payments do not generally appear to have an important effect on income stability and, therefore, neither when farms are distinguished according to LFA location. Concerning the subgroup mountain LFA areas the analysis does not produce homogeneous results.

The analysis of the net effects of direct payments performed by means of the econometric models suggests that:

- The coefficients estimated (i.e. provides an estimate on how one additional Euro spent on direct payments translates in an increase of farm income) for coupled payments are often lower in mountain-LFA farms than in the other farms, especially in the most recent dataset (2007), suggesting that this type of payments are relatively less effective in mountain-LFA than in the other farms. The relative low effectiveness of coupled payments could be explained by the fact that production costs in this group of farms are generally higher than in the other farms. Therefore, because farmers have an incentive to increase the production level in order to increase the amount of coupled payments, this generates a large increase in production costs. In particular, this occurs when farmers, in order to obtain coupled payments, produce even if this would be unprofitable in the absence of payments. In this case, while the coupled payment makes the production profitable, part of the payments does not translate into an increase of farm income.
- Moreover, the level of the decoupled payments coefficients is generally higher in mountain-LFAs.
- Consequently and bearing in mind also the results of EQ1, these results suggest that decoupled payments have been more effective than coupled payments in supporting farm income in mountain LFAs.

The comparison of average farm income per labour unit with regional GDP/employee reflects the findings related to the level of farmers' income. In fact in all regions and across all sectors the farm income per labour unit in LFA areas and in the subgroup mountain LFA areas is lower compared to the regional GDP per employee. Non LFA regions show also a situation of lower income compared the regional GDP, but a less critical one compared with the situation of LFA areas and mountain LFA areas.

These results allow us to conclude that direct payments have contributed to reducing the gap between average farmers' income in farms located in LFA area and in the subgroup of mountain LFA areas and the regional GDP per employee.

B. <u>Organisational form of holdings</u>

The analysis of the effects of direct payments on the level of the income of farmers according to the organisational form of holdings (individual farms, partnerships and farms having other types of organisational form) was conducted on the average 2004-2007 (2007/08 estimated fo Romania and Bulgaria) of FNVA/AWU with and without direct payments. The analysis allows us to conclude that:

- In the EU15 regions (on average), the farm income of individual farms is more dependent on aid than that of the other two organisational forms. The calculations made by deducting direct payments indicate that in this simulated situation the income gap between different types of farm organisation would have been wider than the actual one.
- In EU12 regions, the situation appears to be the exact opposite: the loss of farm income per unit of labour following the simulated removal of direct payments would have been greater in farms having other types of organisational form compared to individual farms and partnerships.

These conclusions must be combined with the analysis of the average workforce per farm, that shows that in the EU15 in the farms having other types of organisational form the size of the labour factor is optimised in relation to farm activities, resulting in a higher level of efficiency. On the other hand, in the EU12 in the same category there is an evident surplus of labour.

The analysis of farm income stability showed that it there does not seem to be a pattern by which income variability is consistently higher (or lower) in one of the three groups. However, in general, direct payments appear to have had a larger income stabilizing effect in individual farms and partnerships compared to the farms having other types of organisational form.

7. TO WHAT EXTENT HAVE THE DIRECT PAYMENTS CONTRIBUTED TO SUPPORTING ECONOMIC VIABILITY OF FARMS? (EQ 2)

7.1 Comprehension and interpretation of the evaluation question

This evaluation question requests an assessment of the extent to which direct payments have contributed to supporting the economic and financial viability of EU farms.

A farm can be considered viable when it is able to guarantee a "sufficient remuneration" of family labour and farm capital. Two aspects have been taken into account:

- economic viability: the ability to guarantee remuneration of family labour at least equal to its opportunity cost, and a positive remuneration of farm capital;
- economic and financial viability (considered together): the ability to guarantee, besides the remuneration of family labour, the remuneration of farm capital at least equal to the average interest rate applied to medium-term loans.

It is important to note, however, that the definition of economic viability may significantly differ depending on the type of organisation of farm resources. For example, the remuneration of farm family labour may be relatively more important in the case of family farms where most of the labour needed is provided by family members and, *vice versa*, less important in farms that mostly employ hired labour.

7.2 Methodological approach, data sources and limits

Economic viability has been analysed by using the following aspects:

- A farm can be considered economically viable if the level of earnings before interests and taxes (EBIT) guarantees the profitability of capital. One of the most commonly used indicators for this purpose is the Return on Investment (ROI). The ROI measures as a percentage the economic return of globally employed capital. In absolute terms, for a farm to be viable, the ROI must be greater than zero.
- A farm can be considered viable from an economic point of view if its net income (i.e. family farm income net of the cost of family labour) makes it possible to adequately remunerate the farm's assets. One indicator to measure it is the Return on Assets (ROA), calculated as the share of farm net income over total farm assets.

These indicators are calculated on the basis of FADN farm data.

The ROI is calculated as a ratio of Earnings Before Interest and Taxes (EBIT) and Total Assets (TA): ROI = EBIT/TA, where EBIT is calculated by deducting from Farm Net Value Added (FNVA) the following items: Wages paid (WP), Rent paid (RP), estimated Value of family labour (CFL). Accordingly: EBIT = FNVA – (WP+ RP + CFL).

In the same way, ROA is calculated as a ratio of Farm Net Income (FNI) and Total Assets (TA): ROA = FNI/TA. FNI is calculated by deducting from Family Farm Income (FFI) the estimated value of family labour (CFL). Accordingly: FNI = FFI – CFL . In practice, FNI = EBIT – (interest paid ±Balance subsidies & taxes on investments). It follows that ROA >ROI only when Balance subsidies & taxes on investments > interest paid.

The family labour value (CFL) of farms located in the region "*r*" has been estimated at the opportunity cost of the average wage of farm employees in the same region, obtained from the item Wages Paid of the sample of FADN farms (for the calculation of the average wage of farm employees, see EQ 1 §

5.2. In practice, for each region *r*: CFLr i = (WPr/paid AWUr)* Σ FWUri (i = farm located in region r). The average values were calculated for the period 2004-2007 for EU25, 2007-2008 (estimated) for Romania and Bulgaria. For the analysis of indicators prior to and after the reform (EU15) the periods considered are 2001-2004 and 2006/2007.

Estimates of the family labour value thus depend on the calculated values of average regional wages. These values are very uneven, and this fact needs to be borne in mind when looking at the results of analyses.

The analysis distinguishes among different farm typologies, identified on the basis of two main dimensions: 1) the type of farming, 2) the extent of family labour employment. In this respect, we sub-divided farm samples according to the percentage share of family labour over total labour (FWU/AWU):

- FWU/AWU <30%
- FWU/AWU between 30% and 70%
- FWU/AWU >70%

Economic and financial viability has been analysed by comparing farms' ROA (i.e. how profitable farms' assets are) with interest paid on loans. For a farm to be economically and financially efficient the ROA must be greater than, or at least equal to, the interest paid on loans.

To verify this condition the ROA was put into relation with Annualised Agreed Percentage Rates concerning loans granted in member States to non-financial corporations with maturity greater than 5 years. The ratio is calculated for the 2004-2007 average using the Eurostat sources. Information regarding UK, DK, LU, SE, MT, CY, LV and SK is not available. With regard to the UK it has been possible to replace Eurostat data with Bank of England data. For the regions of other Member States no calculations were done, and this constitutes a limit of the analysis.

7.3 Judgement criteria and indicators

In order to answer to this question, we based our judgment on the following criteria:

Criteria and indicators
Judgement criterion no. 1 **For the farm typologies examined and the observation period, direct payments have (have not) contributed to sustaining the economic and financial viability of EU farms**
Sign and magnitude of ROI - Return on Investments (average 2004-2007) with and without direct payments in the regions of EU27 with respect to: groups of regions, type of farming, share of family labour employment
Percentage distribution of EU27 regions by class of ROI (average 2004-2007), with and without direct payments
Analysis of composition of ROI: ROTO - Return on Total Output and TO/TA - Total Output/Total Assets (average 2004/2007)
Sign and magnitude of ROA - Return on Assets (average 2004-2007) with and without direct payments in the regions of EU27 with respect to: groups of regions, type of farming, share of family labour employment
Measurement of the relevance of the farm's net financial costs (interest paid ±Balance subsidies & taxes on investments): average percentage variation 2004/2007 of ROA in relation to ROI
Ratio between ROA with and without direct payments, with average interest rates paid on loans (IRL), with and without direct payments in the regions of EU27, average 2004-2007, with respect to: groups of regions, type of farming, share of family labour employment
Informed views of the experts

Judgement criterion no. 2 **In EU15 regions ROI and ROA have changed (have not changed) significantly in the period after application of the 2003 CAP reform**
Comparison of ROI average 2001-2004 and 2005-2007) with and without direct payments in the regions of EU15 with respect to: groups of regions, type of farming, share of family labour employment
Comparison of ROA (average 2001-2004 and 2005-2007) with and without direct payments in the regions of EU15 with respect to: groups of regions, type of farming, share of family labour employment

7.4 Effect of direct payments on Return on Investments

The analysis was first conducted at a global average level (EU27) and for the set of macroregions belonging to EU15 and EU12. For each of the seven sectors taken into consideration, average values for the period 2004-2007 were calculated, taking into account direct payments (actual situation) as well as the absence of direct payments (simulated situation).

It should be noted here (see EQ1) that in field crops, other grazing livestock and mixed sectors the incidence of direct payments on the formation of FNVA (and EBIT) is higher. On the other hand, in horticulture, other permanent crops and granivores the incidence is lowest. The situation for milk lies somewhere in the middle.

Tab. 29 - Average ROI values with and without direct payments, by type of farming and by group of Member States (average 2004-2007). Values in %

		TF1	TF2	TF4	TF5	TF6	TF7	TF8
EU 27	With DP	3,33	5,50	4,59	2,98	1,71	5,43	2,17
	Without DP	-1,49	4,93	3,23	0,13	-2,45	3,80	-2,44
EU15	With DP	2,81	5,40	4,74	2,89	1,68	4,94	2,30
	Without DP	-1,51	4,85	3,40	0,18	-2,50	3,83	-2,20
EU12	With DP	5,44	6,87	2,55	3,84	1,99	7,10	1,88
	Without DP	-1,40	6,00	0,99	-0,31	-1,82	3,69	-2,98

NB: types of farming where incidence of direct payments is highest

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

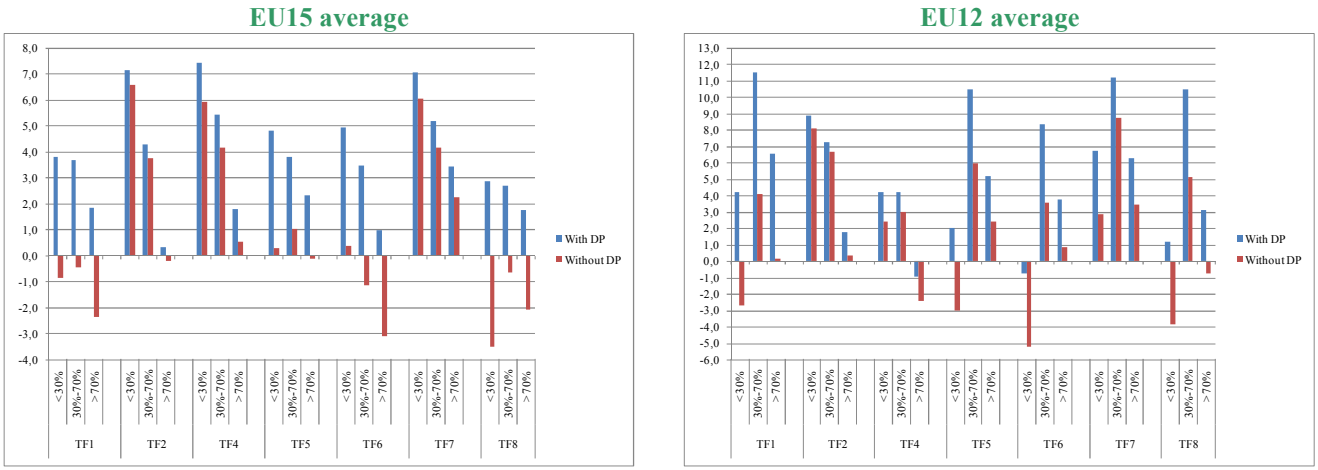
On average, the ROI level in the real situation (with direct payments) is generally rather low: only in the case of granivores in the EU12 does it exceed 7%. Nevertheless (on average), although the value of unpaid labour (family labour) has been considered as a cost (estimated at opportunity cost), the ROI never takes negative average values.

Average ROI values are significantly lower in sectors where the share of direct payments is the highest (and vice versa). In other words, there is an inverse relationship between the level of share of aid and ROI levels. On average, consequently, in field crops, other grazing livestock and mixed sectors (but also granivores) the high level of direct payments plays a key role in the economic viability of farms, even though it does not allow reaching results such as those obtained by the set of other sectors.

In the absence of direct payments (simulated situation), in all sectors having a high incidence of direct payments the average ROI becomes negative (field crops, other grazing livestock and mixed sectors) or very close to zero (granivores in EU15). **Accordingly, on average, in these sectors the simulated removal of direct payments would have caused farms to have economic results that would not allow an adequate profitability of invested capital and remuneration of family labour at opportunity cost**. **In other words (on average), for farms in these types of farming, direct payments appear to be necessary to ensure the economic viability of farms.** On the other hand, as might be expected, in sectors that are less dependent on direct payments average ROI values would remain positive, albeit at lower levels than the actual situation.

Secondly, the analysis was conducted (based on EU15 and EU12 averages) for three types of farms depending on the level of unpaid labour used on the farm. In particular, the type with FWU/AWU <30%; type with FWU/AWU 30-70%; type with FWU/AWU >70%. In this case too the analysis was conducted on the actual situation (with direct payments) and the simulated situation (without direct payments).

Fig. 50 - ROI values with and without direct payments, by type of farming and by farm type according to FWU/AWU class: EU15 and EU12 averages in period 2004-2007 (%)



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

Findings allow us to add some other considerations to what has already been stated above.

For the set of regions belonging to EU15 there seems to be a general rule (i.e. relating to all sectors) according to which the ROI level is inversely proportional to the FWU/AWU ratio. In other words, in farms where the family component is higher (and the farm size is lower; cf § 5.5.2), the ROI value is generally lower than that of farms where the family component is more limited (and the farm size is larger; cf 5.5.2).

In types of farming where economic results are less dependent on direct payments, the average ROI level of farms with FWU/AWU <30% reaches or exceeds (on average) 7%. Nevertheless, the difference between average ROI values in farms with lower (<30%) and higher (>70%) share of family labour is quite high (i.e. in TF2 the average ROI level of farms with FWU/AWU >70 is a little above zero).

In sectors in which economic results are more dependent on direct payments, the average ROI values of farms with FWU/AWU <30% are lower than those of the previous type of farming group, but differences between average ROI values of the three farm types are more modest (although the possible removal of direct payments would affect to a greater extent those farms making a greater use of family labour, with the exception of mixed farms).

It thus appears safe to state that, for the set of EU15 regions, direct payments have led to a greater uniformity of ROI levels among the three farm types analysed (i.e. according the share of family labour employment), the more so when the incidence of direct payments on the economic results of farms is higher.

For the set of EU12 regions, the rule in place for the EU15 does not appear to be so clear: for most sectors the highest ROI values are achieved in the intermediate class of family labour share (30 to 70%). On the other hand, lower ROI values are obtained (on average) in the class of farms with FWU/AWU <30%, in particular in sectors enjoying a greater level of support. In sectors that are more dependent on direct payments, this latter farm type is most at risk in the event of the removal of direct

payments, since ROI levels reach very negative average values (in particular in other grazing livestock and mixed farms).

These quite contrasting results thus make it possible to state (generally speaking) that farms in which the paid labour component is high (FWU/AWU <30%) are the most efficient in the EU15 and the least efficient in the EU12. This suggests that the strategic goals in this class of farms might be completely different: more targeted to economic results in the EU15 and more focused on social aspects in the EU12. In other words, maximisation of profit in the first case, and maximisation of employment in the second case

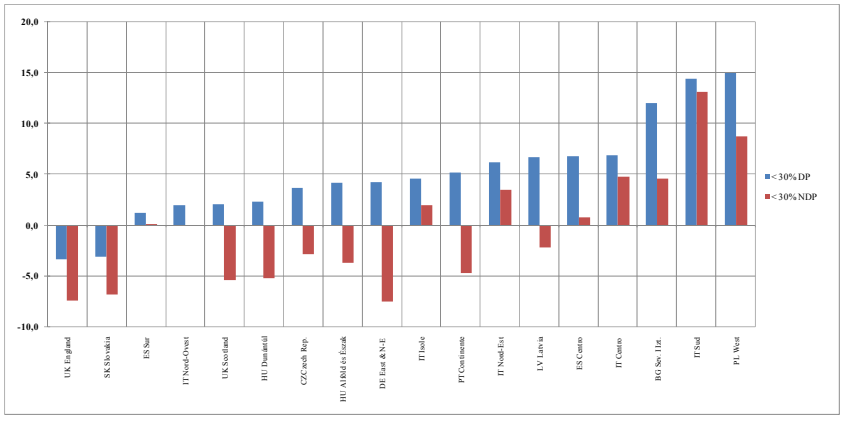
7.4.1 Analysis of ROI level in regions

The results of the ROI analysis (actual and simulated situation), looking at Community averages, hide the existence of very different regional situations. To highlight these differences, for each sector and each farm class as defined by the FWU/AWU ratio, we calculated the average regional ROI value (average for period 2004-2007). In this case, too, ROI values were calculated for the actual situation (with direct payments) and the simulated situation (without direct payments).

The graphs below show, by way of example, the findings of the analysis for TF6 (other grazing livestock) which, as already seen, has the lowest average ROI value of all sectors (for other sectors the results are presented in the annex). Regions have been arranged according to a rising scale of the average ROI value for each of the FWU/AWU classes[90].

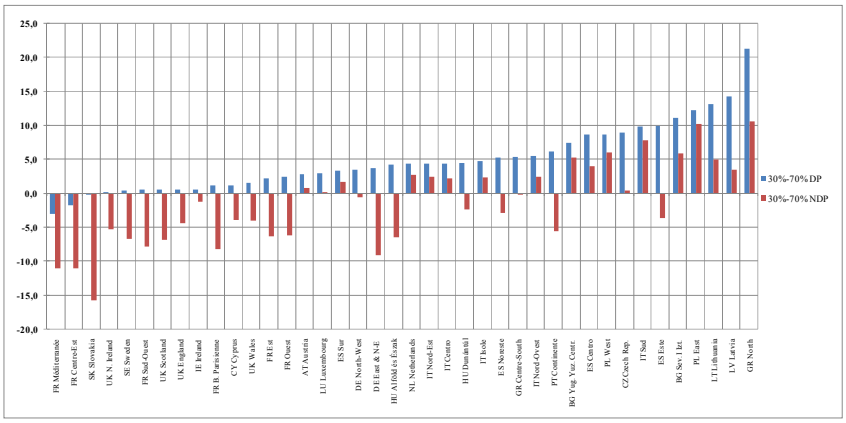
Fig. 51 - TF6: Average ROI values with and without direct payments in regions, by FWU/AWU class (2004-2007, %)

FWU/AWU Class <30%

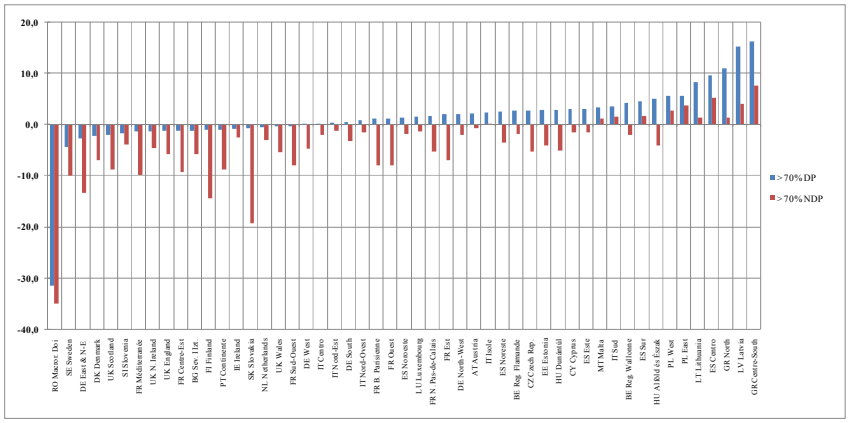


[90] It is noted that the number of regions having an accepted sample of farms <30% (i.e. a number of farms >15) is much lower than the number of regions having an accepted sample of farms >70%.

FWU/AWU Class 30%-70%



FWU/AWU Class >70%



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

An analysis of the results (extended to all types of farming) indicate the following points:

- In all sectors there is quite a wide variability of average regional ROI values, and this is valid for all FWU/AWU classes. This highlights the existence of extremely different situations in the European regions.
- Apart from other factors that may have an influence on average ROI values, a significant role is played by the level of the regional average unit wage, which is also the reference value for estimating the value of family labour (opportunity cost). Roughly speaking, in almost all sectors, the highest average ROI values are achieved in regions where the unit wage is lowest (i.e. in the EU15, in the regions of Greece, southern Italy and some Spanish regions). On the other hand, the lowest average ROI values are in regions where the unit wage is highest (i.e. in the EU15, in Denmark, Sweden, French regions and the United Kingdom).
- In all sectors, in the farm type with FWU/AWU >70%, the average ROI values already have negative values in the real situation (with direct payments) in a relatively large number of regions. This is particularly relevant in the cases of TF2, TF6 and TF8.
- Accordingly, this latter farm class (also the most numerous) has the highest concentration of inefficient farms (and thus economically non-viable), and which already in the actual situation (with direct payments) are unable to remunerate capital, or labour, at a level corresponding to the

opportunity cost. It is thus safe to surmise that the continuation of their business activity is possible only if they decide to remunerate family labour below its opportunity cost91.

To gain a general understanding of the role played by direct payments on the average ROI value at a regional level, we calculated, for each TF, the percentage of regions in which, in the actual situation (with direct payments) and the simulation (without direct payments), the set of farms posted average values greater or less than zero.

Tab. 30 - Percentage of EU27 regions with positive and negative average ROI value by TF, with and without direct payments (average for 2004-2007)

		ROI < 0	ROI >0
TF1	With DP	10,0	90,0
	Without DP	54,3	45,7
TF2	With DP	31,0	69,0
	Without DP	33,6	66,4
TF4	With DP	25,2	74,8
	Without DP	36,4	63,6
TF5	With DP	11,4	88,6
	Without DP	38,6	61,4
TF6	With DP	21,1	78,9
	Without DP	66,1	33,9
TF7	With DP	13,1	86,9
	Without DP	30,3	69,7
TF8	With DP	20,7	79,3
	Without DP	60,3	39,7
All TF	With DP	18,7	81,3
	Without DP	46,2	53,8

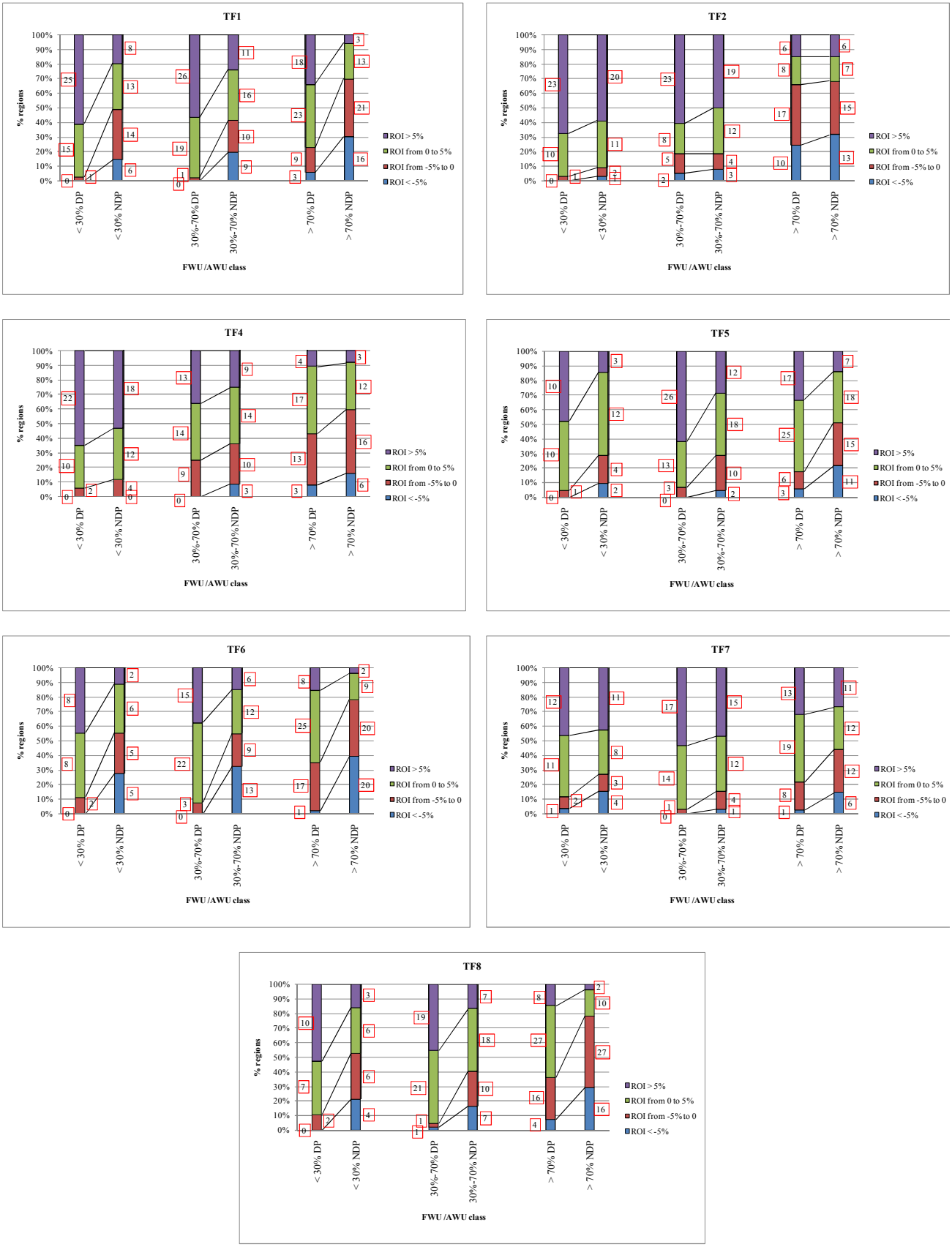
Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

As it might be expected, in the simulated situation the percentage of regions with average ROI values greater than zero goes down, but to an extent that is (again) very much tied up with the degree of dependence on direct payments of the various TFs. Indeed, in field crops, other grazing livestock and mixed farms the percentage of regions with ROI >0 is down by about half compared with the real situation, and in total the number of regions with a negative average ROI value is well over 50% (54% in TF1; 60% in TF8 and 66% in TF6).

It should be noted however that, in this case too, there are significant differences in terms of FWU/AWU class. In particular (see graphs below), the class FWU/AWU >70% appears to be the most affected by the potential effects of direct payments removal. For this type, indeed, the average ROI value would be negative in 77% of regions in the case of field crops, 80% for other grazing livestock, 82% for mixed farms (and 63% for granivores regions). In other words, this confirms the fact that it is with farms using family labour more intensely that direct payments play the biggest role on the viability of the farm.

[91] It should be remembered that calculated values are the average for the four-year period 2004-2007, which should avoid short-term effects.

Fig. 52 – Percentage distribution and number of EU27 regions by ROI class and farm type in terms of FWU/AWU class, for each TF, with and without direct payments (average for 2004-2007)



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

Informed views of the experts

We have asked the experts to provide their opinions regarding the possible motivations for the fact that the ROI becomes negative in the absence of direct payments in farms characterised by large share of family labour. According to some of the experts, this reflects the fact that farmers do not value their labour input into the farm at the current agricultural wage. In other words, they use the payments to; maintain their lifestyle. So the higher the share of family labour on total labour, the stronger this effect is.

For other experts, this is due to the lower efficiency of family farms (small in size) compared to farms employing salaried agricultural workers. This would also be related to the relatively high average age of farmers.

Furthermore, with respect to the fact that in a significant number of cases of the farms where the share of family labour on total labour is high (family farms), the average ROI is negative also with direct payments, we asked them whether they would agree that this is due to the fact that the activity of these farms can be maintained only by making a decision to under-remunerate family labour. Most answers agree with the explanation we suggested. Among the factors justifying under-compensation of family labour, the most frequent one is the lack of employment alternatives in the same areas. The economic recession further reduces the probability of finding alternative employment. Furthermore, this phenomenon is explained by the age of farme holders (close to retirement or already retired).

7.4.2 Analysis of ROI through its components

In order to facilitate the understanding of the results obtained in the different sectors, ROI (EBIT/TA) was also analysed in terms of its two key components: EBIT /TA = EBIT/TO x TO/TA

The EBIT/TO indicator represents the Return on Total Output (ROTO), and is thus influenced by market results and by the size of direct aid.

The TO/TA (total output/total assets) indicator represents the capital rotation rate, and gives a rough indication of how many times capital "rotates" in order to realise the output value. It is not influenced by direct aid[92]. Generally speaking, its value is mostly related to the technical and organisational characteristics typical of each economic-productive sector (i.e. with TO being equal, different production sectors need a varying level of structural capital). The TO/TA will thus have generally very low (or very high) values for most of the enterprises operating in those specific sectors.

The breakdown of ROI into its two components thus makes it possible to isolate the "production process" effect from the "structural characteristic" effect. The table below provides a summary of the findings of the analysis.

[92] In calculating indicators without aid, the TO/TA value obviously remains the same, since both the numerator and the denominator do not contain direct aid.

Tab. 31 - Relationship between ROI, ROTO and TO/A with and without direct payments, by TF and by FWU/AWU class, EU15 and EU12 - average 2004-2007 (ROI and ROTO in %)

		TF1			TF2			TF4			TF5			TF6			TF7			TF8		
		< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%
With Directs paiements																						
EU 15	ROI (%)	3,8	3,7	1,9	7,1	4,3	0,3	7,4	5,4	1,8	4,8	3,8	2,3	4,9	3,5	1,0	7,1	5,2	3,4	2,9	2,7	1,8
	ROTO (%)	16,5	19,0	11,8	10,7	8,5	0,9	20,1	22,6	10,3	13,5	16,8	12,1	21,1	19,7	6,8	15,6	13,3	9,0	7,8	11,2	7,5
	TO/TA	0,23	0,19	0,16	0,67	0,50	0,36	0,37	0,24	0,18	0,36	0,22	0,19	0,23	0,18	0,14	0,45	0,39	0,38	0,37	0,24	0,23
EU 12	ROI (%)	4,2	11,5	6,6	8,9	7,2	1,8	4,2	4,2	-0,9	2,0	10,5	5,2	-0,7	8,3	3,8	6,7	11,2	6,3	1,2	10,5	3,1
	ROTO (%)	9,4	29,7	21,5	16,3	17,5	5,9	12,7	18,1	-7,0	5,4	29,4	21,6	-3,0	28,9	19,8	9,8	18,4	15,7	3,1	26,4	10,8
	TO/TA	0,44	0,39	0,31	0,54	0,41	0,30	0,33	0,23	0,14	0,37	0,36	0,24	0,25	0,29	0,19	0,69	0,61	0,40	0,39	0,40	0,29
Without Directs paiements																						
EU 15	ROI (%)	-0,8	-0,5	-2,4	6,6	3,7	-0,2	5,9	4,2	0,5	0,3	1,0	-0,1	0,4	-1,1	-3,1	6,0	4,2	2,2	-3,5	-0,7	-2,1
	ROTO (%)	-3,7	-2,3	-15,0	9,9	7,4	-0,6	16,1	17,3	3,1	0,8	4,6	-0,6	1,5	-6,5	-21,7	13,3	10,6	5,8	-9,6	-2,7	-8,9
	TO/TA	0,23	0,19	0,16	0,67	0,50	0,36	0,37	0,24	0,18	0,36	0,22	0,19	0,23	0,18	0,14	0,45	0,39	0,38	0,37	0,24	0,23
EU 12	ROI (%)	-2,7	4,1	0,2	8,1	6,7	0,3	2,4	3,0	-2,4	-3,0	5,9	2,4	-5,2	3,6	0,8	2,9	8,7	3,4	-3,9	5,1	-0,8
	ROTO (%)	-6,0	10,6	0,5	14,9	16,2	1,0	7,1	13,0	-17,9	-8,3	16,6	10,1	-21,0	12,3	4,4	4,2	14,3	8,6	-9,8	12,8	-2,7
	TO/TA	0,44	0,39	0,31	0,54	0,41	0,30	0,33	0,23	0,14	0,37	0,36	0,24	0,25	0,29	0,19	0,69	0,61	0,40	0,39	0,40	0,29

NB: TFs in which incidence of direct payments is high in sky blue

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

With regard to the output value margin (ROTO) the following comments can be made:

- In most sectors, the highest average margins are achieved by the farm type having FWU/AWU of 30-70%. Exceptions are horticulture, other grazing livestock and granivores of the EU15, where the highest margin is found in farm types having FWU/AWU <30%.
- In all TFs of the EU15 margins are on average lower in farm types having FWU/AWU >70% (it is thus in this type that production activity is more inefficient). Special mention is made of the very low value of this type in horticulture sector (0.9%).
- In the EU12 the lowest margins are found (on average) in the class FWU/AWU <30% for most sectors (filed crops, milk, other grazing livestock, granivores, mixed)93. Accordingly, in this farm type, characterised by their large size and particularly large number of hired AWU, production activity is less efficient (confirming the hypothesis of the adoption of an employment maximisation strategy highlighted previously).

With regard to the capital rotation rate (TO/TA), in all sectors the indicator takes on values (on average) that are well below one. This stresses the fact that, generally speaking, businesses in the agricultural sector taken as a whole are characterised by a high level of capitalisation compared with the output value generated by the production process.

Nevertheless, the indicator's values are significantly higher (on average) in TF2 (horticulture) and TF7 (granivores) ; lower in TF6 (other grazing livestock) and (in the EU15) in TF1 (field crops). In practice, therefore, the indicator is relatively higher in the two sectors having a lower incidence of direct aid, in which:

- the output value of farms is (presumably) higher;
- fixed capital allows the realisation of more than one production cycle per year[94];
- the indicator's values go down as the share of family labour out of all workers rises, in (almost) all

[93] It is also noted that for two TFs of the EU12 the ROTO is already negative despite the presence of aid, which obviously generates a negative value for ROI.

[94] Granivore fattening cycles (TF7) are short, allowing the realisation of several cycles per year in the same pens. In the same way, horticultural crops (TF2) are generally short cycle, allowing several harvests on the same land during the course of the year.

sectors of the EU15 and EU12. In farms having FWU/AWU >70%, consequently, the efficiency of capital is generally lower compared with the other two types.

This leads one to conclude that in this class of farm there is (on average) an over-capitalisation in relation to production potential. Nevertheless, this phenomenon can also be explained by the fact that in farms having a higher FWU, capital assets (including land) are chiefly owned, while in farms having a greater share of hired workers (presumably larger-sized farms) a more or less important percentage of material resources used (including land) is rented and/or a part of the production process is outsourced to service companies[95] (thus having less need for invested capital).

Analysis of the two ROI components (with direct payments) makes it possible to state that in farms having FWU/AWU >70% lower ROI values compared with other types are the effect of a situation of disadvantage affecting both components: posting lower ROTO (indicating a less efficient production process) as well as equally low TO/TA values (indicating less efficiency in terms of invested capital).

In the EU15, in the farm type having FWU/AWU <30%, higher ROI values (in all TFs) compared with other type are the effect of:

- in the case of horticulture, other grazing livestock, granivores, a two-fold advantage affecting both components (ROTO and TO/TA, both being higher)
- in the case of field crops, milk and mixed sectors, an advantage in terms of TO/TA (significantly higher compared with other FWU/AWU classes) and a proportionally smaller disadvantage in terms of ROTO. In the class FWU/AWU <30% for these three sectors, the greater efficiency of capital thus manages to easily offset the lesser efficiency of the production process.

In the EU12 the situation appears to be more complex . In particular, the lower average ROI value in the farm type having FWU/AWU <30%, vis-à-vis the type 30%-70% (field crops, milk, other grazing livestock, granivores, mixed) is due to either a significantly lower ROTO compared with the TO/TA (field crops, milk, granivores) or to both indicators being lower (other grazing livestock, mixed)[96].

In the simulated absence of direct payments, margins in terms of total output obviously go down, to an extent proportionate to their incidence (field crops, other grazing livestock, mixed and, to a lesser extent, milk farms).

Furthermore, it is noted that in the EU15 all farm types of field crops and mixed sectors have a ROTO that is generally very negative, the same as for TF6 with the exception of the class FWU/AWU <30%[97]. In milk sectors (but also horticulture), on the other hand, only farms with FWU/AWU <70% have (on average) only quite negative values.

In the EU12 the absence of direct payments would take the ROTO of less efficient farm types into negative values, in particular the class FWU/AWU <30% for field crops, other grazing livestock, mixed and milk (in this case too the sectors receiving most aid)[98]. Farms in the intermediate

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[95] In both cases, therefore, material resources used do not form part of the farm's assets, while they are part of variable production costs.

[96] It is interesting to note that in TF4 farm types < 30% and 30-70% have the same ROI (4.2%), but are realised with a different ROTO combination (higher for 30-70%) and TO/TA combination (higher for <30%).

[97] To be noted that without DP the ROTO for the class FWU/AWU >70% of other grazing livestock falls to about -22%, and that of field crops to -15%.

[98] To be stressed that without DP, ROTO for the class FWU/AWU <30% of other grazing livestock and >70% of other permanent crops (already negative with DP) fall respectively to -21% and -18%.

FWU/AWU class (30-70%) would fare better in all sectors, where the ROTO remains positive and on average with higher values compared with EU15.

It is clear that with negative ROTO values, ROI values are also negative, regardless of values obtained for the capital rotation rate. This leads one to believe that any strategy aiming to improve the efficiency of capital would not allow the farms involved to overcome critical situations.

Informed views of the experts

We asked the experts for their opinion about the fact that in the farms where the share of family labour on total labour is high (family farms), low ROI are due to low margins on production as well as to low turnover rate of invested capital.

Most experts totally or partially agree that these farms are characterised by low production efficiency and, at the same time, by the presence of overcapitalization, in comparison to non-family farms. The main reasons explaining this occurrence would be that:

- many of these farms are part-time and are more interested in adapting their farming systems to minimize the labour input, so that they can concentrate on their off-farm employment rather than seeking to maximize productive efficiency on the farm.
- it is normal that efficiency is lower given the fact that own labour costs are usually not taken into account by family farms.
- it is hard to manage land, labour and machinery in a way as to optimize production. Family farms are prone to invest more than necessary in machinery and equipment.

7.5 Effect of direct payments on Return on Assets

The method used to calculate and analyse ROA at different levels (Community and regional), and for FWU/AWU farm classes, is similar to the one already used for ROI.

In view of the close links between ROI and ROA, the analysis did not produce results (and conclusions) that deviated significantly from what has been reported above. In particular, at EU level, the only notable difference relates to milk, where average values for EU27 and EU15, quite positive for ROI, were negative in the case of ROA. Furthermore, the ROA value was lower than the ROI value in all sectors and in all groups of Member States.

Tab. 32 - Average ROA values with and without direct payments, by TF and by group of Member States (average for 2004-2007)

		TF1	TF2	TF4	TF5	TF6	TF7	TF8
EU 27	With DP	2,69	3,93	4,31	2,09	1,40	3,92	1,28
	Without DP	-2,13	3,36	2,95	-0,76	-2,76	2,28	-3,33
EU15	With DP	2,10	3,74	4,47	1,90	1,37	3,23	1,17
	Without DP	-2,22	3,20	3,13	-0,81	-2,82	2,12	-3,32
EU12	With DP	5,03	6,40	2,18	3,75	1,75	6,27	1,53
	Without DP	-1,80	5,53	0,62	-0,40	-2,05	2,86	-3,33

Tab. 33 - Difference between ROA and ROI by TF and by group of Member States (percentage points). Average for 2004-2007

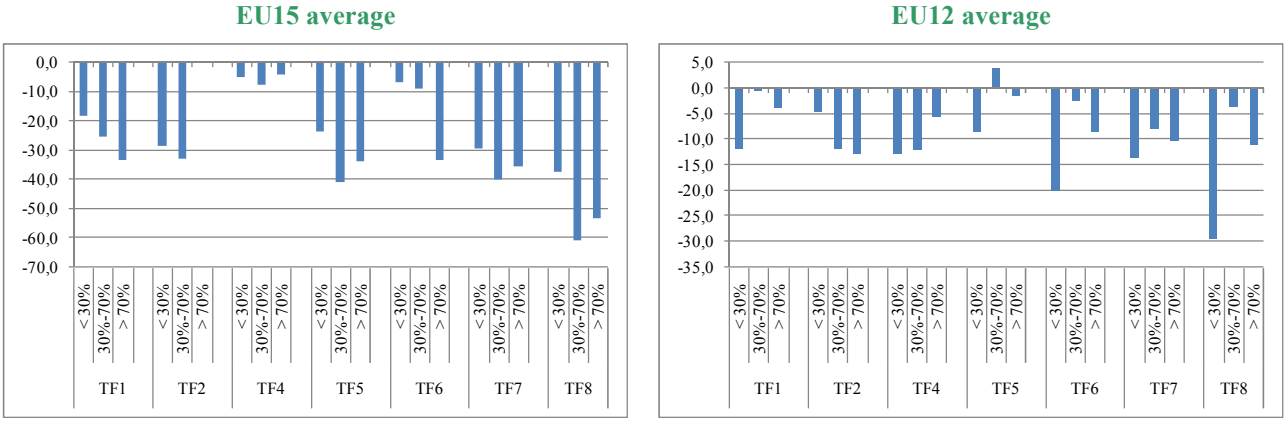
	TF1	TF2	TF4	TF5	TF6	TF7	TF8
EU 27	-0,65	-1,57	-0,28	-0,89	-0,31	-1,51	-0,88
EU15	-0,71	-1,65	-0,27	-0,98	-0,32	-1,71	-1,13
EU12	-0,40	-0,47	-0,37	-0,09	-0,23	-0,83	-0,35

NB: TFs in which incidence of direct payments is high in sky blue

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

The role played by net financial costs (paid interests +/- balance subsidies & taxes on investments) on the ROA level is highlighted in the graphs below, which show the percentage changes between ROA and ROI for each sector and each FWU/AWU class.

Fig. 53 – Percentage variation between ROA and ROI by TF and FWU/AWU class in EU15 and EU12. Average for 2004-2007



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

One can see that on average the negative incidence of farms' net financial costs (in particular interest paid) is higher in EU15 Member States compared with EU12.

In the EU15 Member States the higher relative incidence is posted in mixed farms, in particular in the class FWU/AWU 30-70%, where (on average) net financial costs erode more than 60% of the average ROI value realised by farms (in this class ROA is thus about 40% of ROI). On the other hand, this incidence is almost marginal in all three horticulture classes and in the first two classes (<30% and 30-70%) of other grazing livestock.

For the set of EU12 Member States the higher relative incidence can be seen in this case too in mixed farms , in particular in the class FWU/AWU <30% where, nevertheless, net financial costs erode a little less than 30% of ROI. On the other hand, on average, the ROA of milk farms is almost the same as ROI. This is due to the fact that (a unique case) in the class FWU/AWU 30-70% ROA is greater than ROI. In this class, therefore, it appears that Balance subsidies & taxes on investments > interest paid.

7.5.1 Analysis of ROA level in regions

With reference to the results of the regional analysis, summary data show that, compared with what happens for ROI, the lower ROA level causes an increase in the number of regions in which the average ROA value is already negative in the real situation (with direct payments).

A comparison of ROA and ROI in regions (by sector, with and without direct payments) shows that:

- in the actual situation, in all sectors the percentage of regions in which the average ROA value is negative is higher than the percentage of regions in which the average ROI value is negative (and vice versa). The dimension of this situation is particularly notable in the case of granivores (the percentage of regions with negative values more than doubles, from 13% to about 28%). Furthermore, there are significant changes in the case of milk and other grazing livestock.
- In the simulated situation, the difference between the percentage of regions with negative ROA and negative ROI widens (with the exception of other grazing livestock and granivores), but to a proportionally lesser extent compared with the actual situation (e.g. in other grazing livestock the percentage remains practically the same).

Tab. 34 - Comparison between percentages of EU27 regions with ROA and positive and negative average ROI values by TF, with and without direct payments (average for 2004-2007)

		ROA < 0	ROA >0	ROI < 0	ROI >0
TF1	With DP	12,9	87,1	10,0	90,0
	Without DP	60,7	39,3	54,3	45,7
TF2	With DP	33,6	66,4	31,0	69,0
	Without DP	37,2	62,8	33,6	66,4
TF4	With DP	27,1	72,9	25,2	74,8
	Without DP	40,2	59,8	36,4	63,6
TF5	With DP	15,8	84,2	11,4	88,6
	Without DP	49,1	50,9	38,6	61,4
TF6	With DP	27,5	72,5	21,1	78,9
	Without DP	67,0	33,0	66,1	33,9
TF7	With DP	28,3	71,7	13,1	86,9
	Without DP	40,4	59,6	30,3	69,7
TF8	With DP	23,3	76,7	20,7	79,3
	Without DP	66,4	33,6	60,3	39,7
All TF	With DP	23,6	76,4	18,7	81,3
	Without DP	52,1	47,9	46,2	53,8

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

This confirms, in any case, the important role played by direct payments in reaching positive ROA values (just like ROI values) in the sectors which are more dependent on support, since in the absence of direct payments the average ROA value in field crops, other grazing livestock and mixed sectors would be negative in more than 60% of regions.

7.5.2 Effect of direct payments on the remuneration of capital at opportunity cost

The next step is to verify to what extent direct payments make it possible to remunerate not only family labour but also capital at its opportunity cost, i.e. a level at least equal to the average Interest Rate applied to medium-term Loans (IRL). In short, the aim was to verify to what extent direct payments allow farms to be viable not only economically but also financially. This condition is met if: ROA/IRL $\geq$ 1.

As already mentioned in § 7.2 (Methodological approach), to verify this condition ROA was related to Annualised Agreed Percentage Rates for loans granted in member States to non-financial corporations with maturity greater than 5 years. The ratio was calculated based on averages for the period 2004-2007. The analysis was conducted for both the real situation (with direct payments) and the simulated situation (without direct payments).The table below gives the % number of regions (for which the Annualised Agreed Percentage Rates are available) where, on average, the value of the ROA/IRL ratio for the sample of FADN farms is:

- greater than 1: in this case both the economic viability and financial viability conditions are met;
- between 0 and 1: in this case the condition of economic viability is met, but not that of financial viability;
- below 0: in this case the viability condition is never met (negative ROA).

Tab. 35 - % of regions where on average the value of the ROA/IRL ratio is: greater than 1; between 0 and 1; below 0, by TF and by FWU/AWU class (average for period 2004-2007, with and without direct payments)

	TF1			TF2			TF4			TF5			TF6			TF7			TF8		
	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%
with DP																					
ROA /IRL >1	48,6	52,5	24,4	41,4	53,1	13,9	58,1	34,4	9,4	25,0	56,8	25,0	43,8	29,4	9,3	40,0	50,0	31,4	28,6	36,1	14,9
1 > ROA /IRL >0	51,4	47,5	57,8	51,7	31,3	16,7	32,3	43,8	50,0	68,8	37,8	56,8	43,8	55,9	53,5	30,0	38,5	31,4	71,4	63,9	48,9
ROA/IRL <0	0,0	0,0	17,8	6,9	15,6	69,4	9,7	21,9	40,6	6,3	5,4	18,2	12,5	14,7	37,2	30,0	11,5	37,1	0,0	0,0	36,2
without DP																					
ROA /IRL >1	17,1	17,5	4,4	37,9	46,9	13,9	41,9	25,0	6,3	6,3	27,0	6,8	6,3	5,9	4,7	35,0	42,3	28,6	7,1	5,6	4,3
1 > ROA /IRL >0	28,6	37,5	24,4	48,3	37,5	13,9	35,5	37,5	37,5	62,5	40,5	31,8	50,0	38,2	16,3	20,0	38,5	20,0	57,1	44,4	14,9
ROA/IRL <0	54,3	45,0	71,1	13,8	15,6	72,2	22,6	37,5	56,3	31,3	32,4	61,4	43,8	55,9	79,1	45,0	19,2	51,4	35,7	50,0	80,9
Number of regions	35	40	45	29	32	36	31	32	32	16	37	44	16	34	43	20	26	35	14	36	47

NB: TFs in which incidence of direct payments is high marked in sky blue

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3, Eurostat, UK Bank of England

Taking into account the limits of the analysis, it is noted that, in the actual situation:

- In all sectors, the class FWU/AWU >70% is that in which the condition of economic and financial viability is met in the lowest number of regions, with a maximum of 31% of regions in TF7, and a minimum of a little above 9% of regions in TF4 and TF6.
- The same class presents the largest number of regions with negative values for the indicator (i.e. ROA <0), already in the real situation. In this case too, this occurs in all sectod, with a minimum of about 18% of regions in field crops and milk sectors, and a maximum of 69% of regions in horticulture. To be noted is the fact that horticulture is the sector of economic activity (horticulture) where the relevance of direct payments is almost negligible.
- The condition of economic and financial viability is met (on average) in at least 50% of regions only in the class FWU/AWU 30-70% for field crops, horticulture, milk, granivores. This also occurs in the class <30% for other permanent crops. In other combinations between FWU/AWU classes and TF, the condition is therefore met in a percentage of regions below 50%, with a minimum (for the three categories) in mixed sector.
- On the other hand, no region has an ROA/IRL ratio <0 in the two classes FWU/AWU <30%, and in the 30-70% class this is so for field crops and mixed sectors (sectors having a high incidence of direct payments).

In most class/sectors combinations the majority of regions are concentrated in the ROA/IRL band between 0 and 1. Accordingly, on average, in the majority of regions in the Member States analysed direct payments have allowed the attainment of economic viability, but not financial viability.

Greater details of the real situation in terms of single regions and groups of regions are given in the table below.

Tab. 36 - ROA/IRL ratio in regions, by TF and FWU/AWU class – Situation with direct payments, average for period 2004-2007

		TF1			TF2			TF4			TF5			TF6			TF7			TF8		
		< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%
SPS Historical	AT Austria		2,1	1,2				2,7	1,1	0,4		1,0	0,4		0,7	0,4			0,7		0,3	0,7
	BE Reg. Flamande		1,6	1,1	0,6	0,8	-0,5	2,9	1,7	2,2			0,6			0,2			1,6			0,6
	BE Reg. Wallonne		1,9	1,5				2,5					0,7			0,5			0,0		0,9	1,0
	FR B. Parisienne	1,4	1,3	1,4	1,0	0,7	-2,5	1,0	-0,7			0,3	0,2		0,1	0,1		-0,1	-1,3		0,6	0,5
	FR N. Pas-de-Calais	2,2	0,9	0,7		-2,4	0,9					0,2	0,4			0,2					1,1	0,6
	FR Est	1,3	0,8	1,7	1,0	0,8	0,0					0,4	0,4		0,3	0,3			-0,6		0,8	1,0
	FR Ouest	1,4	1,4	0,9	0,8	0,9	-0,5	0,4	0,2	-0,4		0,7	0,3		0,3	0,1	-0,3	0,7	0,4		0,3	0,5
	FR Sud-Ouest	0,4	1,3	0,1	0,5	1,5	-1,3	1,3	-0,5	-0,7			-0,3		0,0	-0,1		-0,2	0,1		0,0	-0,3
	FR Centre-Est		0,4	0,6	2,5	1,9	-2,5	0,8	0,8	0,4		-0,3	-0,5		-0,5	-0,3			-0,2		0,5	0,0
	FR Méditerranée	0,1	0,5	-0,7	0,3	1,1	-0,9	0,4	0,2	0,1			-0,4		-0,4	-0,1			-0,9			-0,8
	GR North	3,2	1,6	1,0			1,7		2,1	1,3		2,2	2,1		3,5	1,9					2,6	1,9
	GR Centre-South		3,3	1,4	4,0	3,1	2,6	5,2	1,7	0,7					0,9	2,7			0,0		3,2	1,5
	IE Ireland		0,3	0,3							0,3	0,3	0,2		0,1	-0,2					0,2	0,2
	IT Nord-Ovest	1,4	1,2	0,3		2,4	-0,1	2,7	1,9	1,2	0,9	1,3	1,0	0,4	1,1	0,2	4,5	2,6	1,7	1,9	1,5	0,6
	IT Nord-Est	0,6	0,2	-0,4	12,5	1,2	-1,0	2,3	0,8	0,1	0,8	0,6	0,0	1,2	0,9	0,1	0,3	4,4	0,6	0,7	0,2	-0,3
	IT Centro	0,5	0,7	0,0	7,7	2,7	-0,1	2,0	2,0	0,1		2,4	1,1	1,3	0,9	0,1	5,1	2,3	1,3	0,6	1,0	-0,1
	IT Sud	2,2	1,1	0,3	9,5	3,6	0,8	1,3	1,1	0,2	3,5	2,7	1,1	2,8	1,9	0,7		3,3	3,1	0,9	1,0	0,4
	IT Isole	4,3	1,7	0,7	5,2	3,9	-0,6	2,8	1,1	0,4		1,6	1,0	0,9	0,9	0,5	5,6	5,2	2,8		0,8	0,6
	NL Netherlands	0,2	0,2	0,1	0,2	0,0	-0,4	0,9	0,1	-0,5		0,1	0,1		0,4	-0,5	-0,2	0,2	-0,2		0,2	-0,2
	ES Noroeste						-0,2					2,0	1,3			0,3		3,4	2,9			1,9
	ES Noreste		1,2	0,8		1,7	-0,1	0,2	0,5	0,5		1,5	1,4		1,1	0,6	1,3	1,6	1,3		1,4	0,9
	ES Este	0,4	1,0	0,7		1,7	1,7	0,8	0,9	0,7		1,9	1,6		2,0	0,6		3,0	1,8		0,6	1,0
	ES Centro	1,4	1,2	1,0		2,7	2,3		2,0	0,5			2,4	1,3	1,7	2,0		1,5	2,7		1,9	2,1
	ES Sur	0,7	0,9	0,8	1,9	1,3	1,2	1,3	1,3	0,6		2,7	2,1	0,2	0,7	0,9		3,6	2,2		1,5	1,5
	UK Scotland	0,5	0,2	-0,1								0,3	-0,1	0,3	0,0	-0,4					0,1	-0,2
	UK Wales		0,5								0,0	0,4	0,4		0,2	-0,1						-0,2
SPS Hybrid	FI Finland		0,0	0,1	-0,2	-0,9	-2,1			0,0		-0,3	-0,7			-0,4		0,2	0,3		0,1	-0,3
	DE North-West	0,9	0,5	0,3	2,0	1,1	-0,1	1,7	0,8	-0,4	1,4	1,2	0,6		0,5	0,2		0,5	-0,1		0,5	0,1
	DE West	1,9	0,8	0,3	1,8	1,1	-0,6		-0,7	-0,2		1,1	0,6			-0,2		0,3	0,3		0,6	0,1
	DE South	2,0	0,6	0,1	0,9	0,2	-1,4	1,5	0,7	-0,6		1,0	0,3			0,0		0,7	0,0		0,6	0,0
	DE East & N-E	0,6	0,9	-0,2	0,4	-2,0	-7,4	0,1	-0,7	-2,9	0,9	0,8	0,0	0,7	0,5	-0,8	0,4			0,5	0,7	-0,3
	UK England	0,3	0,3	0,1	0,4	-0,2	-1,1	0,2	-0,3	-0,3	0,5	0,3	0,1	-0,6	0,0	-0,3	2,9	0,5	0,1	0,0	0,3	-0,2
	UK N. Ireland			0,1								0,2	0,1		0,0	-0,2			-0,1			-0,1
SPS reg	SI Slovenia			-0,3			-0,3			-0,3		1,0	0,3			-0,2			1,0			0,1
SAPS	BG Sev. I Izt.	2,7	3,4	0,0	0,3	2,1	-1,5	0,8	0,1	-0,9	1,0	2,5	1,4	1,3	1,4	-0,2	-0,1	-0,1	-2,4	1,4	1,3	-0,2
	BG Yug. Yuz. Centr.	2,6	4,2	3,7	0,9	1,1	0,4	-0,5	1,1		0,9	1,7	1,2		0,9		2,2					-0,1
	CZ Czech Rep.	0,4	1,5	0,8	1,0		-0,2	1,9	0,6	0,5	0,4	1,6	0,2	0,6	1,6	0,5	-0,1	0,6	-0,9	0,4	1,8	0,1
	EE Estonia	1,4	1,5	1,0	0,0	0,9	-0,2				0,8	1,1	0,5			0,4	0,7			1,0	1,4	0,3
	HU Dunántúl	0,3	0,6	0,5	0,2	0,0	-0,7	0,0	-0,3	-0,4	-0,1	0,9	0,0	0,0	0,3	0,0	-0,1	1,2	-0,4	0,1	0,7	0,2
	HU Alföld és Észak	0,6	0,9	0,7	0,9	0,4	-0,2	-0,2	-0,1	-0,6	0,5	0,8	0,7	0,3	0,3	0,4	-0,3	0,3	0,1	0,3	0,7	0,2
	LV Latvia	1,3	2,0	1,5	1,3			1,4	0,7	0,5	2,1	2,0	1,4	1,3	2,0	2,5	0,6	0,8	0,7	1,7	1,9	0,8
	PL West	0,8	1,4	0,7	1,2	0,8	0,1	1,2	0,4	-0,2	0,5	1,2	0,7	1,6	0,9	0,5	4,0	1,3	0,6	0,7	1,1	0,3
	PL East	0,9	1,1	0,6	0,9	0,7	0,4	1,2	0,6	0,2		1,3	0,9		1,2	0,5	1,0	1,1	0,8	1,3	0,9	0,3
	RO Macror. Doi	1,3		4,0									-3,3			-3,3						-4,1
	RO Macror. Trei	0,4		-0,7													0,3					-1,4
	RO Macror. Patru	1,0		-1,4																		-1,3
	RO Macror. Unu	0,3		-1,0				0,9					-0,6				0,2					-0,4

ROA/IRL >1

1 > ROA /IRL >0

ROA/IRL <0

NB: TFs in which incidence of direct payments is high marked in sky blue

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3, Eurostat, UK Bank of England

Results concerning the analysis of the simulated situation (without direct payments) appear to show that:

- In sectors in which the role played by direct payments is lower, the situations change only marginally (only in other permanent crops farms was there a significant deterioration in all three FWU/AWU classes).
- In sectors in which the incidence of direct payments is higher, the percentage of regions where in the actual situation the condition of economic and financial viability is met falls drastically in (almost) all FWU/AWU classes (generally speaking this condition is met in a little more than 5% of regions in other grazing livestock and mixed sectors, and in a little more than 12% of regions in TF1).
- Furthermore, the growth of the percentage of regions with ROA/IRL <0 is equally drastic. In this case too, this occurs for all three FWU/AWU classes, but more strongly in the class >70%, where

the percentage of regions rises to about 80% in other grazing livestock and mixed sectors, more than 70% in field crops and more than 60% in milk sector.

Greater details of the simulated situation in terms of single regions and groups of regions are given in the table below.

Tab. 37 - ROA/IRL ratio in regions, by TF and FWU/AWU class – Situation without direct payments, average for period 2004-2007

		TF1			TF2			TF4			TF5			TF6			TF7			TF8		
		< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%
SPS Historical	AT Austria		1,3	0,1				2,6	1,0	0,2		0,6	0,0		0,2	-0,3			0,4		-0,2	0,0
	BE Reg. Flamande		1,4	0,3	0,5	0,8	-0,6	2,8	1,7	2,1			0,0			-0,7			1,4			0,1
	BE Reg. Wallonne		1,2	0,3				2,5					-0,1			-0,8			-0,3		0,0	-0,2
	FR B. Parisienne	-0,4	-1,8	-2,0	0,6	0,4	-3,5	0,4	-1,4			-1,3	-1,5		-2,1	-1,9		-1,0	-2,5		-1,9	-2,0
	FR N. Pas-de-Calais	1,3	-0,7	-1,0		-2,7	0,7					-1,1	-1,1			-1,4					-0,3	-1,1
	FR Est	-0,8	-1,9	-1,7	0,8	0,6	-0,2					-1,1	-0,9		-1,7	-1,7			-0,9		-1,7	-1,4
	FR Ouest	-0,2	-1,1	-2,3	0,5	0,5	-0,9	-0,6	-0,9	-0,8		-1,1	-1,5		-1,7	-2,1	-0,6	0,2	-0,4		-1,5	-1,5
	FR Sud-Ouest	-1,7	-2,1	-3,3	-0,6	1,1	-2,1	0,4	-1,7	-1,7			-1,8		-1,9	-1,9		-1,0	-1,0		-2,1	-2,3
	FR Centre-Est		-2,2	-2,5	2,3	1,7	-2,7	0,2	0,1	-0,3		-1,1	-1,5		-2,7	-2,2			-0,8		-1,2	-2,0
	FR Méditerranée	-1,0	-3,0	-4,8	-0,1	0,7	-1,4	-0,6	-0,9	-0,6			-1,4		-2,3	-2,1			-1,7			-2,8
	GR North	-0,5	-0,3	-0,8			1,4		1,8	0,9		1,1	1,2		1,7	0,3					0,9	0,6
	GR Centre-South		2,8	0,4	3,8	2,9	2,3	4,9	1,0	0,0					0,0	1,3			-0,1		2,1	0,5
	IE Ireland		0,1	0,0							0,1	0,1	0,0		-0,3	-0,5					-0,2	-0,2
	IT Nord-Ovest	0,6	0,2	-0,4		2,4	-0,1	2,7	1,9	1,1	0,4	0,8	0,6	0,0	0,5	-0,2	4,2	2,3	1,6	1,3	1,1	0,2
	IT Nord-Est	0,0	-0,1	-0,7	12,5	1,1	-1,0	2,1	0,8	0,0	0,5	0,4	-0,3	0,7	0,5	-0,3	0,2	4,3	0,5	0,4	-0,1	-0,5
	IT Centro	0,0	0,0	-0,5	7,7	2,7	-0,2	1,9	1,9	0,0		2,2	0,8	0,9	0,4	-0,3	4,8	2,1	1,1	0,4	0,7	-0,5
	IT Sud	1,9	0,7	-0,2	9,5	3,6	0,7	0,7	0,7	-0,1	3,4	2,5	0,9	2,6	1,5	0,3		3,2	3,0	0,6	0,5	-0,1
	IT Isole	4,1	1,3	0,2	5,2	3,9	-0,6	2,6	1,0	0,1		1,3	0,7	0,4	0,4	0,0	5,5	5,1	2,7		0,5	0,2
	NL Netherlands	0,1	0,1	-0,2	0,1	-0,1	-0,4	0,9	-0,1	-0,6		-0,1	-0,1		0,1	-1,0	-0,2	0,2	-0,3		0,0	-0,4
	ES Noroeste						-0,2					1,5	0,9			-0,4		3,4	2,8			1,7
	ES Noreste		0,5	-0,2		1,3	-0,7	-0,3	0,3	0,1		0,7	0,6		-0,6	-0,6	1,2	1,5	1,0		-0,1	-0,4
	ES Este	-0,2	0,4	0,1		1,7	1,7	0,6	0,6	0,4		1,3	0,8		-0,8	-0,4		2,8	1,5		0,0	0,2
	ES Centro	0,3	0,4	0,1		2,5	2,1		1,5	0,1			1,9	0,1	0,8	1,1		1,4	2,5		0,7	1,1
	ES Sur	0,2	0,1	0,0	1,8	1,3	1,2	0,8	0,8	0,1		2,4	1,7	0,0	0,3	0,4		3,6	2,2		0,8	0,8
	UK Scotland	-0,1	-0,5	-0,7								-0,2	-0,5	-0,9	-1,2	-1,5					-0,9	-1,1
	UK Wales		-0,1								-0,5	-0,2	-0,2		-0,7	-0,9						-0,9
SPS Hybrid	FI Finland		-1,1	-1,1	-2,3	-3,0	-5,1			-0,4		-2,0	-2,4			-3,2		-1,4	-1,2		-1,7	-2,0
	DE North-West	0,4	0,0	-0,3	1,9	1,0	-0,2	1,7	0,7	-0,5	0,5	0,5	0,0		-0,3	-0,6		0,2	-0,4		-0,1	-0,4
	DE West	1,2	-0,1	-0,6	1,6	0,9	-0,7		-0,7	-0,2		0,2	-0,1			-1,2		-0,1	-0,1		-0,3	-0,7
	DE South	1,6	0,1	-0,5	0,9	0,2	-1,4	1,4	0,6	-0,6		0,3	-0,2			-0,8		0,3	-0,4		-0,1	-0,5
	DE East & N-E	-1,6	-2,0	-2,8	0,3	-2,0	-7,6	0,0	-1,1	-3,8	-0,8	-0,8	-1,3	-1,8	-2,2	-3,0	-0,4			-1,4	-1,7	-2,1
	UK England	-0,2	-0,3	-0,5	0,3	-0,2	-1,2	0,1	-0,3	-0,4	0,0	-0,2	-0,4	-1,2	-0,8	-1,0	2,8	0,4	0,0	-0,6	-0,4	-0,8
	UK N. Ireland			-0,1								-0,1	-0,2		-0,9	-0,8			-0,2			-0,6
SPS reg	SI Slovenia			-0,6			-0,5			-0,5		0,7	0,0			-0,6			0,8			-0,2
SAPS	BG Sev. I Izt.	1,0	1,9	-0,7	0,2	2,0	-1,6	0,5	-0,2	-1,1	0,6	2,0	1,0	0,4	0,7	-0,8	-0,2	-0,2	-2,4	1,0	0,5	-0,4
	BG Yug. Yuz. Centr.	1,4	2,8	2,4	0,9	1,0	0,4	-0,7	1,0		0,5	1,3	0,8		0,7		2,1					-0,3
	CZ Czech Rep.	-0,6	-0,1	-0,5	0,7		-0,2	1,5	0,3	0,2	-0,5	0,6	-0,7	-0,6	0,0	-1,0	-0,1	0,5	-1,0	-0,6	0,4	-0,9
	EE Estonia	0,6	0,8	0,2	0,0	0,6	-0,4				0,2	0,5	-0,2			-0,4	0,7			0,3	0,7	-0,3
	HU Dunántúl	-0,4	0,0	-0,1	0,0	0,0	-0,9	-0,1	-0,4	-0,4	-0,9	0,5	-0,5	-0,7	-0,3	-0,6	-0,4	0,5	-0,9	-0,6	0,2	-0,4
	HU Alföld és Észak	-0,3	0,2	0,1	0,6	0,2	-0,5	-0,4	-0,3	-0,9	-0,1	0,3	0,3	-0,3	-0,6	-0,4	-0,8	0,1	-0,1	-0,5	0,1	-0,3
	LV Latvia	0,3	0,6	-0,1	1,1			1,0	-0,4	-0,5	0,6	0,9	0,2	0,1	0,5	0,9	0,4	0,4	0,2	0,2	0,6	-0,4
	PL West	-0,1	0,7	0,1	1,2	0,8	0,1	1,1	0,3	-0,3	0,0	0,9	0,4	0,9	0,6	0,2	3,7	1,1	0,3	0,1	0,6	-0,1
	PL East	0,5	0,7	0,1	0,9	0,7	0,3	1,1	0,6	0,1		1,1	0,6		1,0	0,3	1,0	1,0	0,6	0,7	0,6	-0,1
	RO Macror. Doi	-0,5		2,2									-4,5			-3,7						-4,3
	RO Macror. Trei	-1,8		-0,9													-0,8					-1,9
	RO Macror. Patru	-0,7		-1,7																		-1,6
	RO Macror. Unu	-0,9		-1,3				0,5					-1,2				-1,1					-0,7

ROA/IRL >1

1 > ROA /IRL >0

ROA/IRL <0

NB: TFs in which incidence of direct payments is high marked in sky blue

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3, Eurostat, UK Bank of England

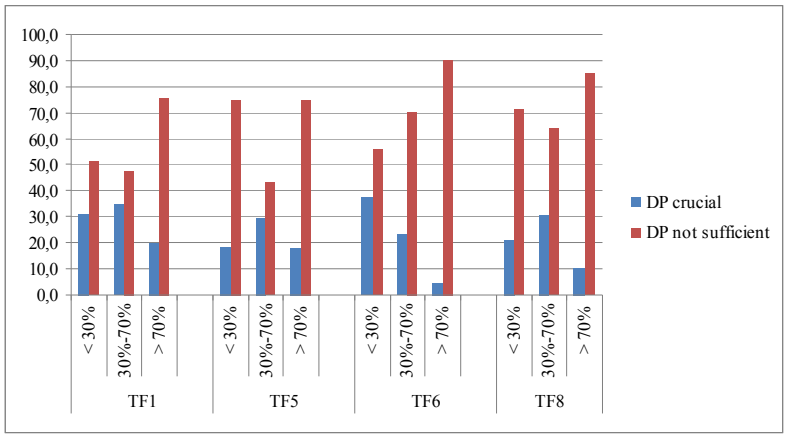
7.5.3 Estimate of the effect of direct payments on the attainment of economic and financial viability conditions

Limiting the analysis to sectors in which the role played by direct payments is greatest, it is possible to establish that direct payments are crucial in achieving the economic and financial viability of farms in a number of regions, given by the difference between the percentage of regions with ROA/IRL>1 in the real situation and the percentage of regions where the condition ROA/IRL>1 is met even in the absence of direct payments (simulated situation).

On the other hand, it is possible to establish that direct payments are insufficient for achieving the dual goal of economic and financial viability in a number of regions, given by the 100-complement of the

sum of the percentage of regions in which direct payments are crucial and the percentage of regions where this goal is attained even in the absence of direct payments.

Fig. 54 – Role of direct payments in attaining the condition of economic and financial viability of farms: % of regions in which direct payments is on average crucial and % of regions where direct payments is on average insufficient



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3, Eurostat, UK Bank of England

Results of the analysis, given in the graph above, lead to the conclusion that, in regional averages, direct payments play a crucial role for the economic and financial viability of farms for a percentage number of regions ranging from a maximum of 37% (class FWU/AWU <30% for TF6) to a minimum of 4.7% (class FWU/AWU >70%, again for TF6).

Within each TF, direct payments do in any case play an important, but more limited role, in the class FWU/AWU >70% (peak of 20% of regions in field crops sectors). In this latter class indeed direct payments appear to be insufficient for attaining the dual goal of economic and financial viability to an extent even greater than 70% of regions, with a peak of 91% in other grazing livestock farms.

This confirms the fact that, despite direct payments, farms having an organisational model relying on the use of family labour to a large extent find it more difficult to attain a state of viability compared with farms applying other organisational models

7.6 The effects of the 2003 reform on the economic viability of farms

The analysis of ROI and ROA trends comparing the periods prior to and after the reform was conducted only for EU15 macro-regions, by comparing average values for the period 2001-04 and the period 2006-07. As already highlighted in EQ1, in this case too the analysis was made possible only when, for each region / TF / FWU/AWU class combination, the number of elements of each sample was above 15 in both periods[99].

[99] In the period 2001-04 the number of regions having a sample with a number of farms greater than 15 in the two classes FWU/AWU <30% and 30-70% is higher compared with the period 2006/07. This might be random, but the systematic nature of the phenomenon leads one to believe that, after the reform, there has been a reduction in the number of hired workers, with a relative move of some farms from one class to another of the sample.

Taking this restriction into account, the table below shows the findings of the analysis concerning the average weighted values of ROI and ROA realised in the EU15[100].

Tab. 38 - EU15: Average weighted values of ROI and ROA prior to (2001-04) and after (2006-07) the reform, by FWU/AWU class and by TF, in the actual situation (%)

		TF1			TF2			TF4			TF5			TF6			TF7			TF8		
		< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%	< 30%	30%-70%	> 70%
ROI	Before reform	2,76	3,13	0,98	8,15	4,59	-0,91	7,39	4,76	1,12	3,51	3,10	1,14	5,78	3,11	0,99	8,49	4,74	3,61	2,12	2,62	1,04
	After reform	4,40	4,34	2,70	6,76	4,91	0,57	8,50	5,40	2,06	5,34	4,02	2,83	4,95	3,58	1,06	6,48	4,42	2,17	3,29	2,90	2,03
	Δ	1,65	1,22	1,72	-1,38	0,32	1,48	1,10	0,64	0,94	1,83	0,92	1,69	-0,83	0,48	0,07	-2,01	-0,33	-1,44	1,17	0,28	0,98
ROA	Before reform	2,02	2,19	0,35	5,86	2,78	-1,62	6,92	4,27	1,01	2,64	1,59	0,29	5,47	2,61	0,53	6,30	2,04	2,02	0,96	0,65	-0,02
	After reform	3,64	3,36	2,11	4,74	3,60	0,04	8,08	5,01	1,97	4,10	2,45	2,06	4,56	3,30	0,76	4,22	2,35	0,98	2,26	1,33	1,10
	Δ	1,62	1,17	1,76	-1,12	0,82	1,66	1,16	0,74	0,96	1,46	0,86	1,77	-0,90	0,69	0,23	-2,08	0,31	-1,04	1,30	0,67	1,12
Var % ROA/ROI	Before reform	-26,9	-30,0	-64,6	-28,0	-39,4		-6,3	-10,4	-9,7	-24,9	-48,7	-74,6	-5,4	-16,0	-46,5	-25,9	-57,0	-44,0	-54,9	-75,1	-98,5
	After reform	-17,5	-22,7	-22,0	-29,9	-26,7	-93,6	-4,8	-7,3	-4,3	-23,3	-39,1	-27,1	-7,8	-7,9	-28,5	-34,9	-46,8	-54,8	-31,3	-54,3	-45,5

> 5%

< 0

NB: TFs in which incidence of direct payments is high marked in sky blue

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3, Eurostat, UK Bank of England

Results of the analysis appear to show that in most TF / FWU/AWU class combinations average ROI values and, even more, average ROA values, are above zero, but not greater than 5%. Only in a few cases (on average) are indicators negative or not above 5% in the period prior to and/or after the reform.

In all sectors, both in the period prior to the reform and in the subsequent period, there is an inverse relationship between the ROI and ROA level and FWU/AWU class: in the class <30% the levels of indicators are always higher than those of the class >70%, which reach relatively lower levels.

In almost all TF / FWU/AWU class combinations, ROI and ROA levels increased more or less significantly in the post-reform period, with the exception of TF7 and the class <30% for TF2 and TF6. Nevertheless, the rise in ROA is, generally speaking, larger than the growth of ROI (with the exception of TF2 and TF7), particularly in the class FWU/AWU >70%. In short, therefore, after the reform the incidence of net financial costs (in particular interest paid) on the profitability of farms was relatively smaller compared with the pre-reform period, thus permitting a higher remuneration of capital.

Bearing in mind the lower levels obtained in the pre-reform period, the largest rise, of both ROI and ROA, was posted for the class FWU/AWU >70 %, in particular in TF1, TF5 and TF8[101]. In both of the other classes increases were large but not as great.

One may conclude that, after the reform, there has been a greater realignment of ROA and ROI levels between the three FWU/AWU classes, since differences are less than those in place in the previous period. This can be seen in all sectors, but to a greater extent in those TFs mentioned above.

[100] The table highlights, for each of the combinations TF/FWU/AWU class, the average ROI and ROA values below zero, and values above 5%.

[101] In TF1 the ROI for the class >70 % rises 2.8 times, in TF5 2.5 times and in TF8 1.9 times. What is more, the ROA in TF5 rises more than 6 times, and in TF5 over 7 times (in TF8 it is also extremely high, with ROA being negative prior to the reform).

Informed views of the experts

In relation to ROI (ROA) taking higher values in the years following the 2003 reform, compared to the pre-reform period, we have suggested to the experts the possible causes that may have had an influence on such a result. Among the suggested causes, the experts indicate as the most likely the overall improvement of market conditions and a combination of improved market conditions and technical and managerial improvements adopted by farms following the implementation of the reform.

7.6.1 ROI and ROA trends in regions

Taking into account the results of the analysis at EU level, we sought to verify the extent to which the general growth in ROI and ROI levels prior to and after the reform has affected regions. To this end, for each sector and each FWU/AWU class we calculated the number of regions posting growth, and the relative percentage out of all regions analysed for each of the TF / FWU/AWU class combinations. Furthermore, in order to see whether there are significant differences, EU15 regions were grouped together into two subsets selected by type of model of implementation of the reform (SPS historic and SPS hybrid).

Tab. 39 - EU15: number of regions where average ROI and ROA levels increased prior to (2001-04) and after (2006-07) the reform, by FWU/AWU class, TF and model of implementation of the reform (No. and %)

TF	Class of FWU/AWU	ROI									ROA								
		SPS Historical			SPS Hybrid			Total regions			SPS Historical			SPS Hybrid			Total regions		
		N° regions	N° increased	% increased	N° regions	N° increased	% increased	N° regions	N° increased	% increased	N° regions	N° increased	% increased	N° regions	N° increased	% increased	N° regions	N° increased	% increased
TF1	< 30%	15	11	73,3	7	7	100,0	22	18	81,8	15	10	66,7	7	7	100,0	22	17	77,3
	30%-70%	22	16	72,7	8	6	75,0	30	22	73,3	22	17	77,3	8	7	87,5	30	24	80,0
	> 70%	25	20	80,0	10	10	100,0	35	30	85,7	25	21	84,0	10	10	100,0	35	31	88,6
TF2	< 30%	10	5	50,0	7	5	71,4	17	10	58,8	10	6	60,0	7	5	71,4	17	11	64,7
	30%-70%	18	9	50,0	7	4	57,1	25	13	52,0	18	9	50,0	7	4	57,1	25	13	52,0
	> 70%	18	7	38,9	7	6	85,7	25	13	52,0	18	7	38,9	7	6	85,7	25	13	52,0
TF4	< 30%	14	10	71,4	5	4	80,0	19	14	73,7	14	10	71,4	5	4	80,0	19	14	73,7
	30%-70%	18	11	61,1	4	3	75,0	22	14	63,6	18	10	55,6	4	4	100,0	22	14	63,6
	> 70%	18	9	50,0	5	4	80,0	23	13	56,5	18	9	50,0	5	4	80,0	23	13	56,5
TF5	< 30%	1	1	100,0	3	3	100,0	4	4	100,0	1	1	100,0	3	3	100,0	4	4	100,0
	30%-70%	16	11	68,8	9	7	77,8	25	18	72,0	16	10	62,5	9	8	88,9	25	18	72,0
	> 70%	25	19	76,0	10	10	100,0	35	29	82,9	25	20	80,0	10	10	100,0	35	30	85,7
TF6	< 30%	6	3	50,0	2	1	50,0	8	4	50,0	6	3	50,0	2	1	50,0	8	4	50,0
	30%-70%	22	8	36,4	4	3	75,0	26	11	42,3	22	8	36,4	4	3	75,0	26	11	42,3
	> 70%	27	13	48,1	10	6	60,0	37	19	51,4	27	12	44,4	10	7	70,0	37	19	51,4
TF7	< 30%	4	1	25,0	3	1	33,3	7	2	28,6	4	1	25,0	3	1	33,3	7	2	28,6
	30%-70%	11	5	45,5	6	2	33,3	17	7	41,2	11	6	54,5	6	3	50,0	17	9	52,9
	> 70%	20	4	20,0	7	1	14,3	27	5	18,5	20	6	30,0	7	2	28,6	27	8	29,6
TF8	< 30%	4	1	25,0	3	2	66,7	7	3	42,9	4	1	25,0	3	2	66,7	7	3	42,9
	30%-70%	19	12	63,2	9	6	66,7	28	18	64,3	19	11	57,9	9	7	77,8	28	18	64,3
	> 70%	27	20	74,1	10	9	90,0	37	29	78,4	27	19	70,4	10	10	100,0	37	29	78,4
All TF	< 30%	54	32	59,3	30	23	76,7	84	55	65,5	54	32	59,3	30	23	76,7	84	55	65,5
	30%-70%	126	72	57,1	47	31	66,0	173	103	59,5	126	71	56,3	47	36	76,6	173	107	61,8
	> 70%	160	92	57,5	59	46	78,0	219	138	63,0	160	94	58,8	59	49	83,1	219	143	65,3

NB: cases in which the increase is <50% marked in sky blue

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

Results of the analysis show that in the great majority of TF / FWU/AWU class combinations the average ROI and ROA levels rose in more than 50% of regions for which data are available. In some combinations growth affected 100% of regions. Only in a few cases, heavily concentrated in granivore farms and to a lesser extent in other grazing livestock, the average growth affected less than 50% of

regions. In all regions the rise in ROA affected a number of regions that was slightly higher than the rise in ROI, and limited to the FWU/AWU classes 30-70% and >70% (in the class <30% the rise generally affected the same number of regions).

Generally speaking, the average ROI and ROA levels affected a higher percentage of regions with hybrid SPS compared with regions adopting historic SPS. This can be seen in all FWU/AWU classes, and in all sectors except for granivores. With all due caution, these systematic results lead one to conclude that the phenomenon observed could not be random. In other words, and without prejudice to all other causes, the system implementing hybrid SPS would appear to have favoured to some extent the growth of the two indicators.

Finally, with reference to trends in the periods prior to and after the reform, we grouped together regions according to the frequency in which average ROI and ROA levels fall into four value classes, namely: <-5%; -5% to 0; 0 to 5%; >5%.

Tab. 40 - EU15: Percentage of regions by ROI and ROA value classes, in total and for each TF, prior to and after the reform (no. and %)

	Total regions (%)	ROI								ROA							
		Before reform (%)				After reform (%)				Before reform (%)				After reform (%)			
		< -5%	from -5 to 0	from 0 to 5%	> 5%	< -5%	from -5 to 0	from 0 to 5%	> 5%	< -5%	from -5 to 0%	from 0 to 5%	> 5%	< -5%	from -5 to 0%	from 0 to 5%	> 5%
TF1	100	0,0	13,8	56,3	29,9	0,0	4,6	41,3	54,0	0	25,3	54	20,7	0	8,05	43,7	48,3
TF2	100	9,0	20,9	19,4	50,7	9,0	19,4	22,4	49,3	11,9	23,9	22,4	41,8	11,9	17,9	28,4	41,8
TF4	100	1,6	20,3	39,1	39,1	0,0	15,6	39,1	45,3	1,56	23,4	39,1	35,9	0	18,8	40,6	40,6
TF5	100	1,6	18,8	64,1	15,6	1,6	9,4	50,0	39,1	1,56	32,8	53,1	12,5	1,56	14,1	51,6	32,8
TF6	100	1,4	22,5	54,9	21,1	1,4	22,5	53,5	22,5	2,82	29,6	49,3	18,3	1,41	28,2	49,3	21,1
TF7	100	2,0	5,9	39,2	52,9	2,0	19,6	35,3	43,1	1,96	19,6	31,4	47,1	7,84	25,5	25,5	41,2
TF8	100	1,4	23,6	50,0	25,0	0,0	13,9	59,7	26,4	1,39	31,9	44,4	22,2	1,39	19,4	55,6	23,6
All TF	100	2,3	18,3	46,8	32,6	1,9	14,5	43,5	40,1	2,94	26,9	42,9	27,3	3,15	18,3	42,9	35,7

NB: circled cells are those where variations prior to and after the reform are larger

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

The analysis indicates that the percentage of regions posting negative average values went down significantly: from 20.6% to 16.4% for ROI and from 29.8% to 21.4% for ROA. Furthermore:

- in all sectors the percentage of regions having an average ROI and ROA value < -5% is marginal, with the exception of TF2 (both prior to and after the reform) and granivores (after the reform). It is recalled that in both these sectors direct payments have had a limited incidence.
- In field crops, milk, other permanent crops and mixed sectors in the periods prior to and after the reform regions shifted from lower ROI and ROA classes (below zero) to higher classes. In TF1 and TF5 the most important shift was recorded in favour of the higher class of values (>5%).
- On the other hand, in granivores and horticulture the situation worsened, with a general move from higher to lower classes. In particular, in granivores regions with a negative ROI went from 7.8% to 21.6%, and those with >5% went from 53% to 43%; in the same way, regions with a negative ROA went from 21.6% to 33.3%, and those with >5% went from 47.1% to 41.2%.
- It is noted however that granivores and horticulture (together with other permanent crops, all with a low share of direct payments) are the sectors which in the period prior to the reform posted the highest concentration of regions in the class >5% (for both ROI and ROA values).
- Finally, in other grazing livestock sector no significant changes were noted between the two periods.

7.7 Evaluation judgement

A farm can be considered viable when it is able to guarantee a "sufficient remuneration" of family labour and farm capital. Two aspects have been taken into account:

- economic viability: is related to the ability to guarantee remuneration of family labour at least equal to its opportunity cost and positive remuneration of farm capital;
- economic and financial viability : is related to the ability to guarantee, besides the remuneration of family labour, the remuneration of farm capital at least equal to the average Interest Rate applied to medium-term loans.

Concerning economic viability, the judgement is based on the results of the analysis of two key indicators obtained from the FADN sample data:

- Return on Investments (ROI), calculated as a ratio of Earnings Before Interest and Taxes (EBIT) and Total Assets (TA);
- Return on Assets (ROA), calculated as a ratio of Farm Net Income (FNI) and Total Assets (TA)

Both indicators were measured net of the value of family labour, estimated at its opportunity cost of the average wage of farm employees.

To form a judgement on the soundest base, the analysis compared the value of indicators in the actual situation (with direct payments) and in the simulated situation (without direct payments). Furthermore, the indicators were analysed for each sector and distinguishing between three farm types defined according to different shares of unpaid labour (FWU) vis-à-vis all employed labour (AWU). Namely: type with FWU/AWU < 30%; type with FWU/AWU between 30 and 70%; type with FWU/AWU > 70%.

With reference to the ability of direct payments to support the economic viability of farms, the analysis led to the following conclusions.

At a Community level, ROI and ROA values in the actual situation are generally low, especially in sectors where the share of direct payments is highest (field crops, other grazing livestock, mixed and, in part, milk sectors). Nevertheless average values are almost never negative. On the other hand, in the simulated situation average ROI and ROA values would have became negative in all sectors where the share of direct payments is highest (field crops, other grazing livestock, mixed sectors).

It may therefore be concluded that, on average, in the simulated situation (absence of direct payments) economic results would have been not not sufficient to adequately remunerate capital nor family labour in these sectors. In other words (on average), direct payments have been crucial in ensuring the economic viability of farms specialised in field crops, grazing livestock, mixed farming and, partly, in the milk sector.

Some distinctions were made possible by further analyses. At the EU15 level, ROI and ROA values are generally lower in farms where the family component of labour is higher (and presumably farms are smaller), and higher in farms where the family component is more limited (and presumably farms are larger). At the EU12 level this rule does not appear to be so evident: for most sectors the highest values for the two indicators are obtained in the class FWU/AWU from 30 to 70%, while the lowest values are obtained (on average) in the class FWU/AWU <30%.

It is thus possible to conclude that farms in which the paid labour component is high (FWU/AWU <30%) are the most efficient in the EU15 and the least efficient in the EU12, suggesting in this last case an excess presence of paid labour. Therefore, the strategic goals of

these farms might be different: more targeted to economic results in the EU15 and more focused on social aspects in the EU12.

At a regional level there is quite a large variability. In a significant number of Community regions average ROI values, and even more average ROA levels, are negative (generally speaking, in less than 24% of regions in the actual situation, and in 52% of regions in the simulated situation).

This leads one to conclude that, on average for the period 2004-2007, and with some differences across sectors, in about 76% of regions direct payments have enabled farms to adequately remunerate family labour (calculated at opportunity cost) and to remunerate to some extent the invested capital of farms. *Vice versa*, in about a quarter of the Community regions, on average, farms are not economically viable even with direct aid, since farm performance does not ensure a sufficient remuneration of either family labour or invested capital.

Nevertheless, in about 28% of regions[102], direct payments make it possible to adequately remunerate family labour at the opportunity cost, but not remunerate invested capital. In this case, farms have a problem of economic viability, since capital remuneration would presume an under-remuneration of family labour.

This situation is particularly evident in the class resorting most to family labour (FWU/AWU >70%), in particular in horticulture, other grazing livestock and mixed sectors. It is thus quite likely that in many farms of this class there are elements of hidden unemployment, resulting in the use of family labour surplus to actual needs, dictated by technological progress.

Concerning economic and financial viability, the analysis compared ROA values and average interest rates paid on loans (IRL), the latter being considered as an opportunity cost of capital. It was considered that when the value of the ROA/IRL ratio is:

- greater than 1: both economic viability and financial viability conditions are met;
- between 0 and 1: the economic viability condition is met, but the financial viability condition is not;
- below 0: the viability condition is never met (since ROA is negative).

The results of the analysis lead us to conclude that on average, in the majority of regions direct payments have allowed the attainment of economic viability, but not of financial viability (the value of the ratio is between 0 and 1 for farms in most regions). Furthermore, despite the presence of direct payments, farms having an organisational model largely relying on the use of family labour find it more difficult to attain a state of viability compared with farms applying other organisational models.

With reference to the effects of the 2003 reform (analysis only for EU15 regions), a general growth in ROI and ROA values was seen, stronger in farms in which the family component of labour was higher. Accordingly, in all sectors the indicators have come close together for the three classes.

ROI and ROA values rose for a larger number of regions having adopted the hybrid SPS model compared with the number of regions having adopted historic SPS model (in all FWU/AWU classes, and in all types of farming except for granivores). Consistently similar results across the considered region groups lead to conclude that the phenomenon observed could not be random. In other words, and without prejudice to all other causes, the system implementing hybrid SPS would appear to have favoured to some extent the growth of ROI and ROA.

[102] Calculated as the difference between the percentage share of regions in which ROA would become on average < 0 in the absence of DP (52.1%) and the number of regions in which ROA is in any case on average < 0 even with DP (23.6%).

8. THEME 2 – EFFICIENCY AND COHERENCE

TO WHAT EXTENT HAVE THE DIRECT PAYMENTS BEEN EFFICIENT WITH RESPECT TO ACHIEVING THEIR OBJECTIVES? (EQ 3)

8.1 Comprehension and interpretation of the evaluation question

The evaluation question asks to assess whether direct payments have been efficient with respect to achieving their objectives concerning the income of farmers. The assessment of direct payments' efficiency must take into account two distinct aspects.

The first aspect refers to efficiency with respect to targeting the appropriate recipients. In this sense, direct payments can be considered as an efficient policy instrument if they support the income of farmers who actually need that support and, furthermore, if they target the recipients in a way that reduces income disparities among farmers.

In this respect, direct payments should provide enough support to farms that are not able to reach a certain income level (per labour unit) sufficient to guarantee a fair standard of living and, at the same time, they should not over-compensate farms that reach that same income level (per labour unit) even in the absence of direct payments. In case of over-compensation, the corresponding monetary amount of direct payments represents an unnecessary surplus, therefore, we would have to consider direct payments as inefficient.

Furthermore, the analysis of the targeting efficiency of direct payments concerns the extent to which the payments are allocated in a way that contributes to reducing incomes disparities among farmers. This entails two issues. The first issue regards direct payments' contribution to the overall equity of farmers' income distribution. The second issue involves examining whether direct payments provide higher contribution to the lower income groups and, proportionally, lower contribution to the higher income groups so as to reduce disparities. In particular, if direct payments provide higher contribution to the lower income groups and less contribution to the higher income groups, they can be considered as an efficient policy instrument with respect to the targeting objective.

The second key dimension refers to the relative efficiency of direct payments in enhancing income levels as compared to other CAP instruments, such as market support and rural development measures. Therefore, this part of the evaluation aims at establishing whether direct payments may be more efficient than market support (1st Pillar of the CAP) and rural development measures (2nd Pillar) in sustaining farmers' incomes. Importantly, the relative contribution of coupled *vs.* decoupled direct payments to farmers' incomes is assessed for answering the present evaluation question.

8.2 Methodological approach, data sources and limits

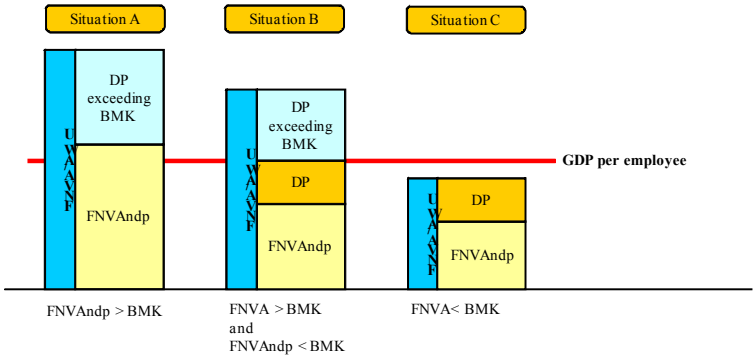
Assessing the efficiency of direct payments in terms of targeting the appropriate recipients

The first part of the analysis compared farmers' income with the GDP per employee in 2001, 2004 and 2007 at regional level considering three situations:

- situation A: *(FNVAndp/AWU) / GDP/employee > 1*. In this situation the income of farmers is equal or higher than the GDP per employee of the corresponding region even in the absence of direct payments. For farms in this situation, DP/AWU represents the expenditure going to farms that even without direct payments achieve the benchmark income.
- situation B: *(FNVA/AWU) / GDP/employee > 1 and (FNVAndp/AWU) / GDP/employee < 1*. In this situation the income of farmers is equal or higher than the GDP per employee of the

corresponding region but only because of direct payments. For farms in this situation, part (variable from to case to case) of direct payments surpasses the income objective. This part corresponds to: *FNWA/AWU - GDP/employee*

- situation C: *(FNVA/AWU) / GDP/employee < 1 and (FNVAndp/AWU) / GDP/employee <1* . In this situation, the income of farmers is lower than the benchmark (GDP/employee of region r even with direct payments).



For each type of farming and region groups classified according to the SPS model (historic, hybrid, regional and SAPS), the following indicators were computed:

- the percentage of farms falling into each of the three situations out of all farms in the FADN samples. The sum of percentages of situation A and situation B (situation A+B) represents the overall percentage of farms for which there is a part of direct payments exceeding the benchmark.
- the percentage amount exceeding the regional GDP per employee in situation A and in situation B out of the total amount of direct payments received by all farms in the FADN samples. The sum of percentages of situation A and situation B (situation A+B) represents the total amount exceeding the benchmark . For each type of farming and region r, the calculation was done as follows:

  *Share A = % (Σ (DPi/AWUi * AWUi)/ Total DP*) for each i = 1…n farms falling into situation A.

  Share B = % (Σ ((FNVAj/AWUj – GDP/employee) AWUj)/ Total DP)* for each j = 1…n farms falling into situation B.

  Total amount exceeding the benchmark = Share A + Share B

To calculate these indicators, it was necessary to work on each of the farms making up the FADN samples (e.g. to calculate the number of farms belonging to one or the other of the three situations mentioned, the individual position of each farm was assessed). This forced us to conduct the analysis on samples of farms for three specific years, and not (unlike the case of answers to previous evaluation questions) on average values for the samples of one or more periods.

The results of analysis conducted on a single year may reflect the presence of extraordinary events (natural disasters, short-term market crises, etc.) to a greater extent than would be the case when working on average values for a given period (since in this case the effects of possible anomalous events for a single year are diluted within average values for the period). This represents a second limitation.

As already mentioned, data on single farms come from the EU-FADN-DG AGRI L-3 source. To select one of the three situations mentioned, the income levels (FNVA/AWU) of each farm of the FADN samples were compared with specific GDP/employee values of the regions to which the same farms belong. The data for the latter indicator is sourced from Eurostat (see EQ1).

The second part of the analysis examines whether direct payments have been efficient with respect to reducing inequity in the distribution of farmers incomes in the EU regions and in the sectors interested by the evaluation. The methodology comprises two levels of analysis that complement each other.

First of all, we assess the extent to which direct payments contribute to reducing the overall inequity in the distribution of farmers' income across types of farming and EU regions. The second level of the analysis concerns a closer examination of the way in which coupled and decoupled direct payments are targeted to farmers belonging to different income classes (from lower to higher). The two levels of analysis are described as follows.

The first level of analysis concerns the assessment of direct payments' effects in terms of their contribution to a more equitable distribution of farmers' incomes. Such an assessment is based on the comparison of income concentration coefficients calculated for the distributions of FNVA/AWU gross and net of direct payments.

The analysis is carried out in three years (2001, 2004 and 2007) for each type of farming, distinguishing EU regions according to the model of SPS or SAPS implemented from 2004 onwards (see Tab. 1). The examined groups are illustrated in the following table.

CAP model	Code	Member States/Regions
Historic SPS	SPS_Hist	AU, BE, ES, FR, GR, IE, IT, NL, PT, UK-Scotland, UK-Wales
Hybrid SPS with prevalent historic component	SPS_Hybr(H)	LU, UK-England, UK-Northern Ireland
Hybrid SPS with prevalent regional component	SPS_Hybr(R)	DE, DK, FI, SE
Regional SPS	SPS_ Reg	MT, SI
SAPS	SAPS	BG, CY, CZ, EE, HU, LT, LV, PL, RO, SK

The Gini coefficient of concentration is used to measure the degree of statistical dispersion of variables that are transferrable between different units of the same population, such as income. There are various ways to express and to compute the Gini coefficient[103]. A widely used formula is that proposed by Pyatt et al. (1980)[104]:

$G = [2\ covar\ (y, r_y)] / N\hat{y}$,

Where $covar\ (y, r_y)$ is the covariance between income (y) and ranks of all observations according to their income (r_y) ranging from the lowest to the highest. N is the total number of observations and $\hat{y}$ is the mean income.

Whatever the computation method, the Gini coefficient ranges between 0 and 1 (or, equivalently, between 0% and 100%), with zero corresponding to perfect equity in the distribution and 1 corresponding to complete inequity. However, the Gini coefficient cannot be used in case the observed variable takes negative values, and, indeed, income is > 0 by definition. As this is true in most cases, agriculture can be an exception to this rule, with negative income values often

[103] Mathematically or geometrically, based on the Lorenz curve that represents the proportion of total income of a population earned by a certain proportion of the same population, or statistically as half of the mean difference of the variable in comparison to its arithmetic mean.

[104] Pyatt G., Chen C-N., Fei J. (1980). The distribution of income by factor component. *Quarterly Journal of Economics*, November, 451-473.

encountered. The presence of negative income values is likely to produce an over-estimation of incomes disparities (depending on the share of negative observations over the total), for which the Gini coefficient can result to be > 1. To overcome this problem, we calculate an adjusted Gini index using the approach proposed by Chen et al. (1982)[105]. Basically, the adjusted Gini coefficient is a standard Gini coefficient normalised for the proportion of negative income values within the observed distribution and, therefore, constrained to range between 0 and 1.

The analysis is based on the comparison of the following Gini coefficients calculated for 2001, 2004 and 2007, for each type of farming across the groups of Member States:

- G1 = Gini coefficients of the FNVA/AWU distributions, with FNVA/AWU including direct payments;
- G0 = Gini coefficients of the FNVA/AWU distributions, with FNVA/AWU net of direct payments.

The Gini coefficient has a number of advantages. First of all, it is independent from the size of the economy for which it is measured and it is also independent from the size of the population. This works well in our evaluation, because we can compare Gini coefficients calculated across regional farm samples that differ in size and sectors that are characterised by sometimes rather different levels of income per labour unit.

One of the main disadvantages of this index, however, is that it is not able to capture where in any examined income distribution the inequity occurs. Similarly, the comparison of Gini coefficients calculated on actual and simulated income distributions does not provide information on the way in which direct payments are distributed to lower or higher income farms.

The second level of analysis examines the contribution of direct payments to farmers' income according to income classes, this time making a distinction between coupled and decoupled payments. The analysis is first carried out at the micro-economic level on FADN farm data.

This second level of analysis reinforces the previous one, as it provides further insight about the way in which direct payments contribute to enhancing the income of farmers in lower vs. higher farm income classes.

The basic assumption is that, to be efficient, direct payments' contribution to low income farms has to be higher than the contribution to high income farms, so as to be more effective in reducing income inequities. This assumption is tested by means of quantile regression.

The structure of the equations to be estimated is similar to that introduced in the methodology section (§ 4.1.3) and the econometric approach can be considered as an extension of conditional mean models (i.e. the Ordinary Least Square model) where mean values are substituted with the quantile values of the distribution of the dependent variable (i.e. FNVA/AWU). By using all the sample observation units, quantile regression allows to estimate the parameters of direct payments for each quantile within the income distribution.

The analysis focuses on the variations occurring in the direct payments' parameters when moving from lower quantiles, identifying low farmers' income classes, to higher quantiles, identifying high income classes. If direct payments' parameter estimates become smaller when moving from lower to higher income quantiles, then direct payments can be considered to be efficient with respect to the targeting objective.

[105] Chen C-N., Tsaur T-W., Rhai T-S. (1982). The Gini coefficient and negative income. Oxford Economic Papers, Vol.34, 473-478.

The contribution of direct payments in reducing the existing disparities in income distribution in the agricultural sector is also examined from a macro-economic perspective. In this case, we analyse the impact of coupled and decoupled payments on farmers' incomes across EU regions (at NUTS II level), based on the economic accounts data for Agriculture (Eurostat) and the CAP payments information provided by the CATS database. Quantile regression is again applied, this time at the regional level, to ordered income quantiles (with quantiles referring to EU regions), where farmers income is represented by the corrected Factor Income per agricultural employee (i.e. CFI/EMP_{agr}).

The description of these econometric tools can be found in the methodology chapter.

Assessing the relative income transfer efficiency of direct payments

The contribution of coupled and decoupled direct payments to farmers' income, relative to that of market support and other policy measures, provides an indication of direct payments' relative efficiency compared to the other policy instruments as an income transfer policy instrument.

At the micro-economic level, the relative efficiency of direct payments is assessed through comparison of the estimated coefficients of direct payments (coupled and decoupled) with the coefficients of market support and other policies[106] resulting from the regression analysis applied to FADN data (see EQ1). Provided that the parameter estimates all take a positive sign, the assumption is that the larger the parameter estimate is, the larger the contribution of a policy instrument to farmers' income and, therefore, the more efficient that policy is in contributing to income as compared to the other instruments. The relative efficiency of coupled and decoupled payments compared to other policy instruments is also assessed at the macro-economic level. The comparison of the OLS regression parameters for direct payments (both coupled and decoupled) and other policy instruments permits to assess whether the former are more efficient than the latter in enhancing the level of agricultural income across EU regions (i.e. CFI/EMP).

The quantitative analysis is complemented by qualitative analysis of informed opinions obtained from a group of experts regarding the phenomena observed.

8.3 Judgment criteria and indicators

In order to reply to this part of the question, we based our judgement on the following criteria:

Criteria and Indicators
Judgment criterion no. 1 **Direct payments have (have not) been efficient with respect to allowing farmers to achieve an income level able to guarantee a fair standard of living**
Percentage share of farms whose income per labour unit reach the regional GDP per employee even without direct payments: *(FNVA/AWU – DP/AWU) / GDP/Empl.>1*
Percentage expenditure received by farms whose income per labour unit reach the regional GDP per employee even without direct payments
Percentage share of farms whose income per labour unit reach the regional GDP per employee thanks to direct payments *(FNVA/AWU) / (GDP/Empl).>1*
Percentage expenditure amount exceeding the benchmark for farms that receive more direct payments than they need to reach the regional GDP/employee

[106] We recall that the variable *otha* includes mainly rural development payments.

Criteria and Indicators
Judgment criterion no. 2 **Direct payments have (have not) been efficient with respect to reducing income disparities among farms in the regions and farm typologies considered in the analysis**
Comparison of income inequity indices (i.e. Gini coefficients) across types of farming and groups of regions classified according to models of implementation of the SPS and SAPS: G_1 = Gini coefficients relative to the distributions of FNVA/AWU including direct payments G_0 = Gini coefficients relative to the distributions of FNVA/AWU net of direct payments
Informed views of the experts
Quantile regression parameter estimates according to income classes across types of farming
Quantile regression parameter estimates according to income classes across EU regions
Judgment criterion no. 3 **Direct payments have been more (less) efficient than other support measures in enhancing the level of farmers' incomes in the regions and farm typologies considered in the analysis**
Comparison of the linear regression estimates of the parameters of the three instruments (direct payments, market support, rural development measures) across EU Regions and in region sub-groups according to differences in GVA_{agr}/GDP (Macro-econometric analysis)
Comparison of the linear regression estimates of the parameters of the three instruments (direct payments, market support, rural development measures) across types of farming and in SPS *vs.* SAPS regions (Micro-econometric analysis)

8.4 Efficiency of direct payments in terms of targeting the appropriate recipients

For methods adopted to calculate the indicators, see the § on the methodological approach. In order to provide a thorough and in-depth discussion, results are presented for three levels of analysis:

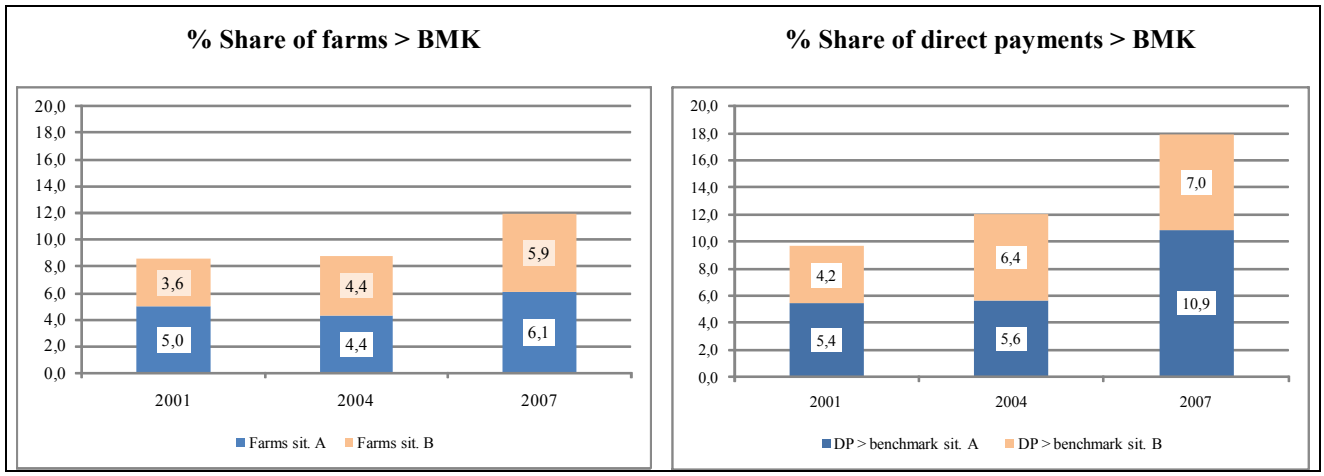
- overall Community level (i.e. all farms present in the FADN samples, without any distinction), in order to give an overall judgement on the efficiency of direct payments vis-à-vis the income objective;
- type of farming and regions classified according to SPS/SAPS model implemented, in order to establish possible differences;
- single regions, in order to highlight the existence of differences from region to region.

8.4.1 Overall results

The graphs below show the results of the analyses conducted on all farms of the FADN samples for the years 2001 (54,331 EU15 farms), 2004 (70,216 EU25 farms) and 2007 (75,206 EU27 farms).

Distinctions are made between the share of farms whose farm income per labour unit reaches the benchmark (regional GDP per employee) out of all farms and the corresponding percentage of direct payments exceeding the benchmark out of the sum of direct payments, in Situation A and Situation B respectively.

Fig. 55 – % share of farms exceeding the benchmark out of all farms and % of direct payments exceeding the benchmark out of the sum of direct payments, in situation A and in situation B: total FADN samples 2001, 2004, 2007



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3; Eurostat

An observation of these results prompts some considerations.

Although it has grown over time, the percentage of farms with income higher than their specific benchmark reached a maximum (A+B) of about 12% (in 2007), and the percentage of farms over their specific benchmark even without direct payments (situation A) is limited to a maximum of 6.1%. Overall, the great majority of Community farms, from a minimum of 88.1% (2007) to a maximum of 91.4% (2001), fall into Situation C (FNVA/AWU < GDP/employee).

Therefore, when considering all types of farming together, the system of direct payments attains a good level of efficiency in terms of of directing income support to farms whose income is lower than the benchmark is quite high: just 6.1% of farms received direct payments when they did not need it, and 5.9% of farms received more aid than they needed.

The percentage of direct payments paid to farms that do not need or only partly need direct support has also grown over time, but on levels and at a speed that are remarkably greater than for the previous indicator.

The total share of direct payments exceeding the benchmark (A+B) is within a range of 10 to 18% of the total amount paid out depending on the year. In 2007 the total share of direct payments exceeding the benchmark reached about 18% (A+B) out of which almost 11% is received by farms exceeding the benchmark even without direct payments (situation A).

Furthermore, since the percentage of direct payments exceeding the benchmark is always higher than the percentage of farms, it is surmised that this amount is concentrated, on average, on a proportionally more limited number of farms. Therefore, this amount is distributed in an unfair manner[107]: it may be deduced from this fact that, as the difference between the two indicators has grown over time, so has the degree of disparity.

[107] *Vice versa*, if % direct payments exceeding the benchmark was below % farms, it would relate to a proportionally higher number of farms and his distribution would be fairer.

8.4.2 Results of the analysis by type of farming and groups of regions implementing different CAP models

The results of the analysis conducted distinguishing types of farming and region groups highlight important differences *vis-à-vis* the previous overall analysis. Indeed, the overall share of farms with income over their benchmark when all types of farming are analysed together (and the corresponding amount of direct payments), may differ considerably from the situation of individual types of farming that are characterised by different share of direct payments on income.

Before explaining these results, and with the aim of giving a more valid interpretation, we believe it appropriate to focus on the distribution of the number of farms and the amount of spending for direct payments among different types of farming within the FADN samples used.

Indeed, the total sum of direct payments is not distributed evenly among types of farming: spending is concentrated in field crops, milk, other grazing livestock and mixed farms, whereas the budget allocated to horticulture, other permanent crops and granivores fails to reach 8% of the total spending.

Tab. 41 - Distribution of the amount of direct payments among types of farming analysed in the 2001, 2004 and 2007 FADN samples (% of total direct payments)

	% DP amount		
	2001	**2004**	**2007**
Field crops	49,6	42,1	38,7
Horticulture	1,1	0,7	1,0
Permanent crops	3,3	2,3	1,8
Milk	10,9	12,6	15,7
Grazing livestock	12,1	13,5	12,7
Granivores	2,2	2,6	4,9
Mixed	20,8	26,1	25,2
All types of farming	100,0	100,0	100,0

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

The results concerning the share of farms exceeding the regional GDP per employee out of all farms, and even more the share of direct payments exceeding this benchmark out of direct payments paid, should thus be interpreted in relation to the relevance actually represented by the amount of direct payments allocated to different types of farming.

This means that, for the purposes of providing a global judgment on policy, the same percentage will have a different economic significance depending on whether the relative relevance of direct payments expenditure in the different types of farming is higher or lower.

The table below reports the values of the indicators studied.

Tab. 42 - % share of farms exceeding the benchmark out of all farms and % share of direct payments exceeding the benchmark out of the sum of direct payments, by type of farming and region groups, in situation A in situation B and in situation (A+B)

		Share % of farms > benchmark									Share % of DP>BMK/total DP								
		2001			2004			2007			2001			2004			2007		
		A	B	(A+B)	A	B	(A+B)	A	B	(A+B)	A	B	(A+B)	A	B	(A+B)	A	B	(A+B)
Field crops	SPS Historic	5,0	5,7	10,7	2,8	6,5	9,3	6,5	9,4	15,9	5,5	6,1	11,6	5,3	10,1	15,4	15,1	11,6	26,7
	SPS Hybrid	3,1	8,3	11,5	3,4	9,8	13,2	10,7	16,6	27,3	3,4	4,1	7,5	5,0	7,4	12,4	17,6	12,0	29,7
	SPS Regional				1,6	0,0	1,6	2,7	1,4	4,1				23,4	0,0	23,4	12,7	0,6	13,2
	SAPS				11,2	10,9	22,2	17,1	11,7	28,8				17,3	16,0	33,3	22,1	9,2	31,4
Horticulture	SPS Historic	14,3	0,0	14,3	5,0	0,0	5,0	3,8	0,0	3,8	7,1	0,2	7,3	5,1	0,0	5,1	6,6	0,4	7,1
	SPS Hybrid	1,9	0,1	2,0	0,7	0,0	0,7	2,1	0,0	2,1	1,4	0,2	1,6	0,0	0,0	0,0	3,2	0,0	3,3
	SPS Regional				2,4	0,0	2,4	0,8	0,0	0,8				0,6	0,0	0,6	1,3	0,0	1,3
	SAPS				5,3	0,0	5,3	5,0	0,1	5,1				7,8	0,0	7,9	14,1	1,5	15,6
Permanent crops	SPS Historic	2,5	1,2	3,7	3,2	0,9	4,1	2,3	0,4	2,7	5,7	4,3	10,0	3,9	3,9	7,8	2,9	0,9	3,8
	SPS Hybrid	2,7	0,0	2,7	1,4	0,5	1,9	2,8	1,3	4,1	5,9	0,0	5,9	0,4	3,4	3,8	4,6	1,7	6,3
	SPS Regional				2,6	0,0	2,6	0,0	0,0	0,0				0,3	0,0	0,3	0,0	0,0	0,0
	SAPS				2,3	0,0	2,3	5,8	1,1	6,9				1,6	0,0	1,6	6,9	1,2	8,2
Milk	SPS Historic	3,5	0,6	4,1	5,4	2,5	7,9	6,4	5,5	12,0	3,2	1,5	4,6	8,0	3,9	11,9	11,5	5,2	16,7
	SPS Hybrid	2,9	3,3	6,2	1,0	2,9	3,9	6,1	9,5	15,6	3,5	3,4	6,8	2,0	2,3	4,3	10,7	7,2	17,9
	SPS Regional				1,9	0,0	1,9	1,4	1,4	2,7				4,2	0,0	4,2	2,5	0,4	2,9
	SAPS				4,8	4,7	9,5	6,0	4,4	10,4				4,0	4,5	8,5	5,3	3,5	8,8
Grazing livestock	SPS Historic	0,8	0,8	1,6	1,7	3,1	4,8	2,0	2,6	4,6	0,9	0,5	1,4	3,5	4,0	7,5	5,7	2,3	8,0
	SPS Hybrid	0,0	0,9	0,9	0,1	2,1	2,1	0,7	3,6	4,2	0,0	0,5	0,5	0,0	1,2	1,3	1,2	2,2	3,5
	SPS Regional				0,0	1,9	1,9	0,4	1,3	1,8				0,0	0,8	0,8	0,5	4,8	5,3
	SAPS				2,9	3,1	6,0	5,5	4,5	10,0				5,8	7,2	13,1	6,9	3,0	9,9
Granviores	SPS Historic	20,5	2,5	22,9	22,3	1,8	24,0	12,4	1,3	13,7	19,3	8,7	28,0	24,0	2,0	26,0	19,6	1,5	21,1
	SPS Hybrid	25,2	10,0	35,2	7,7	4,2	11,9	4,0	1,7	5,7	36,0	9,8	45,8	6,1	3,2	9,2	5,0	2,3	7,3
	SPS Regional				12,5	19,4	31,9	7,9	3,4	11,2				33,5	29,8	63,3	19,0	3,2	22,2
	SAPS				12,2	4,4	16,6	9,2	2,4	11,6				15,1	9,2	24,3	12,7	6,9	19,6
Mixed	SPS Historic	9,7	5,8	15,5	2,6	6,0	8,7	3,9	7,8	11,7	15,0	6,1	21,1	4,5	4,7	9,3	7,5	7,4	14,9
	SPS Hybrid	5,3	5,7	11,0	2,4	5,0	7,4	3,0	7,7	10,7	4,4	3,7	8,1	2,8	2,3	5,1	2,4	5,3	7,7
	SPS Regional				0,0	2,9	2,9	0,0	2,7	2,7				0,0	10,7	10,7	0,0	2,9	2,9
	SAPS				3,1	2,8	6,0	3,1	3,2	6,3				3,5	4,1	7,5	3,4	2,4	5,9
All types of farming	SPS Historic	5,1	3,1	8,3	4,0	3,8	7,8	4,7	5,0	9,7	6,1	4,5	10,7	5,3	6,8	12,0	10,6	7,0	17,6
	SPS Hybrid	4,4	5,2	9,6	2,2	4,9	7,1	5,6	8,8	14,4	4,6	3,9	8,5	3,3	4,1	7,4	9,2	7,5	16,7
	SPS Regional				2,4	2,4	4,8	1,6	1,5	3,0				19,5	16,8	36,3	7,5	2,0	9,5
	SAPS				6,7	5,5	12,2	9,1	6,0	15,1				10,4	9,9	20,4	13,4	6,2	19,5
	Total	**5,0**	**3,6**	**8,6**	**4,4**	**4,4**	**8,8**	**6,1**	**5,9**	**11,9**	**5,4**	**4,2**	**9,7**	**5,6**	**6,4**	**12,1**	**10,9**	**6,9**	**17,8**

NB: values exceeding the Community total are highlighted in yellow
Source: Elaborations based on sample data EU-FADN-DG AGRI L-3; Eurostat

The results obtained prompt the following observations and considerations.

A: sectors in which the share of direct aid is limited

In horticulture and other permanent crops sectors the % of farms over the benchmark (i.e. having FNVA/AWU > BMK) is remarkably lower than the Community average, same as for the % of direct payments exceeding the benchmark. There do not appear to be important variations that may in some way relate to the change in policy (only for other permanent crops there is a slight increase in the % of farms and of direct payments for the Hybrid SPS group). Considering the limited relevance of spending for direct payments out of the total envelope (3% at most), for these two sectors the analysis is not particularly relevant, regardless of the CAP model adopted. Nevertheless, the low percentage of farms over the benchmark highlights a widespread need for support that the policy either does not fulfil or in any case (in particular for Hybrid SPS and Regional SPS) only partially satisfies.

On the other hand, in the granivores sector the % of farms over the benchmark (i.e. having FNVA/AWU > BMK), in particular in situation A, is much higher than the Community average for all region groups (in some cases well over 20%). Correspondingly, despite quite a modest direct payments share (4.9% out of the total envelope for 2007), the % of direct payments exceeding the benchmark too reaches remarkable levels, which are above the Community average (with a peak of

65% for the Regional SPS group in 2004)[108]. An exception is represented by the Hybrid SPS group, for which the change in policy does not appear to have had an important impact.

B: sectors in which the share of direct aid is more important

In this case the differences among sectors are very noticeable, with field crops and other grazing livestock at the two extremes, and mixed and dairy farming in an intermediate position.

In the case of field crops, the total percentage (A+B) of farms with FNVA/AWU > BMK far exceeds the Community averages in all groups, with the exception of the Regional SPS. Furthermore, there was a very large growth from 2004 to 2007, in particular for the Hybrid SPS group (from 13.2% to 27.3%). In the same way (and to a greater extent), total % (A+B) of direct payments exceeding the benchmark was around 30% for Hybrid SPS and SAPS , in 2007, and in any case it exceeded 26% for Historic SPS.

Accordingly, and taking into account that with about 40% of total expenditure field crops posted the highest amount of spending on direct payments, the considerable amount exceeding the benchmark assumes particular economic importance, since in absolute terms it could be redistributed to farms that do not reach the benchmark, in the same sector or in other sectors.

In the case of the other grazing livestock sector, on the other hand, the total % (A+B) of farms having FNVA/AWU > BMK are, for all groups and all years analysed, well below the Community average, as are the total % (A+B) of direct payments exceeding the benchmark (although to a lesser extent). Only in the SAPS group does the share approach (but not reach) the Community average for both indicators. On the other hand, the applied CAP model would appear, to some extent, to have had a greater impact in the case of Hybrid SPS (from 2.1 to 4.2% between 2004 and 2007) than for Historic SPS (from 4.8 to 4.6%).

It is also noted that in this sector the % of farms falling into situation A was the lowest of all (consequently, only a very small portion of farms would exceed the benchmark even without direct payments), and also the % of farms falling into situation B was at the lowest levels (in 2007: 2.6% in Historic SPS and 3.6% in Hybrid SPS, with a maximum of 4.5% in SAPS).

It may thus be stated that for the other grazing livestock sector the degree of efficiency of the system is high. In relation to direct payment amounts corresponding to roughly 12-13% of the total envelope, further rises in efficiency, would (probably) bring about only a very small improvement as the percentage of farms with FNVA/AWU < BMK is very high (97.5%).

With reference to the two sectors occupying an intermediate position (milk and mixed farming), it is noted that all values relative to the % of farms with FNVA/AWU > BMK, just as for the % of direct payments exceeding the benchmark, are below the Community average. Nevertheless, in 2007 in particular, for Historic SPS and Hybrid SPS values of the first indicator exceeded 10%, and for the second indicator values exceeded 15% (with the exception, in this case, of Hybrid SPS). Generally speaking, therefore, both sectors showed quite a high level of inefficiency. It is interesting to notice that such percentage increases compared to 2004.

Finally, with regard to the latter indicator, it is noted that the dairy sector is in a situation relatively closer to that of field crops (lowest efficiency level), whereas mixed farming is closer to the other grazing livestock sector (highest efficiency level). Nevertheless, since the spending for direct

[108] The percentage values were above the Community average in 2007 too, a year in which, as already mentioned in the answers to previous evaluation questions, the average incomes of farms specialised in granivores were down on those of 2004 because of the large rise in the unit cost of inputs.

payments is remarkably higher in mixed farming (about 23% of total spending, on average) than in the milk sector (about 12-13% on average), the amount that could be redistributed to other farms that do not reach the benchamrk should be roughly the same for both these types of farming.

One final observation concerns the comparison between the percentage of farms with income exceeding their reference benchmark and the percentage of direct payments exceeding the benchmark. It is seen indeed that the latter is greater than the former in most types of farming/region groups combinations. Also, this phenomenon has grown over time, affecting 57% of region groups in 2001 and almost 79% in 2007. In short, a more uneven distribution of spending (an increase in over-compensation for a relatively smaller number of farms) has affected a progressively higher number of regions over time, in particular the regions applying the Hybrid SPS model.

Tab. 43 - Groups of regions where the % of the direct payments exceeding the benchmark is higher than the % of farms with FNVA/AWU>BMK

		2001	2004	2007
Field crops	SPS Historic	*	*	*
	SPS Hybrid			*
	SPS Regional		*	*
	SAPS		*	*
Horticulture	SPS Historic		*	*
	SPS Hybrid			*
	SPS Regional			*
	SAPS		*	*
Permanent crops	SPS Historic	*	*	*
	SPS Hybrid	*	*	*
	SPS Regional			
	SAPS			*
Milk	SPS Historic	*	*	*
	SPS Hybrid	*	*	*
	SPS Regional		*	*
	SAPS			
Grazing livestock	SPS Historic		*	*
	SPS Hybrid			
	SPS Regional			*
	SAPS		*	
Granivores	SPS Historic	*	*	*
	SPS Hybrid	*		*
	SPS Regional		*	*
	SAPS		*	*
Mixed farms	SPS Historic	*	*	*
	SPS Hybrid			
	SPS Regional		*	*
	SAPS		*	
Tot. groups where% DP over BMK > % farms over BMK		8	18	22
Total groups of regions		14	28	28
%		57,1	64,3	78,6

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3; Eurostat

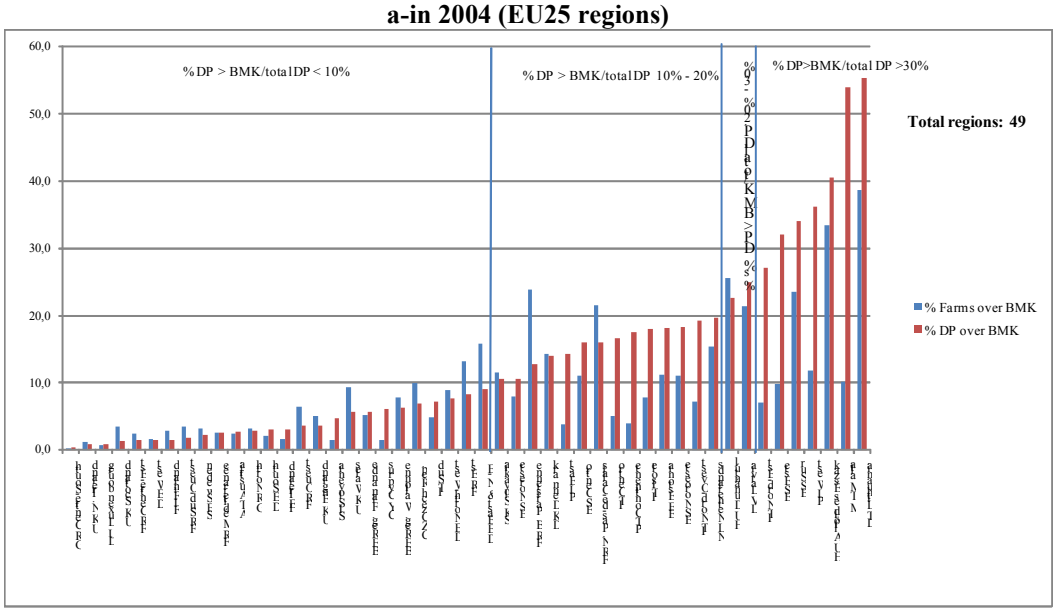
8.4.3 Results of the analysis by region

The analysis was also conducted for individual regions, with a view to highlighting existing regional differences. In each region, the analysis was conducted for each type of farming and for all types of farming together.

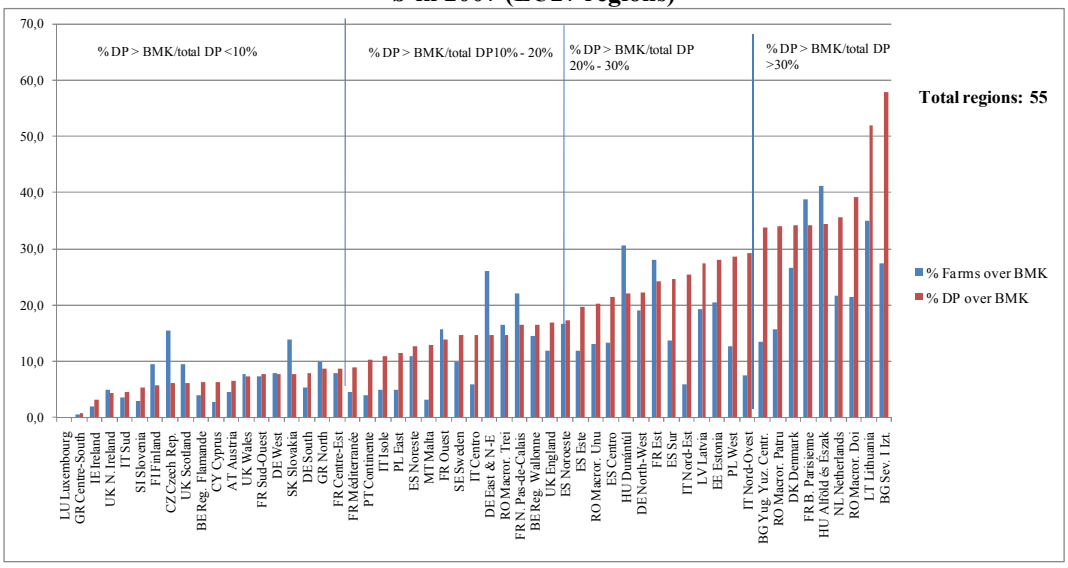
For all types of farming together, the graphs below (referring to the years 2004 and 2007) give for each region the % of farms in which the average FNVA/AWU exceeds the regional GDP per employee (sum of the situations A and B) and the % of direct payments exceeding the benchmark over the total payments payments' amount received by all farms of the FADN sample of each specific region (regions have been ordered according to the progression of the % of direct payments exceeding the benchmark).

Fig. 56 – All types of farming: % of farms exceeding the benchmark out of all farms and % of direct payments exceeding the benchmark out of all direct payments in EU regions – situations A + B (%)

a-in 2004 (EU25 regions)



b-in 2007 (EU27 regions)



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3; Eurostat

It should be stressed that, when looking at all types of farming together, regional results can be influenced to varying degrees by the different distribution of farms in respective types of farming which, as already mentioned on several occasions, have a different share of direct payments.

Bearing in mind this limit (as well as others already mentioned in paragraph 8.1), a very varied distribution is observed in both the % of direct payments exceeding the reference benchmark (from a minimum of zero in Luxembourg to a maximum of almost 60% in BG-Severna I Iztochna), and the percentage of farms with income exceeding the benchmark (from a minimum of zero in Luxembourg to a maximum of 41% in HU Alföld és Észak).

The analysis conducted on each type of farming highlights some cases, where the percentages of farms over BMK, and/or percentages of direct payments exceeding the benchmark reach particularly high levels. With regard to 2007, for instance, in field crops direct payments exceeding the benchmark (A+B) are about 50% of spending on direct payments in the Wallonie region (B), in Bassin Parisien (F), in the Netherlands, in Severna I Iztochna (BG) and in the three Baltic countries (Latvia, Estonia, Lithuania); In the milk sector in Spain Centro and Spain Sur; in the other grazing livestock sector in Italy Nord-Est and in Macroregiunea Unu (Romania); in the mixed farming sector in Severna I Iztochna and in Yugozapadna Yuzhina Centralna (BG).

It is also noted that in some of these regions the percentage of direct payments exceeding the benchmark expressed by situation A (i.e. the farms reaching the BMK even without direct payments) reaches or passes 40% (Wallonie, Netherlands, Severna I Iztochna , Estonia, Lithuania in field crops; Spain Centro and Spain Sur in milk; Italy Nord-Est and Macroregiunea Unu in other grazing livestock; Spain Noreste and both Bulgarian regions in mixed farming).

If we group together the regions by classes of % of farms in which the average farm income exceeds the regional GDP per employee / % of direct payments exceeding the benchmark, some further observations can be made:

- For both indicators there is higher concentration of regions in the lower class (up to 10%) and a much more limited presence in the higher class (over 30%). Nevertheless, in almost 22% of the regions, over 20% of farms exceed the benchmark, just as in over 34% of regions 20% of direct payments exceed the benchmark.
- From 2004 to 2007 (taking into account the increase in the number of regions following the accession of Romania and Bulgaria in the EU), for both indicators a number of regions have switched from lower % classes to higher % classes. This confirms, therefore, that in 2007 direct payments were awarded to a larger number of farms that did not need them or that needed less than they actually received.

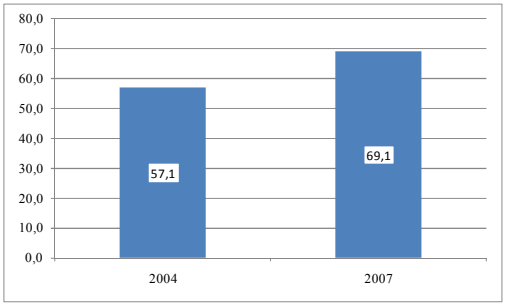
Tab. 44 - Number and percentage of regions by surplus/total amount and farms over benchmark classes, in 2004 and 2007

		N . Regions			% regions		
		2004	2007	Δ	2004	2007	Δ
% DP over BMK	< 10%	26	20	-6	53,1	36,4	-16,7
	10% - 20%	14	15	1	28,6	27,3	-1,3
	20% - 30%	3	11	8	6,1	20,0	13,9
	> 30%	6	9	3	12,2	16,4	4,1
	Total regions	49	55	6	100,0	100,0	0,0
% farms over BMK	< 10%	31	25	-6	63,3	45,5	-17,8
	10% - 20%	11	18	7	22,4	32,7	10,3
	20% - 30%	5	8	3	10,2	14,5	4,3
	> 30%	2	4	2	4,1	7,3	3,2
	Total regions	49	55	6	100,0	100,0	0,0

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3; Eurostat

This decline is however bigger for the share of direct payments exceeding the benchmark compared with the share of farms with income over benchmark. In 2007 this phenomenon thus produced an increase in the percentage of regions where the share of direct payments exceeding the benchmark is greater than the share of farms over BMK (from 57 to 69%).

Fig. 57 - Regions where % of direct payments exceeding the benchmark > % farms over the benchmark, in 2004 and 2007 (% of total)



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3; Eurostat

In conclusion, the regional analysis shows a direct payment system that have generated extremely varied levels of efficiency in terms of targeting the appropriate recipients.

8.5 Efficiency of direct payments in contributing to farmers' income equity

This part of the analysis is centred on the examination of direct payments' effects on income equity. In other words, we analyse whether direct payments play a role in decreasing the existing disparities in the distribution of farmers' incomes. If they do, then direct payments can be considered as efficient with respect to the targeting objective.

The analysis is based on the comparison of Gini coefficients calculated on the distributions of FNVA/AWU including direct payments and net of direct payments (i.e. G_0 and G_1, as illustrated in § 8.2) and it is carried out for each type of farming and for five groups of regions identified according to the model of implementation of the CAP on FADN data in 2001, 2004 and 2007.

8.5.1 Equity in farmers' income distributions

Overall, the calculated Gini coefficients for Farm Net Value Added per AWU (i.e. G_1) in **2007** point to medium to high inequity in the examined income distributions (Tab. 45). This judgement stems from the comparison with the level of income inequity across the population of EU Member States: the 2009 Gini coefficients calculated on the distribution of household disposable income across the EU27 (Statistics on Income and Living Conditions – EU-SILC published by Eurostat) range between a minimum of 0.23 (Slovenia) to a maximum of 0.37 (Latvia). The coefficient for the EU27 in the same year equals 0.304 (0.303 in the EU15 and 0.307 in the EU12).

The following observations emerge from the analysis of the coefficients:

- No Gini coefficient takes a value smaller than 0.3 in any of the considered sector and group of regions. At the same time, half of the coefficients across types of farming and groups of regions take values equal to or larger than 0.5, which means that total income for the corresponding groups is concentrated in less than half of all considered farms;
- In most of the considered types of farming, there is heterogeneity in the level of income inequity across groups of regions. In almost all cases, inequity of income distribution appears to be higher in the regions of the EU12 (applying regional SPS and SAPS) compared to the regions of the EU15 (applying historic and hybrid SPS models);
- Overall, the highest income inequity is recorded in the granivores sector, probably due to the coexistence of a relatively small number of efficient enterprises, for which income per labour unit is high, and a larger number of producers with remarkably lower income per labour unit. On the other end of the spectrum, incomes are found to be more evenly distributed across dairy farms

(with the exception of Malta and Slovenia – Regional SPS) and farms specialised in horticulture in all groups of regions, but the Member States applying the SAPS.

Tab. 45 - Gini coefficients[a] of income inequity across types of farming and region groups (2001, 2004, 2007)

		2001		2004		2007	
		G_1	G_0	G_1	G_0	G_1	G_0
Field crops	SPS - Historic	0.48	0.76	0.54	0.82	0.50	0.62
	SPS - Hybrid (H)	0.83	0.91	0.69	0.99	0.52	0.61
	SPS - Hybrid (R)	0.48	0.83	0.51	0.89	0.44	0.66
	SPS - Regional			0.59	0.69	0.61	0.69
	SAPS			0.59	0.76	0.56	0.68
Horticulture	SPS - Historic	0.46	0.47	0.49	0.50	0.47	0.48
	SPS - Hybrid (H)	0.36	0.36	0.37	0.37	0.34	0.34
	SPS - Hybrid (R)	0.36	0.40	0.37	0.40	0.37	0.39
	SPS - Regional			0.38	0.45	0.35	0.39
	SAPS			0.74	0.73	0.60	0.60
Other permanent crops	SPS - Historic	0.46	0.50	0.53	0.60	0.47	0.53
	SPS - Hybrid (H)	0.47	0.50	0.45	0.47	0.41	0.44
	SPS - Hybrid (R)	0.45	0.46	0.56	0.58	0.39	0.40
	SPS - Regional			0.55	0.64	0.63	0.71
	SAPS			0.76	0.88	0.83	0.93
Milk	SPS - Historic	0.41	0.46	0.44	0.51	0.40	0.47
	SPS - Hybrid (H)	0.33	0.37	0.35	0.43	0.32	0.39
	SPS - Hybrid (R)	0.37	0.47	0.39	0.51	0.38	0.49
	SPS - Regional			0.56	0.65	0.63	0.82
	SAPS			0.46	0.55	0.44	0.51
Other grazing livestock	SPS - Historic	0.44	0.69	0.47	0.78	0.48	0.77
	SPS - Hybrid (H)	0.50	0.97	0.46	1.00	0.50	0.96
	SPS - Hybrid (R)	0.48	0.94	0.41	0.91	0.44	0.89
	SPS - Regional			0.80	0.97	0.77	0.97
	SAPS			0.49	0.61	0.54	0.69
Granivores	SPS - Historic	0.55	0.57	0.59	0.62	0.67	0.72
	SPS - Hybrid (H)	0.50	0.52	0.61	0.63	0.64	0.67
	SPS - Hybrid (R)	0.38	0.46	0.43	0.54	0.69	0.87
	SPS - Regional			0.50	0.61	0.58	0.89
	SAPS			0.52	0.58	0.67	0.80
Mixed	SPS - Historic	0.43	0.61	0.46	0.71	0.46	0.61
	SPS - Hybrid (H)	0.46	0.79	0.52	0.92	0.47	0.77
	SPS - Hybrid (R)	0.45	0.66	0.40	0.67	0.44	0.68
	SPS - Regional			0.74	0.99	0.72	0.92
	SAPS			0.52	0.63	0.52	0.63

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

[a] G_1 is the Gini coefficient calculated on the distribution of real incomes per labour unit (FNVA/AWU), whereas G_0 is the coefficient calculated on the distribution of incomes net of direct payments (FNVAndp/AWU).

For each considered year, in all groups of regions and types of farming a certain proportion of farms shows negative income values per labour unit, with this proportion increasing when considering income net of direct payments. In some cases such share is considerably large, touching on 40% or even 50%.

In spite of the adjustment operated in the computation of the Gini coefficients to account for varying proportions of negative values in the considered income distributions, as described in the methodology, in the types of farming and groups of regions where a large share of incomes is less than zero (this usually occurs when we consider income net of direct payments), the Gini coefficient tends

to become rather large, often taking values quite close to one. This indicates that (especially in the absence of direct payments) income inequity becomes extremely high, with total income being concentrated within a very small number of farms. High income disparities in the case of FNVA/AWU considered net of direct payments are found, in particular, across farms specialised in field crops in the group of SPS Hybrid(H) regions, in farms specialised in other grazing livestock in the regions applying the SPS Hybrid(R) and Regional models.

In 2001, the Gini coefficients are fairly homogeneous across types of farming in the three considered groups of regions (i.e. the EU15), suggesting that the level of income disparities does not differ depending on the farming sector, nor the region group. The only exception is found in correspondence of farms specialised in field crops in the group clustering England, Northern Ireland and Luxembourg (i.e. the regions later applying Hybrid SPS models retaining, though, a strong historic component), for which income inequity appears substantially higher (0.83).

A similar degree of homogeneity in the values of Gini coefficients is maintained across the three region groups of the EU15 also in 2004 and 2007.

A comparison of the Gini coefficients (i.e. G_1) between the three groups of regions implementing historic and hybrid SPS models (EU 15) and the two groups implementing the regional SPS and SAPS in 2004 and 2007, shows that inequity in the distribution of farmers' income tends to be higher in the latter regions, in particular in horticulture and other permanent crops (SAPS), and milk, other grazing livestock and mixed farming (regional SPS).

8.5.2 Impact of direct payments on income equity

We made a comparison between the Gini coefficients calculated for actual and simulated income distributions (G_0 and G_1 respectively are the Gini coefficients of the distributions of FNVA/AWU net and gross of direct payments) to assess whether direct payments have an effect in terms of reducing the level of income inequity in the examined types of farming and groups of regions.

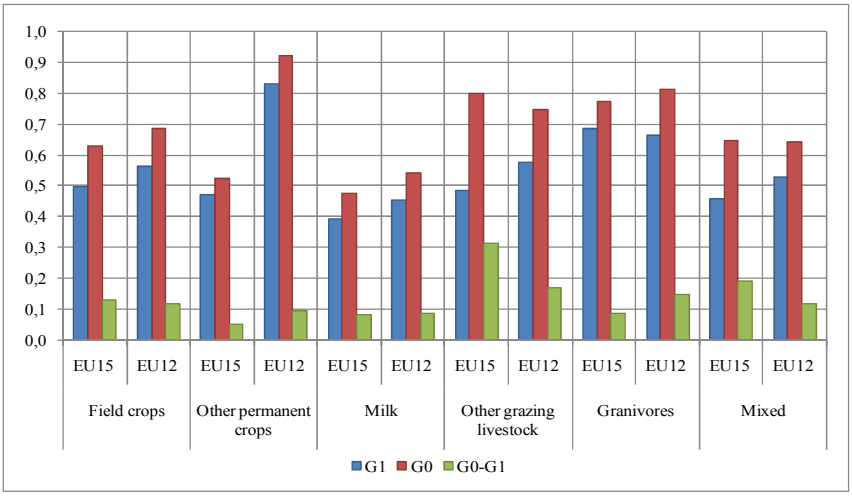
The comparison shows that inequity is always higher for FNVA/AWU considered net of direct payments (i.e. $G_0>G_1$) suggesting that **direct payments contribute to reducing inequity in farm income distribution in all considered sectors, region groups and examined years**[109]. In this respect, the largest direct payments' effect is always found in the other grazing livestock sector.

Fig. 58 compares Gini coefficients of real and simulated FNVA/AWU in the EU15 and EU12 in 2007. The main results of this comparison show that:

- in the EU15 direct payments appear to have a stronger effect in reducing income inequities, compared to the EU12, in the sectors traditionally benefitting from substantial CAP direct support (i.e. field crops, other grazing livestock and mixed farming);
- in the EU12 direct payments have a slightly stronger effect in reducing income disparities, compared to the EU15, across farms specialised in other permanent crops and granivores;
- in the dairy sector, the effect of direct payments on income equity appears to be fairly homogeneous in both groups of Member States;
- the effects of direct payments on income disparities in the EU12 are generally more homogeneous across sectors, than they are in the EU15. Indeed, the difference G_0-G_1 is around 0.1 in most sectors, with the only exception Other grazing livestock and Granivores.

[109] No effects of direct payments on income equity are observed in the horticultural sector, therefore analysis of this sector is not relevant.

Fig. 58 - Gini coefficients of real and simulated FNVA/AWU across EU15 and EU12 by type of farming (2007)



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

A further remark concerns some differences observed in the income equity effects of direct payments for each type of farming among the four groups of regions applying different SPS models in 2007: 1) larger effect of direct payments on income equity in farms specialised in other grazing livestock and mixed farming of the regions applying hybrid (H) and (R) SPS models; 2) higher impact of direct payments in field crops farms of the regions implementing SPS Hybrid (R); 3) larger direct payments effect in milk and granivores farms of the regions applying the regional SPS model.

Therefore, overall, the effects of direct payments on equity of income distribution in 2007 seem to be lower in the historic SPS regions than in the other SPS regions.

It is interesting, at this point, to assess whether the impact of direct payments on equity of income distribution has changed over time, to see whether the introduction of decoupling, albeit through different implementation models, has brought about any changes with respect to the distribution of farmers' incomes. In order to evaluate such changes, we compare two years: 2004, corresponding to the last year before the implementation of the 2003 CAP reform in the EU15 and the year of accession of 10 new Member States; and 2007 that represents the year when all countries implement either the SPS or SAPS, including Bulgaria and Romania.

Changes in the effects of direct payments on income equity are assessed in the light of the changes occurred in the overall level of income disparities over the same time. Such changes are examined for each considered type of farming, as illustrated in the following paragraphs.

Field crops: Farmers' real incomes appear to be more evenly distributed in 2007 compared to 2004 in all groups of regions except Malta and Slovenia, where income inequities do not seem to change. The regions applying the Hybrid SPS model with prevalent historic component (i.e. England, Northern Ireland and Luxembourg) show the largest improvement in income equity after the implementation of the 2003 reform (albeit disparities were rather large both in 2001 and in 2004).

Interestingly, inequity decreases proportionally more for income considered net of direct payments than for income including direct payments in four out of five groups of regions, suggesting that, compared to 2004, in 2007 direct payments play a less important role in reducing income disparities.

Mixed farming: The level of income inequity (i.e. of FNVA/AWU including direct payments) does not appear to substantially change from 2004 to 2007 in any of the region groups. However, the G_0-G_1

differences result to be smaller in 2007 compared to 2004, in particular in the regions applying the historic SPS and those applying the hybrid SPS with a strong historic component. Similarly to the results obtained in the case of farms specialised in field crops, the results suggest that, compared to 2004, in 2007 direct payments play a lesser role in reducing income inequities in the mixed farming sector.

Granivores: From 2004 to 2007 income inequity increases in all region groups, more remarkably so in those applying the hybrid SPS with a strong regional component (i.e. Denmark, Germany, Finland and Sweden). Such a trend suggests that in these regions, the share of farms with low (or negative) incomes per labour unit may have increased in 2007 compared to 2004 (perhaps related to an increase in production costs due to the sharp increase in cereal prices). Overall, this sector shows a completely opposite trend compared to the other sectors: the effect of direct payments in reducing income disparities becomes progressively larger (it was nearly null in 2001). The regions where the role of direct payments in decreasing income disparities becomes more important are the EU12 (regional SPS and SAPS) and the EU15 regions applying hybrid SPS models with a prevalent regional component.

Informed views of the experts

We have asked the experts to help us interpret some of the results of the analysis concerning the effects of direct payments on income equity. In particular, what could be the reasons for lower income disparities and, at the same time, lower impact of direct payments on income equity in field crops and mixed farms in 2007 compared to 2004; and what are the likely reasons that may explain higher income disparities and higher direct payments effects on equity in the granivores sector in 2007 compared to 2004.

Overall, the answers of the experts point to the following explanations:

- In the first case, we have sectors where direct payments have traditionally provided large income support, in particular to farms characterised by low productivity and low income per labour unit. With the introduction of decoupling, such an effect on less efficient farms may have increased, with the result that income disparities diminish in 2007. At the same time, improved market conditions (i.e. price rise in 2007) may have acquired an overall more important role in reducing income disparities, partly substituting the role before played by direct payments (which therefore appears to be smaller in 2007).
- In the second case, we have a sector traditionally not supported through direct payments. The changes in income equity are likely due to the effects of the cereal price increase *vis-à-vis* quite different levels of production efficiency. In this sense, the increase in the price of inputs may well have affected proportionately more the less efficient low income producers pushing their income even lower, but not so much the more efficient producers. This has enlarged the disparities already existing in income distribution.

In the other permanent crops and milk sectors, most groups of regions register a slight improvement in the equity of income distribution. However, the effect of direct payments on income equity is rather limited and does not appear to change remarkably between 2004 and 2007. The overall level of inequity of income distribution across farms specialised in other grazing livestock and the role played by direct do not appear to change substantially between 2004 and 2007 in any of the considered groups of regions.

8.6 Efficiency of direct payments in reducing farmers' income disparities

In this section we report the results of the third and last type of analysis aimed at evaluating the targeting efficiency of direct payments. After assessing whether direct payments allow farmers to reach an individual income level able to guarantee them a fair standard of living and whether the payments contribute to overall equity of income distribution, here we focus the analysis on whether direct payments are targeted in a way that reduces income disparities.

The analysis focuses on the effects of coupled and decoupled direct payments on farmers' incomes according to income classes, ordered from the lowest to the highest. Quantile regression analysis is used to this scope. The resulting direct payments coefficients estimated for each income quantile of the considered samples provide a measure of the changes produced by one additional unit of coupled and decoupled direct payments on income per labour unit of that income quantile. If the size of the coefficients (for coupled or decoupled payments) is higher in the lower income quantiles and lower in the higher income quantiles, then we are led to conclude that direct payments are efficient with respect to the objective of reducing income disparities.

The analysis is here conducted at both the micro- and the macro-economic level and presented in the this order.

8.6.1 Quantile regression analysis applied at the micro-economic level

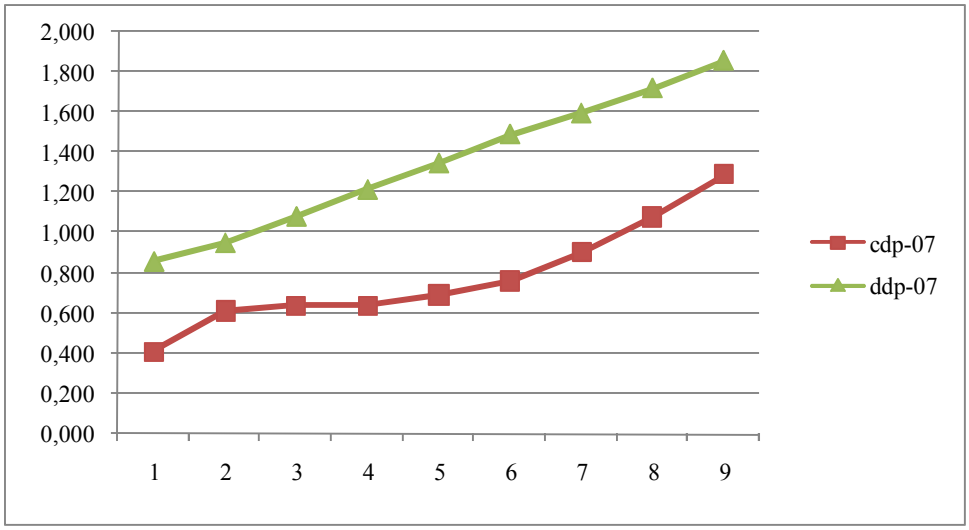
Quantile regression has been applied to individual FADN farms subdivided according to the type of farming in 2004 and 2007[110]. Here we focus the analysis on the most recent available data, 2007. This decision is supported by two main considerations. First, the estimates of decoupled and coupled payments cannot be easily compared in 2004, as coupled payments were awarded in all Member States, whereas decoupled payments were only granted in the new Member States. The second consideration concerns the fact that the coupled payments estimates in 2004 and 2007 are very similar.

The quantile regression estimates of the effects of coupled and decoupled direct payments on farmers' income along income quantiles are reported as follows. The graphs report the level of the estimated coefficients on the y-axis and the quantiles (from 1 to 9) on the x-axis.

In the model applied to field crop farms (see Fig. 59), the level of the two considered coefficients clearly increases from the lower to the higher quantiles. This means that the impact of direct payments in enhancing farmers' income increases as the income level increases. This behaviour concerns both coupled and decoupled payments.Note that the absolute difference between the coefficients for decoupled and coupled payments remains more or less constant apart from the second and the last quantile, where it declines.

[110] Quantile regression is not applied to Horticulture, Other permanent crops and Granivores farms because the linear regression models for these farm types had generated poor results in terms of low R^2

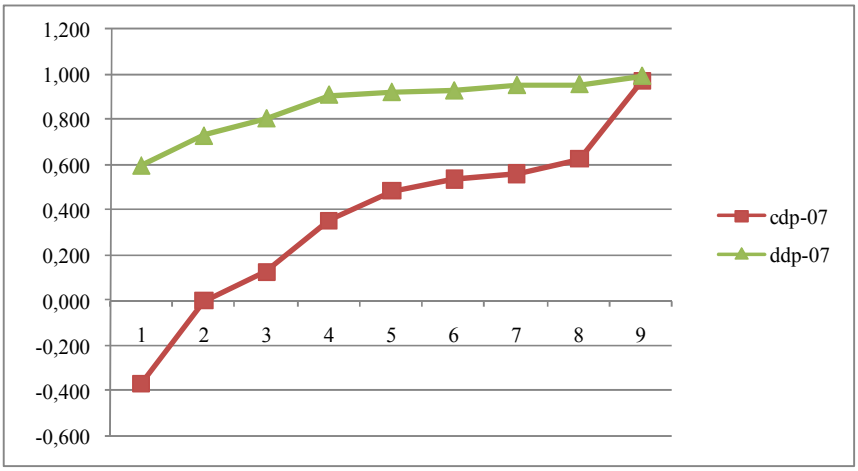
Fig. 59 - Level of the estimated coefficients for coupled and decoupled payments: Field crops farms (2007)



Source: Agrosynergie quantile regression estimates based on sample data EU-FADN-DG AGRI L-3

The results for milk farms slightly differ from the previous ones (Fig. 60). The evolution of the coefficients for decoupled payments is clearly positive in the first four quantiles, but in the higher quantiles the coefficient estimates remain stable at around the same level. The coefficient referring to coupled payments is very low in the first 2-3 quantiles, but it increases at a very fast and steady pace in the following quantiles until it reaches the same level of the coefficient of decoupled payments in the 9th quantile. The comparison of the two trends suggests that in milk farms, decoupled payments may be less inefficient than coupled payments with respect to the targeting objective. Coupled payments seem to be particularly inefficient in enhancing farmers' income in the low income classes.

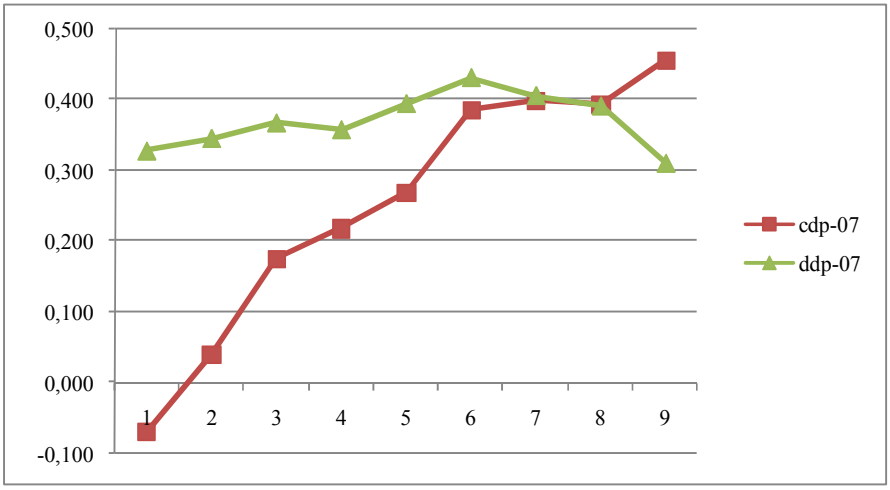
Fig. 60 - Level of the estimated coefficients for coupled and decoupled payments: Milk farms (2007)



Source: Agrosynergie quantile regression estimates based on sample data EU-FADN-DG AGRI L-3

The farms specialised in other grazing livestock represent again a different case from the previous ones (Fig. 61), as in these farms the decoupled payments coefficient only moderately increases in the first six quantiles, but then it declines moving from the 6th to the 9th quantile. This suggests that decoupled payments are relatively more efficient than coupled payments in terms of targeting because their income effect declines in the highest income classes. This is clearly not the case for coupled payments, for which the coefficients increase steadily moving from lower to higher quantiles.

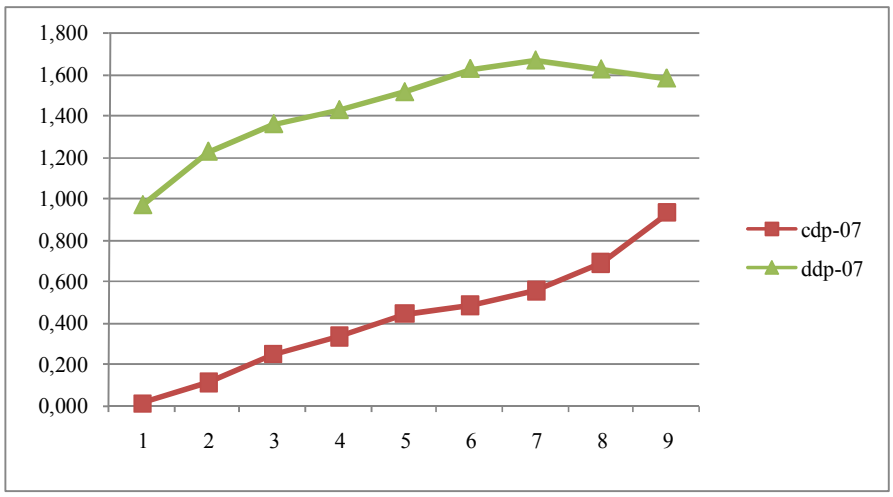
Fig. 61 - Level of the estimated coefficients for coupled and decoupled payments: Other grazing livestock farms (2007)



Source: Agrosynergie quantile regression estimates based on sample data EU-FADN-DG AGRI L-3

The last graph (Fig. 62) shows the results of the model applied to mixed farms. In this group of farms, the coefficients for decoupled and coupled payments move in a way that is similar to the case of field crop farms. However, as seen in the other grazing livestock farms, the coefficients for decoupled payments decline slightly in the last two considered quantiles. In any case, the contribution of decoupled payments to the level of income is sensibly higher than the contribution of coupled payments in all quantiles.

Fig. 62 - Level of the estimated coefficients for coupled and decoupled payments: Mixed farms (2007)



Source: Agrosynergie quantile regression estimates based on sample data EU-FADN-DG AGRI L-3

To conclude, the results of the quantile regression models applied at the micro-economic level suggest that the same amount of coupled payments is generally more effective in supporting the farms with high income levels than those with low income levels. Because this does not help in reducing income disparity, coupled payments cannot be considered to be efficient with respect to the targeting objective.

The results concerning decoupling payments are less clear-cut, showing depending on sector a different level of efficiency with respect to the targeting objective. In the model applied to field crops farms, the quantile regression indicates that they have a larger effect in the higher income classes. On

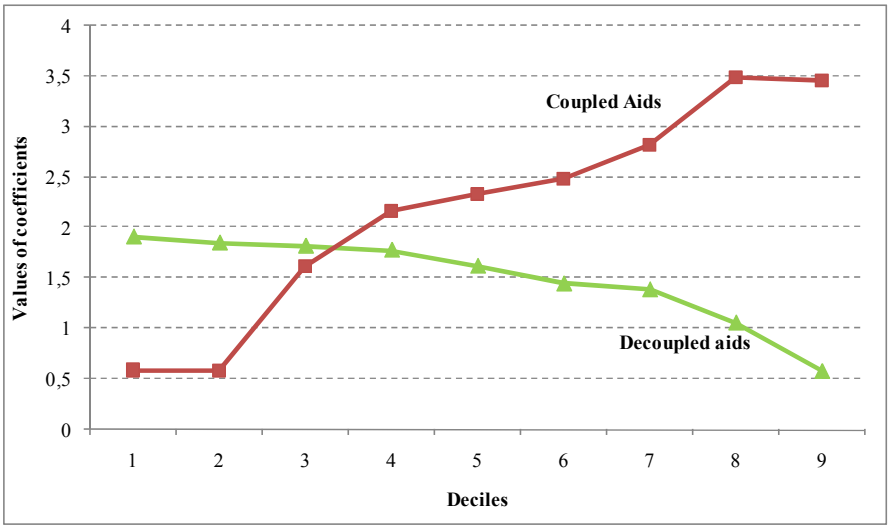
the contrary, in milk sector estimated coefficients remain stable in the higher income quantiles and in other grazing livestock and mixed farms in cases, they decline in the last two or three quantiles.

8.6.2 Quantile regression analysis applied at the macro-economic level

We report the results of the analysis of the efficiency of coupled and decoupled payments in terms of reducing income disparities across EU regions. The coefficient estimates resulting from the quantile regression applied at the macro-economic level on 2007 data are reported in Fig.62.

It is evident from the graph that coupled and decoupled payments bear opposite effects on the level of farmers incomes (i.e. CFI/EMP) according to income classes. The results show that the dimension of the effects of decoupled payments is negatively related with the factor income produced per agricultural employee, i.e. the (positive) value of the coefficients associated with decoupled aids decreases as factor income per agricultural employee increases. On the contrary, the effects of coupled payments appear to increase with increasing levels of factor income per agricultural employee.

Fig. 63 – Level of the estimated coefficients for coupled and decoupled payments at the EU region level (2007)



Source: Agrosynergie quantile regression estimates based on data from Eurostat Regional Agriculture Statistics and CATS

As decoupled payments have a larger income effect on the lower income classes and a smaller impact on the higher income classes, we are led to conclude that decoupled payments contribute to decreasing income disparities and, therefore, they are efficient with respect to the targeting objective.

On the contrary, coupled payments contribute more to income in the higher income classes than they do in the lower income classes and, therefore they may well add to income inequity rather than reduce it. For this reason, coupled payments cannot be considered as efficient with respect to the targeting objective.

8.7 Evaluation of the relative efficiency of direct payments

In order to evaluate the relative income transfer efficiency of direct payments compared to the other policy instruments (measures under CMO and rural development measures), the analysis makes further use of the results of the linear regressions at the macro- and micro-economic levels, already exploited in the answer to EQ1.

With respect to the macro-econometric analysis, the coefficient estimates (2004 and 2007) suggest that direct payments are relatively more efficient than rural development measures in relation to the objective of contributing to the enhancement of farmers' income. As seen in the answer to EQ1 (§ 5.3.2), the OLS coefficient estimates of rural development aids are negative and significant.Such a result could be related to the structural nature of the examined aids that comprise interventions much more oriented to improve life conditions in marginal territories, than to increase production and income of production factors. Indeed, if we had used a variable expressing quality of life as the dependent variable in the models, instead of a measure of income generated by agricultural production (i.e. CFI), then we would be likely to find that rural development aids have a significant and positive effect. Furthermore, the negative sign associated to rural aids can be further explained by considering the negative correlation existing between per capita GDP and per capita rural aids at the regional level.

The comparison of the magnitudes of direct payments and market aids coefficient estimates does not allow to draw such robust conclusions. Indeed, the estimate for market aids effects is not statistically significant in the 2007 model. Only for the group of regions where agriculture produces a share of regional GDP greater than the sample median value, we find that the market aids coefficient estimate is significant and much larger than the coefficients of coupled and decoupled payments. Therefore, in this group of regions the results suggest that market support is more efficient than direct payments in contributing to farmers' incomes.

With respect to the micro-econometric analysis, the coefficients of direct payments are higher than the coefficients of both measures under CMO and other policies (mainly rural development payments) in the model applied to the whole farm sample (2007). This result is consistent with that obtained from the 2004 estimates.

In 2007, the coefficient estimate of development payments in the model for the whole farm sample appears to be negative (in the 2004 model, it is not statistically significant). The results for individual types of farming are less clear-cut:

- concerning measures under CMO, the coefficients are higher than the coefficients for the other considered policies in three of the seven types of farming: field crops, milk and other grazing livestock. A very similar result is obtained in the 2004 model.
- concerning rural development payments, in three cases the coefficients are not significant and in the remaining four cases they are positive and significant, albeit small in size.

In the analysis conducted distinguishing between farms located in SPS and in SAPS regions, the results of the model applied to the whole farm sample are equal to those just illustrated in the case of the general model and they do not differ very much in SPS and SAPS regions.

8.8 Evaluation judgement

The evaluation question invited us to formulate a judgement concerning the efficiency in relation of three aspects:

1. the goal of targeting the appropriate recipients
2. the goal of reducing income disparities
3. the relative efficiency of direct payments in enhancing income levels as compared to other policy instruments: measures under Single CMO and rural development measures.

In relation to the objective of targeting the appropriate recipients, the higher the percentage of farmers receiving direct payments, even though they did not need them or did not need so much, the less efficient the system was considered. This case occurs when: situation a) farmers reached/exceeded their reference income benchmark (regional GDP/employee) even in the absence of direct payments; situation b) farmers reached/exceed the income threshold thanks to direct payments.

The analysis was conducted on the sample of FADN farms for all considered types of farming and for the years 2001, 2004 and 2007, with a calculation of the percentage share of farms having a farm income per labour unit equal or above the regional GDP per employee even in the absence of direct payments (situation A); the percentage share of farms having a farm income per labour unit equal or above the regional GDP thanks to direct payments (situation B).

We also calculated the corresponding percentage share of direct payments received by farms in situation A and in situation B (i.e. the amount exceeding the benchmark for farms that received more direct payments than they needed to reach the regional GDP/employee level).

Bearing in mind some limitations, in the years analysed (2004, 2006 and 2007), at global level the efficiency of direct payments in terms of directing income support to farms whose income is lower than the benchmark is quite high (although the level has dropped over time): just 6.1% of farms received direct payments when they do not need it, and 5.9% of farms received more aid than they need, for a sum of 12%.

If we examine the expenditure, 82% of it went to farms whose income did not reach the benchmark, i.e. the regional GDP per employee, even with direct payments (2007). Conversely, 18% of the expenditure went to farms whose income with or even without direct payment was higher than the reference benchmark (2007). Since the percentage of the amount of direct payment is higher than the percentage of farms that received support they do not need, it is surmised that this amount is concentrated in a proportionally more limited number of farms.

The results of the analysis conducted distinguishing types of farming and region groups highlight important differences vis-à-vis the previous overall analysis. Indeed, the results may differ considerably since the seven analysed types of farming are characterised by different share of direct payments in the farm income.

In sectors for which the share of direct aid is low, the analysis is not very pertinent. In sectors for which the share of direct payments is high, the differences among sectors are important, with field crops and grazing livestock at the two extremes:

- In field crops the percentage of direct payments exceeding the benchmark (from 13.2% in the group of regions applying the Regional SPS model to 31.4 in the SAPS group, 2007) has particular economic importance (in 2007, fields crops covered 40% of the total expenditure).
- For grazing livestock the targeting efficiency is high (in 2007, the share of direct payments exceeding the benchmark ranges from 3.5% in the group of regions applying the Hybrid SPS

model to 9.9 in the SAPS group) and further rises in efficiency, would (probably) bring about only a very small improvement.

At the regional level, in 16.4% of the EU27 regions over 30% of the expenditure is going to farms that without direct payments (situation A) or with direct payments (situation B) achieve a farm income equal or above the regional GDP per employee. However, in further 36.4 % of regions, the percentage is 10%. Furthermore, across the regions the percentage of farms exceeding the reference benchmark rises from a minimum of zero to a maximum of 41%, whereas the direct payments exceeding the benchmark rises from a minimum of zero to a maximum of almost 60%.

The analysis leads to conclude that, while at a global level the efficiency of direct payments in directing income support to farmers whose income is lower than the benhmark is quite high, at the sector level (and even more at the regional level) there are remarkable differences.

Concerning the objective of reducing income disparities, a first level of analysis concerns the assessment of the effects of direct payments in terms of their contribution to a more equitable distribution of farmers' incomes. The analysis is based on the comparison of income concentration coefficients (Gini coefficients) calculated for the distributions of FNVA/AWU gross and net of direct payments. The analysis is carried out in three years (2001, 2004 and 2007) for each type of farming, distinguishing EU regions according to the model of SPS or SAPS implemented from 2004 onwards

The first consideration immediately emerging from the analysis concerns the rather high level of inequity that characterises farmers' income in most sectors across all EU regions when compared to income inequity levels reported for the whole population of the EU27 and of individual Member States (source: EUSILC by Eurostat).

Furthermore, the disparity would be higher in the absence of direct payments. The comparative analysis of income disparities through the Gini coefficients computed for farmers' income gross and net of direct payments clearly shows that direct payments contribute to reducing overall inequities in farmers income distributions in all considered types of farming, region groups and examined years.

The comparison of income distributions for each type of farming in the EU15 and EU12 in 2007 shows that effects of direct payments on income equity are, overall, larger in the EU15, in particular, in the sectors traditionally heavily supported through direct aid. Furthermore, in the EU15 the contribution of direct payments to the reduction of income disparities varies from sector to sector, whereas in the EU12 it is more homogeneous across the examined types of farming.

A further comparison of Gini coefficients across the four SPS region groups in 2007 suggests that, overall, direct payments bear a positive larger effect on income equity in the regions applying hybrid and regional SPS models than in the regions implementing the historic SPS model.

The comparison of the results obtained in 2004 and in 2007 shows differences over time across the examined types of farming. The role of direct payments does not appear to change much in three sectors (other permanent crops, milk and other grazing livestock), whereas it appears to have become less important in the field crops and mixed farming sectors. On the contrary, the impact of direct payments on equity of income distribution increases for farms specialised in granivores, especially in the regions of the EU12 (regional SPS and SAPS) and in the regions of the EU15 applying hybrid SPS models with strong regional component.

It is possible to conclude that, overall, direct payments are an efficient policy instrument because they are targeted in such a way that contributes to improving overall income equity, but with uneven income distribution persisting in most sectors and geographical areas.

A second level of analysis examines the contribution of direct payments to farmers' income according to income classes, this time making a distinction between coupled and decoupled payments. The analysis is carried out at the micro- and macro-economic level using quantile regression models. The results lead to the following conclusions:

- the analysis at the macro-economic level suggests that decoupled payments contribute to decreasing income disparities as their income effect is larger in the lower income classes and becomes smaller in the higher income classes (the value of the coefficients associated with decoupled aids decreases as the corrected factor income per agricultural employee increases). On the contrary, coupled payments contribute more to income in the higher income classes than they do in the lower income classes (the value of the coefficients associated with coupled aids increases as the corrected factor income per agricultural employee increases).. Therefore, we are led to conclude that decoupled payments are efficient with respect to the targeting objective, whereas coupled payments are not.
- the quantile regression models developed at micro-economic level lead for all analysed sectors to the same conclusions on coupled payments: as they do not help reducing income disparity, they cannot be considered efficient with respect to the targeting objective. The results concerning decoupled payments are less clear-cut, showing depending on sector a different level of efficiency with respect to this objective.

In order to evaluate the relative income transfer efficiency of direct payments compared to the other policy instruments (measures under CMO and rural development measures), the analysis makes further use of the results of the linear regressions at the macro- and micro-economic levels.

The macro-econometric analysis suggests that direct payments are relatively more efficient than rural development measures in relation to the objective of contributing to the enhancement of farmers' income. The OLS coefficient estimates of rural development aids are negative and significant in all cases. Such a result could be related to the nature of the rural aids that comprise interventions much more oriented to improve life conditions in marginal territories, than to increase production and income of production factors. Indeed, if we had used a variable expressing quality of life as the dependent variable in the models, instead of a measure of income generated by agricultural production (i.e. CFI), then we would be likely to find that rural development aids have a significant and positive effect. Furthermore, the negative sign associated to rural aids can be further explained by considering the negative correlation existing between per capita GDP and per capita rural aids at the regional level.

The results of the micro-econometric analysis regarding rural development payments for individual sectors are less clear-cut.

The comparison between the effects of direct payments and measures under the CMO does not allow to draw such robust conclusions, either in the macro- or in the micro-econometric analysis.

9. TO WHAT EXTENT HAVE THE DIRECT PAYMENTS BEEN COHERENT WITH OTHER CAP MEASURES: MEASURES UNDER THE SINGLE CMO AND RURAL DEVELOPMENT MEASURES? (EQ 4)

9.1 Comprehension and interpretation of the evaluation question

The evaluation question asks to examine the level of coherence between the three main CAP instruments: direct payments, measures under Single CMO and rural development measures with respect to the objective of enhancing and stabilising the income of farmers. In principle, we observe that these three policy instruments concur in achieving this objective :

- Direct payments (1st pillar) are primarily an income support measure: particularly after the 2003 reform, the single farm payment supports farmers' income without influencing production decisions;
- The CMO measures (1st pillar) contribute to stabilising the markets and to ensuring a fair standard of living for the concerned agricultural community (recitals 10 and 29 Regulation 1234/2007);
- Among the objectives of the EU's rural development policy (2nd pillar), it is that relative to contributing to the achievement of CAP objectives, as laid down in the Treaty, through accompanying and complementing market and income support policies of the Pillar I (recital 1 of Regulations 1698/2005 and 1257/1999).

The relative importance of these instruments has been altered over time. The new CAP reinforces EU rural development measures, reducing spending on Pillar 1 measures and transferring the funds to Pillar 2 measures (compulsory modulation). Within the first Pillar, most market support measures have been decoupled and transferred to farmers as direct payments. At the same time, some CMOs have been modified so as to reduce market support.

Thus, the evaluation question requests to analyse whether over the period the distribution of total support (direct payments, CMO and rural development measures) has significantly changed and to assess whether the three policy instruments complement each other in terms of their contribution to the level of agricultural incomes and whether they are coherent with respect to contributing to income stability.

The evaluation question asks furthermore to analyse the coherence among direct payments and the aids granted to farmers in areas with handicaps (LFA payments).

Council Regulation (EC) No 1698/2005 (Recital 33) describes the objective of the LFA scheme as follows: *Natural handicap payments in mountain areas and payments in other areas with handicaps should contribute, through continued use of agricultural land, to maintaining the countryside, as well as to maintaining and promoting sustainable farming systems*. Consequently, LFA payments are interlinked with direct payments but, whilst the single farm payment aims at sustaining farmers income, LFA scheme aims at preventing farmland abandonment in areas with natural handicaps, for sustainable land management purposes.

From a theoretical standpoint, direct payments and the LFA scheme appear to share the same objectives, by supporting farmers income together with the continuation of farming. From an empirical point of view, it is necessary to evaluate whether these policy instruments have actually contributed to reduce disparities existing within EU regions between farms operating in disadvantaged areas and other farms and whether the choice of SPS implementation model has had any effects.

9.2 Methodological approach, data sources and limits

The analysis is conducted across the EU Member States covering the time period corresponding to the years 2001-2007.

To express a judgment on the coherence between the direct payments and the other policy instruments regard the objective of enhancing the level of farmer incomes, the level and the development of FNVA/AWU over the period was compared with the total CAP support per work unit (EU15 regions, weighted average for groups of sectors), drawing also a distinction between the support provided by direct payments, measure under CMOs and rural development measures.

The FADN sample has been divided into three groups: sectors where the share of direct payments in FNVA is higher (field crops, other grazing livestock, mixed farms), sectors where the share is lowest (horticulture, permanent crops, granivores), and milk specialists, which are in an intermediate situation.

The support provided by rural development measures has been calculated using the individual farm data, adding the variables SE621 (environmental subsidies), SE622 (LFA subsidies) and SE623 (other rural development payments). To such sum has been subtracted the amount in Support for quality, corresponding to the variable JC840, since already contained in the direct payments. Empirical problems arise when analysing the data referring to the subsidies on investments, because the payments are reported only in the year in which they are granted even if their effect is going to be experienced for the following years too. For this reason, the calculation does not include subsidies on investments.

The approach used to estimate the support provided by CMO policies is based on market price differentials computed annually by the OECD for a number of agricultural commodities produced in the EU. As explained (see § 4.1.2, methodology and limitations), the absolute level of support provided by CMO policies was calculated as the difference between current sales revenue values recorded in the FADN data base and reference sales revenue values computed on the basis of commodity-specific ratios.

Finally, moving on to the econometric modelling exercise (see § 4.1.3), it was also verified the signs of the coefficients for the considered groups of policies: whether the estimated parameters of CMO and for the other non direct payment policies show the same sign as the sign of direct payments' parameter estimates.

The coherence of the three policy instruments with respect to their contribution to stabilising farmers' incomes is assessed through the comparison of the coefficients of variation (CV) calculated for:

- FNVA/AWU (CVa);
- FNVA/AWU without direct payments (CVb);
- FNVA/AWU without direct payments and CMO support (CVc);
- FNVA/AWU without direct payments and support provided through rural development measures (CVd).

over the period of observation (2001-2007) in the 37 regions of the EU15 and for all types of farming. Before proceeding to the calculation, the trend component was removed from income series. For each type of farming we assess the percentage share of regions for which the effects of the compared policies are in accordance (i.e. have the same sign). The details of the methodology used to compute the coefficients of variation can be found in the Methodology chapter of this report (§ 4.1.1).

The comparisons specifically are CVb *versus* CVc and CVb *versus* CVd, in order to separately assess the coherence between direct payments and CMO support, and direct payments and rural development measures. In general, the following cases are expected to occur:

1. If CVb > CVa and CVc > CVb, then both direct payments and CMO support contribute to increasing income stability. In this case, we are led to conclude that the two instruments of the 1st Pillar of the CAP are coherent with respect to the objective of contributing to stabilising farmers' income. If, on the other hand, CVb > CVa but CVc ≤ CVb, it means that, contrary to direct payments, OCM support does not have a positive effect on income stability and therefore, the two instruments are not coherent.
2. If CVb > CVa and CVd > CVb, then both direct payments and rural development measures contribute to increasing income stability. In this case, we are led to conclude that the two instruments (respectively belonging to the 1st and to the 2nd Pillar of the CAP) are coherent with respect to the objective of improving income stability. *Vice versa* for the case in which CVb > CVa but CVd ≤ CVb.

The analysis also highlights the cases in which direct payments do not have a positive effect in terms of reducing income volatility (i.e. CVb ≤ CVa), whereas CMO support and/or rural development measures do have a positive impact. In these cases, we would be led to conclude that direct payments are not coherent with respect to the objective of contributing to income stability in comparison with the other policies.

For assessing the coherence between direct payments and LFA payments, LFA areas have been divided in two groups: the ones that have received the compensatory allowance and the ones that have not received the compensatory allowance, using the FADN variable SE 622. The analysis focuses on the comparison the farmers' income of LFA areas receiving compensatory allowance with farmers' income of LFA areas not receiving compensatory allowance and with farmers' income not located in LFA areas.

The exercise has been done for the years 2004 and 2007, in the actual an simulated situation (without compensatory allowance) at EU27 average level (weighted average of all sectors), at sector level and by implementation model. In order to be able to compared the results by model of implementation in 2004 and in 2007, Member States have been grouped according to their implementation choices in 2004 (see § QE 3 for further details).

For the sectors "horticulture", "other permanent crops" and "granivores" the analysis was not possible because the number of regions with available data is very limited and not significant.

9.3 Judgment criteria and indicators and sources

In order to answer to this question, we based our judgment on the following criteria:

Criteria and Indicators
Judgement criterion no. 1 **Over the observation period, in the EU regions, direct payments, measures under CMOs and rural development measures have (have not) been complementary regarding the objective of enhancing the level of farm incomes**
Comparison of the development 2001-2007 of: FNVA/AWU, total CAP support per AWU; DP per AWU; CMO sustain per AWU; rural development payments per AWU, with respect to the type of farming
Parameter estimates relative to the net effects of the three policy instruments (DP, CMO and RD) on FNVA/AWU with respect to type of farming and model of SPS implementation

Judgement criterion no. 2 **In EU15, for the examined types of farming and the observation period, direct payments, measures under CMOs and rural development measures have (have not) been coherent with respect to the objective of stabilising the income of farmers**
Comparison of the coefficients of variation computed for FNVA/AWU (CVa), FNVA/AWU net of direct payments (CVb), FNVA/AWU net of direct payments and CMO support (CVc) and FNVA/AWU net of direct payments and rural development payments (CVd)
Judgement criterion no. 3 **In EU regions, for the type of farming examined and the observation period, direct payments and LFA support have (have not) concurred to reducing disparities between the income of farmers located in less-favoured area and farmers not located in less-favoured area**
Comparison of FNVA/AWU of farms located in LFAs receiving a compensatory allowance with FNVA/AWU of farms located in LFAs not receiving a compensatory allowance and FNVA/AWU of farms not located in LFAs
Comparison of FNVA/AWU net of compensatory allowance of farms located in LFAs receiving a compensatory allowance with FNVA/AWU of farms located in LFAs not receiving a compensatory allowance and FNVA/AWU of farms not located in LFAs

9.4 Coherence regarding the objective of enhancing the level of farm incomes

The analysis of this topic has been developed with two main approaches.

The statistical analysis looks at the evolution over time of the support provided by direct payments and the other policies. The idea behind this analysis is that the three instruments of the agricultural policy could be coherent when, in response to changes introduced by policy modification, the overall per capita level of support remains roughly constant and at the same time, the level of individual income does not decrease. In other words, the aim is to verify whether those cases where the support provided by CMO measures decreases, this may or may not be compensated by a relatively increase of support provided by direct payments and/or by Rural Development policies.

The second approach is based on the micro-econometric analysis of FADN data. In this case the analysis is more focused on the comparative impact of direct payments and the other policies in specific years. The basic idea is to verify whether the estimated parameters of CMO and for the other non direct payment policies show the same sign as the sign of direct payments' parameter estimates. If this were not the case, discordance in the signs of the parameter estimates would suggest that direct payment policies have not been coherent with the other two policy instruments as farm income support tools.

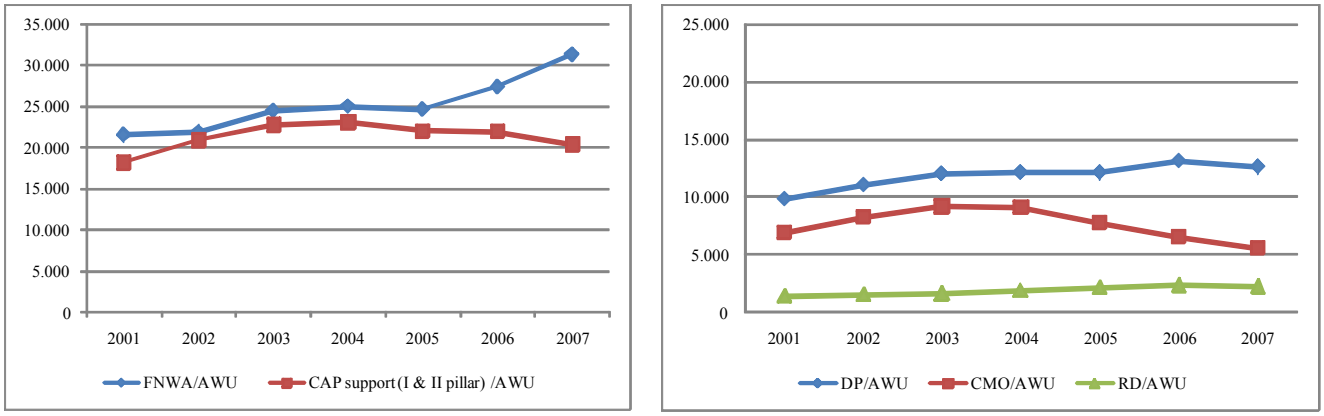
In this way, the two approach complement each other because these provide a more complete assessment of the EQ4.

9.4.1 Results deriving from the statistical analysis

The analysis has been undertaken by sector, according the share more or less high of direct income payments on farmers' income.

Concerning the group of type of farming field crops, other grazing livestock and mixed farming, the analysis shows that, until the implementation of the reform, income is a direct expression of the total level of support. Indeed, until 2004 included, the difference between the two values is extremely limited. Moreover, until 2004 the increase of the global support by AWU is related to the increase of the three support components: direct payments, rural development and CMO measures. In the pre-reform period, thus, the three support measure seem to act in an additional way.

Fig. 64 – Field crops, other grazing livestock and mixed farms: development of farm income, total CAP support, direct payments, CMO sustain and rural development payments (per AWU, 2001-2007)



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

After the reform, the global support by work unit slightly decreases, because the great decrease of support given through the CMO measures is not totally compensated by the increase of direct payments and of rural development support. After 2005, the average income (growing trend) appears to be more linked to market results. In this sense the policy development seems to have favoured a process of reorientation to market of farms.

On this basis, we can affirm that, after the reform, the three support measures complement each other as they substitute each other over time in order to maintain relatively stable the total level of support. In this sense, direct payments are coherent with the other support instruments respect the objective of enhancing the level of farmers' income.

For which refers to milk specialist farms, we see again in a clear way the abovementioned results. Indeed, until 2004 the sector benefits form a global support even highest than the income. The higher support level respect the FNVA/AWU is due to the strong indirect support provided by the CMO measures. After the reform, the decrease of the CMO support, even more in this case, is not at all compensated by the other instruments. However, the income level grows and appears linked to market. Therefore, after the reform, the three measures do not fully complement each other but contribute in a coherent manner to achieving the objective of enhancing the level of farm incomes.

The analysis of the other three sectors shoes that the total support is marginal respect the income per labour unit. The support remains almost unchanged in time, in all its components.

Fig. 65 – Milk specialists: development of farm income, total CAP support, direct payments, CMO sustain and rural development payments (per AWU, 2001-2007)

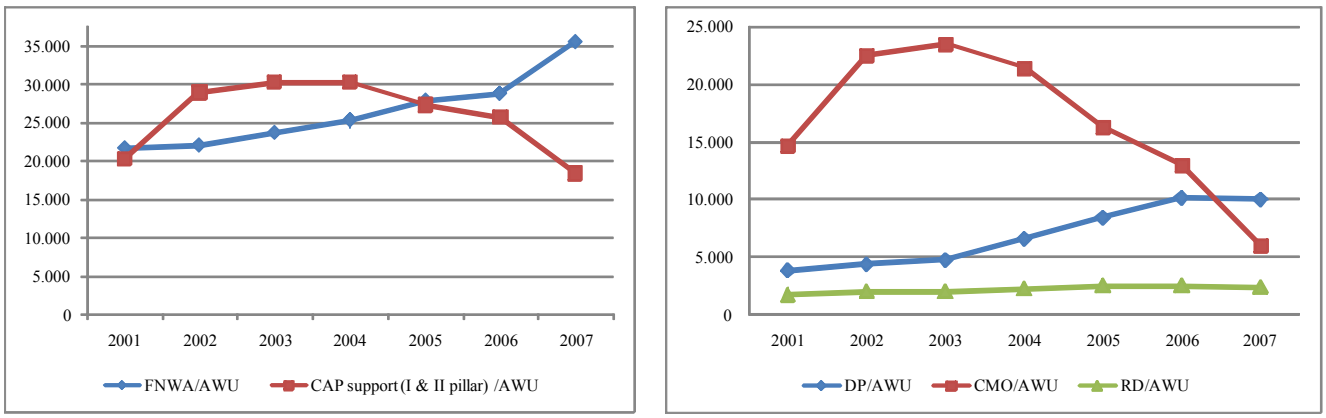
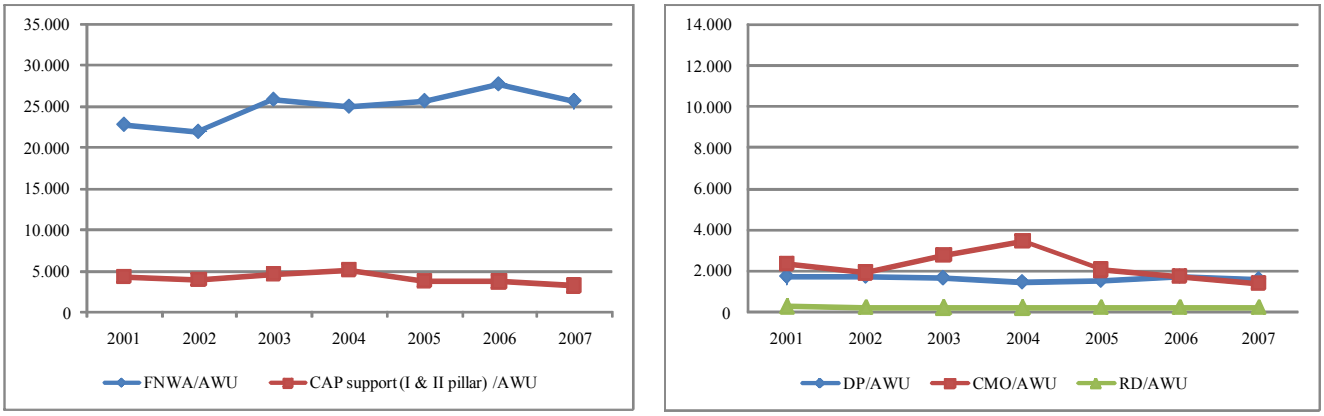


Fig. 66 – Horticulture, permanent crops and granivores: development of farm income, total CAP support, direct payments, CMO sustain and rural development payments (per AWU, 2001-2007)



Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

The same analysis undertaken by ESU (FADN sample broken down by class of economic size : small, medium, large) does not highlights significant differences: the three classes on the three analysed groups of sectors reflect the same relations, with income levels and support levels increasing progressively (see EQ 1). The exception concerns small farms of the field crops, other grazing livestock and mixed farms. In this case, indeed, across the 2001-2007 period, the total support continues to increase (direct payments increase more than compensates the slight decrease in CMO support), determining an equal income increase (see graphs in annex).

9.4.2 Results deriving from the micro-econometric modelling

As already explained, the micro-econometric models have estimated coefficients for the support provided by coupled and decoupled direct payments, but also for the support provided by measures under CMOs and by other non direct payment policies (variable "otha", that mainly refers to rural development payments).

The results of the basic or restricted models in 2007 (see also § 5.5.3.2) have shown that in all considered models the parameters referring to direct payments and to the support provided by CMOs are positive.

Tab. 46 - Signs of the coefficients for the analysed policies (2007)

	Field crops	Horticulture	Permanent crops	Milk	Other grazing livestock	Granivores	Mixed farms	Whole sample
Coupled direct payments	+	+	+	+	+	+	+	+
Decoupled direct payments	+	+	+	+	+	+	+	+
CMO support	+	+	+	+	+	+	+	+
Other policies (mainly RD)	+	n.s	+	n.s	+	+	n.s	-

n.s.: not significant.

Source: Agrosynergie regression estimates based on sample data EU-FADN-DG AGRI L-3.

In the case of the other non direct payment policies, in four of the seven sectors the estimated coefficients are positive, in the other 3 the coefficients are not significant. It is worth noting that, in the model for the whole 2007 farm sample, the estimated coefficients turn to be negative[111]. These results suggest a limited/negative impact in the short run on the unitary farm value added.

[111] As indicated in EQ1, also the macro-econometric estimates a negative coefficient for the Rural Development measures.

The regression analysis cannot explain the reasons behind the results. However, with the due prudence, the hypothesis can be advanced that such result is linked to the very nature of the considered rural development payments.

Indeed, the analysis has considered the annual payments under the rural development policies (such as agro-environmental payments or LFA payments) that are often granted to farmers as an incentive to generate public goods, while subsidies on investments have not been accounted for[112].

For example, agro-environmental payments are clearly aimed at reducing the negative externalities or at increasing the positive externalities the farm sector may generate. Nevertheless, this behaviour has a negative impact on the farm economic results when payments are not accounted for: participation may result in an increase of production costs or/and a reduction of production and of the revenues obtained by selling it. Indeed, the idea behind agro-environmental payments is exactly that of compensating farmers for such effects. Therefore, when this is the case, it is not surprising that the impact of payments granted within this group of policies may not always have a clearly positive effect on farm value added.

A different result may have been obtained considering subsidies on investments that could increase the farm economic performance.

The results of the basic or restricted models in 2004 are similar to the results of those for 2007. In most of the cases, the parameters referring to the four typologies are positive. The coefficients for the other payment policies have to be considered not significant (i.e. zero) in the estimations for the whole sample and for horticulture and granivores sectors.

The analysis of the signs of the coefficients for the four considered groups of policies allow us to affirm that direct payments have been coherent with the measures under Single CMO as farm income support tools. Concerning rural development policy, the results of the regression estimates are less clear-cut.

9.5 Coherence with respect to the objective of enhancing income stability

This section reports the results of the analysis relative to the contribution of direct payments, CMO support and rural development measures to income stability. The aim is to assess whether there is coherence between direct payments and, respectively, CMO support and rural development measures with regard to the objective of stabilising farmers' incomes. As explained in the methodology, coherence is assessed on the basis of comparisons between coefficients of variation of FNVA/AWU. The effects of CMO and rural development measures are examined in the light of the previously examined effects of direct payments on farmers' income stability (i.e. in EQ1).

The percentage share of regions for which direct payments and, respectively, CMO support and rural development measures (RD) have the same type of effect and, conversely, the percentage share of regions for which this is not the case are presented in Tab. 47.

[112] See § 9.2.

Tab. 47 - Share of EU15 regions according to the effects of direct payments, CMO and rural development measures on income stability (%)

	% share of regions					
Coherence of policy effects on income stability	**TF1**	**TF4**	**TF5**	**TF6**	**TF7**	**TF8**
DP and CMO coherent (both have positive effect)	82,4	65,2	92,3	46,7	90,9	88,9
DP and CMO not coherent (DP pos, CMO neg effect)	11,8	21,7	0,0	46,7	0,0	11,1
DP and CMO not coherent (DP neg, CMO pos effect)	5,9	13,6	7,7	6,7	9,1	0,0
DP and CMO both have negative effect	0,0	0,0	0,0	0,0	0,0	0,0
DP and RD coherent (both have positive effect)	75,0	82,6	75,8	81,5	75,0	82,8
DP and RD not coherent (DP pos, RD neg effect)	20,8	4,3	3,0	11,1	20,0	17,2
DP and RD not coherent (DP neg, RD pos effect)	4,2	13,0	21,2	3,7	5,0	0,0
DP and RD both have negative effect	0,0	0,0	0,0	3,7	0,0	0,0

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

The analysis of the effects of direct payments on income stability presented in the answer to EQ1 have shown that, overall, these payments contribute to increasing income stability[113]. The comparison between the effects of direct payments and, respectively, the effects of CMO support and rural development measures suggests that both these policy instruments have an overall positive impact on income stability in the majority of the examined regions across the examined types of farming.

In general, CMO support measures provide an additional positive effect (compared to that of direct payments) towards reducing income volatility in a large share of the examined EU15 regions in field crops, milk, granivores and mixed sectors (82-91% of the regions). Only in farms specialised in other grazing livestock and other permanent crops the level of accordance between direct payments and CMO support appears to be lower. In particular, CMO support appears to increase income volatility, rather than contributing to its reduction, in farms specialised in other grazing livestock across nearly half of the considered EU15 regions.

Similarly, rural development measures provide an additional positive effect (to the effect of direct payments) in reducing income variability. The results in Tab. 47 show that both policy instruments contribute to increasing income stability across the largest share of regions (75-83%) in all sectors. However, in field crops, granivores and mixed sectors we find that in approximately 20% of the regions rural development measures do not provide additional positive effect on income stability.

The analysis brings to light some interesting differences between the three policy instruments with respect to their contribution to higher income stability. In particular, the results point to some regions where the effects of CMO support and rural development measures appear to be larger than direct payments effects. In particular, rural development measures seem to play an important role in stabilising incomes in Austria (all sectors except granivores), some regions of Germany and Luxembourg (milk, other grazing livestock and mixed farming) and Sweden (milk).

CMO measures appear to play a more important role than direct payments in stabilising farmers' incomes in the milk and other grazing livestock sectors for a number of regions, and in few cases also in the granivores (Italy and Spain), field crops and mixed farming sectors.

[113] This is true for all types of farming but the horticultural sector, where the analysis had found that direct payments do not have any impact on income stability. Similarly, no impact of CMO and rural development measures is detected in this sector, which, again, has not been analysed.

Comparison of the impact of direct payments on income stability with the effects of the other two policy instruments	
Field crops	In general there is a good level of coherence both between direct payments and CMO support and between direct payments and rural development measures. The compared policy instruments appear not to be coherent only in four regions: BE Région Wallonne, FR Méditerranée, GR Centre-South (i.e. direct payments and OCM support) and UK England and BE Région Wallonne (i.e. direct payments and rural development measures). In some regions, the positive effect of CMO on income stability is much larger than that of direct payments (i.e. AT, BE Région Flamande, NL, DK, DE South). In this sector, contribution to income stability is larger in the case of CMO support than for rural development payments, except for Austria, where the opposite is true (i.e. the contribution of rural development measures to income stability appears quite larger than both contributions of direct payments and CMO measures).
Other permanent crops	Direct payments and rural development measures appears to be in agreement in a larger number of regions, compared to direct payments and CMO support. However, in spite of some regions where the effect of direct payments and of the other two policies takes opposite signs (i.e. direct payments and CMO support in Greece, ES Noreste and Sur, DE North; direct payments and rural development measures in DE North-West and East&North-East, FR Méditerranée and GR Centre-South), the contribution given by both CMO and rural development policies to income stability is rather small, usually smaller than that of direct payments except for two regions, Austria and IT Nord-Ovest, where the effect of rural development payments is somewhat larger
Milk	In this sector, the substantial role played by CMO measures in supporting farmers' incomes is reflected as well on income stability. Not surprisingly, we find that the impact of these measures on income stability is remarkably higher than that of direct payments in a number of regions, but especially Austria, France, Portugal, ES Centro and Sur, UK Scotland, Denmark, Finland and Sweden. Rural development policies seem to play a non negligible role too in some areas: Austria, most German regions, Luxembourg and Sweden. The regions where there seems to be lack of coherence between direct payments and rural development measures are mainly concentrated in Spain and Italy. One specificity of this sector is that, when we subtract the estimate of CMO support from the FNVA/AWU net of direct payments, a sizeable share of farmers' incomes turn negative. As a consequence, we obtain out-of-range values of CVc in a number of regions (notably, Italy, Ireland, the Netherlands, Germany, good part of the UK and part of Spain) making the comparison between CVb and CVc impossible. Furthermore, in the case of France, FNVA/AWU average values are negative in each considered year, generating negative CVc. In this case, we can consider the coefficient of variation in its absolute value and carry on with the comparison, but we must be aware that we are comparing coefficients of variation that are in one case calculated on positive income values (i.e. CVb) and in the other case on negative incomes (i.e. CVc).
Other grazing livestock	The analysis of this sector produces rather mixed results. First of all, the issue of negative income series with subsequent negative coefficients of variation in the case of FNVA/AWU considered net of direct payments and CMO support is rather important and widespread (Belgium, France, Ireland, nearly the whole UK, almost all Germany, Luxembourg, Finland and Sweden). In many of these cases (i.e. France, UK, Sweden and Finland), we find that CVc < CVb, suggesting that CMO support somewhat reduces the positive contribution provided by direct payments to income stability. On the contrary, there are regions where the effect of CMO support on income stability is positive and adds sensibly to the effect of direct payments (Austria, Belgium, Netherlands, IT Sud, ES Noroeste and Noreste, Luxembourg). Somewhat different results are obtained in TF6 when comparing direct payments with rural development measures. In this case, the effects on income stability appear to be overall rather coherent between the two policies, as we find opposite effects in four regions only: Finland, Sweden, UK Northern Ireland and IT Nord-Est. In this latter region, however, it appears that none of the three considered policy instruments is contributing to income stability. The income stabilising effect of rural development measures generally is rather limited with some notable exceptions: Austria, Ireland, FR Bassin Parisienne and FR Est, DE East & North-East, UK Wales and Northern Ireland, and Luxembourg.
Granivores	There is substantially a good degree of agreement between the effects of direct payments and those of the other two policy instruments with respect to improving income stability. Rural development measures have a very small impact on stability, though, close to zero in most regions. On the other hand, the effect of CMO measures on income stability appears to be considerably larger than that of direct payments in some Member States, notably Spain and Italy, but also in Austria, UK England and DE South.
Mixed farms	In this sector too, there is a good level of agreement between the examined policy instruments with respect to their contribution to income stability. Opposite effects of these policy instruments on income stability are only found in four regions: FR Sud Ouest and FR Centre-Est (i.e. direct payments and OCM support) and Gr North and the Netherlands (i.e. direct payments and rural development measures). Similarly to other examined TF, the income stabilising effects of rural development measures appear rather small. On the contrary, CMO support has an important positive impact on income stability in Austria, Ireland, most of the Italian regions, FR Nord Pas-de-Calais and FR Ouest.

9.6 Coherence between direct payments and LFA compensatory allowance in reducing income gap

Figures concerning the level of farm income of farmers located in LFA areas and in non LFA areas as well as the comparison between the two, have already been presented in § 6. In this section we make a further subdivision of the farms located in LFA areas according to whether or not they receive the LFA compensatory allowance.

In fact, not all farms within an LFA receive the compensatory allowance (which is granted annually per hectare of utilised agricultural area and the unit value of which is established by the Member States within a range between a minimum of 25 €/ha and a maximum of 200 €/ha). To be eligible for payments, a farm must first be situated within an area that is classified as LFA, and second, it must comply with farm level eligibility rules: farm minimum area established by each Member State, carry out the agricultural activity for at least five years from the first received payment of the aid and apply good agricultural practices compatible with the protection of the environment/countryside. In addition, Member States apply a range of specific eligibility criteria.

From a theoretical standpoint, the assumption is that Community and national compensatory allowance eligibility criteria create a mechanism by which the compensatory allowance is given to farmers having lowest levels of income. There is coherence when the income of LFA farmers receiving LFA payments is lower than or at most equal to the income of other farmers (i.e. the income of farmers not located in LFA and farmers located in LFA but not receiving the LFA payments).

In order to determine if the two measures, direct payments and compensatory allowance, are coherent and actually contributed to reducing gap between farms operating in LFA areas and other farms, we have computed two ratios:

- (FNVA/AWU of farms located in LFA areas receiving a compensatory allowance)/ FNVA/AWU of farms not located in LFA areas)
- (FNVA/AWU of farms located in LFA areas receiving a compensatory allowance)/ FNVA/AWU of farms located in LFA areas not receiving a compensatory allowance).

on the actual situation (with compensatory allowance) and on a simulated situation (without compensatory allowance).

For verifying the theoretical assumption the values of the two ratio should be < 1, meaning that the compensatory allowance and direct payments contribute both to reduce income gap between the analysed farmers. Conversely, if the value of the ratios is > 1 then it should be an overlap of the two instruments creating situations of overcompensation.

The table below presents the results by indicating whether or not the values of the ratios are >1 or <1. The cases for which there is an incoherence between the two measures (ratio >1) are highlighted.

Tab. 48 – Coherence between direct payments and LFA compensatory allowance in reducing income disparities

		2004				2007				GLOBAL JUDGEMENT
		GROSS CA		NET CA		GROSS CA		NET CA		
		LFA receiving CA/Not LFA > 1	LFA receiving CA/LFA not receiving CA >1	LFA receiving CA/Not LFA > 1	LFA receiving CA/LFA not receiving CA >1	LFA receiving CA/Not LFA > 1	LFA receiving CA/LFA not receiving CA >1	LFA receiving CA/Not LFA > 1	LFA receiving CA/LFA not receiving CA >1	
EU 27	Field crops	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	DP and CA are coherent and do not overlap
	Milk	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
	Other grazing l.	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
	Mixed	<1	<1	<1	<1	<1	<1	<1	<1	
SPS_HIST	Field crops	< 1	< 1	< 1	< 1	< 1	N	< 1	< 1	DP and CA are coherent and do not overlap
	Milk	< 1	< 1	< 1	< 1	< 1	N	< 1	< 1	
	Other grazing l.	< 1	< 1	< 1	< 1	< 1	> 1	< 1	< 1	
	Mixed	<1	<1	<1	<1	<1	N	<1	<1	
HYBRID (H)	Field crops	< 1	na	< 1	na	na	na	na	na	DP and CA are coherent and do not overlap
	Milk	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
	Other grazing l.	> 1	na	> 1	na	> 1	na	> 1	na	
	Mixed	> 1	na	N	na	> 1	na	> 1	na	
HYBRID (R)	Field crops	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	DP and CA are coherent and do not overlap
	Milk	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
	Other grazing l.	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
	Mixed	< 1	> 1	< 1	> 1	< 1	> 1	<1	<1	
REG	Field crops	< 1	> 1	< 1	> 1	< 1	na	< 1	na	DP and CA are coherent and do not overlap
	Milk	> 1	> 1	> 1	> 1	< 1	< 1	< 1	< 1	
	Other grazing l.	na	na	na	na	na	na	na	na	
	Mixed	<1	na	< 1	na	N	na	<1	na	
SAPS	Field crops	< 1	< 1	< 1	< 1	> 1	> 1	< 1	< 1	DP and CA are not coherent overlap
	Milk	< 1	> 1	< 1	< 1	> 1	> 1	< 1	< 1	
	Other grazing l.	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	
	Mixed	<1	<1	<1	<1	> 1	> 1	<1	> 1	

Source: Elaborations based on sample data EU-FADN-DG AGRI L-3

The analysis have been done distinguishing EU regions also according to the model of implementation. Indeed, the choice of SPS model potentially plays an important role, as we can assume that in the regions applying the historic model the value of the single payment entitlements, calculated according to the average payment received during the reference period, is lower for farms located in LFAs as compared to farms located elsewhere. On the contrary, in the hybrid and regional models, the value of entitlements is the same for all farmers within a region and the amount of aid per farmer only depends on the overall number of entitlements.

As we can see, in most of the analysed cases the two ratios are always < 1, either in the actual or in the simulated situation (this is always true when working at EU27 average level). The analysis by implementation model, however, highlights in some cases situations of overcompensation of the farmers located in LFA areas receiving compensatory allowance respect the two other analysed groups of farms:

SPS-HIST group of regions: in general direct payments and compensatory allowance are coherent and do not overlap. The situation observed before the reform is maintained the same after the reform. The only exception regards the other grazing livestock sector in 2007 for which there is an overcompensation of the farmers located in LFA areas receiving compensatory allowance respect those of the same areas not receiving the CA. In the simulated compensation the overcompensation is no longer verified.

HYBRID (H) group of regions: in general direct payments and compensatory allowance are coherent and do not overlap. The only exceptions concern LFA farmers receiving CA of the other grazing livestock and mixed farms that appear to be overcompensated respect farmers not located in LFA areas, in both years, and also in the simulated situation (with the exception of mixed farms in 2004). The implementation of the hybrid model (H) has not changed the picture existing before the reform and has maintained a situation of overlap between the compensatory allowance and direct payments where this overcompensation existed already before the reform.

HYBRID (R) group of regions: in general direct payments and compensatory allowance are coherent and do not overlap. The exception concerns mixed LFA farmers receiving the CA that are in a better position in terms of level of income respect LFA farmers not receiving CA both in 2004 and in 2007. The main difference is that in 2004 in the simulated situation this was also true but not in 2007. Therefore it seems that the implementation of the hybrid model with prevalent regional component has had an effect of partially redistribution of the aid diminishing the overcompensation observed before the reform and increasing therefore the degree of coherence between the two measures.

REG group of regions: in 2007, direct payments and compensatory allowance are coherent and do not overlap. The cases of overlap existing in 2004 are no longer observed in 2007. In this case too the implementation of the regional model seems to has an effect of redistribution of the aid.

SAPS group of regions: In 2007 in field crops, milk and mixed sectors LFA farmers receiving CA have an income higher than LFA farmers not receiving CA as well as of farmers not located in LFA areas. In the simulated situation overcompensation of LFA farmers receiving CA remains only in the case of mixed farms and respect farmers of the same area not receiving CA. In the case of the regions applying the SAPS model (based on a calculation for which the value of entitlements is the same for all farmers), the CA seems generally to be allocated to LFA farmers already having an income at the same level of the farmers of the other areas or not receiving the CA. In this case direct payments and the compensatory allowance seem to overlap each other.

9.7 Evaluation judgement

The coherence between the three main CAP instruments, direct payments, CMO measures and rural development measures, has been analysed with respect to:

- the objective of enhancing the income of farmers;
- the objective of stabilising the income of farmers;
- the role in reducing gaps between the income of farmers operating in LFA areas and the income of farmers operating in not less-favoured areas.

The judgment on the coherence between the direct payments and the other policy instruments regards the objective of enhancing the level of farmer incomes is based on statistical and econometric analysis.

The statistical analysis looks at the level and development of FNVA/AWU over 2001-2007, with the total CAP support per labour unit (EU15 regions, weighted average for groups of sectors). We have verified if after the reform in those cases where the support provided by CMO measures decreases, this may or may not be compensated by a relatively increase of support provided by direct payments and/or by Rural Development policies.

In the four types of farming most supported with direct payments (field crops, grazing livestock other than dairy, mixed farming and in part milk farms), until the implementation of the reform (2001-2004), the difference between the level of farmers' income and the total level of support is extremely limited: farm income per labour unit is almost equal to total support per labour unit. In this period, the increase of total support by work unit is related to the increase of all three support components: direct payments, CMO measures and rural development payments (without investments)..

After the reform, the overall support per work unit slightly decreases (the large decrease of support given through CMO measures is not totally compensated by the increase of direct payments and of rural development support). The average income of farmers (upward trend) appears to be more linked to market results. Thus, the policy development seems to have favoured the market reorientation of farms. In the other three types of farming (horticulture, permanent crops and granivores) the total support is marginal in relation to farm income per work unit and remains almost unchanged over time, in all its components

On this basis, we can affirm that after the reform the three types of support measures complement each other as they substitute each other over time in order to maintain the overall level of support approximately constant. In this sense, direct payments are coherent with the other support instruments respect the objective of enhancing the level of farmers' income.

The analysis done through the micro-econometric models focused on the comparative impact (signs of the estimated coefficients) of direct payments and the other two policies in specific years. The regression estimates for the four considered groups of policies allow us to conclude that direct payments have been very coherent with the measures under Single CMO as farm income support tools. Concerning rural development policy, the results of the analysis are less clear-cut.

The coherence with respect to the objective of enhancing income stability is assessed on the basis of comparisons between coefficients of variation of FNVA/AWU in the presence/absence of the effects of the three policies (2001-2007, in the regions of the EU15 and for all types of farming).

The comparative analysis of the effects of direct payments with, respectively, the effects of CMO support and rural development measures on income stability suggests that, overall, the three policy instruments act in agreement with respect to contributing to more stable farmers' incomes. Indeed:

- Overall, CMO support measures provide an additional positive effect towards reducing income volatility. Indeed, in four out six types of farming the share of regions where the two policy instruments act in synergy (the difference between the CV is positive) ranges between 82-91%. Only in two types of farming (other grazing livestock and other permanent crops) the share of regions where the two policy instruments act in synergy is lower (respectively 46.7% and 65.2%).
- In all analysed types of farming, rural development payments provide an additional positive effect on income stability: the share of regions where the two policy instruments act in agreement ranges between 75-82.8%. However, in field crops, granivores and mixed farming in approximately 20% of the regions, rural development payments do not provide additional positive effect on income stability.

The coherence analysis has finally verified if direct payments and LFA payments are coherent and actually contributed to reduce the income gap between farmers operating in LFA areas and farmers operating in area non LFA.

The analysis is based on the ratio between the income of farmers located in LFA areas that have received the compensatory allowance, the income of the farmers located in LFA areas that have not received this allowance and the income of farmers not located in LFA areas, in the actual situation (with compensatory allowance) and in a simulated situation (without this allowance). The values of the two ratios between incomes should be < 1, meaning that the LFA payments and direct payments contribute both to reduce the income gap between the analysed farmers. Conversely, if the value of the ratios is > 1 then there is an overlap of the two instruments.

Both in 2004 and in 2007, at EU level (considering all regions and types of farming together) the two ratios are always < 1, either in the actual or in the simulated situation. We can thus conclude that in general the compensatory allowance given to specific farms within a certain LFA area is justified and coherent with direct payments and the two measures complement each other in reducing income disparities among farmers.

However, the analysis by type of farming and by groups of regions according to the SPS implementation model highlights some situations of overlap (ratio >1). In any case, after the reform, in the regions implementing the hybrid model with prevalent regional component and in the regions implementing the regional model, the overlap observed before the reform seems diminishing.

10. CONCLUSIONS

One of the five objectives assigned to the Common Agricultural Policy (CAP) by the EC Treaty is to guarantee the agricultural community a fair standard of living, in particular by increasing the individual earnings of people engaged in agriculture.

This evaluation examined the effects of the direct support schemes laid down in Council Regulation (EC) No 1782/03 (later Council Regulation (EC) No 73/09) on the income of farmers. The effects of direct payments related to other CAP objectives, such as enhancing the competitiveness of the agricultural sector or ensuring sufficient and secure food supply, were not taken into account in the evaluation.

The evaluation examined the effectiveness and efficiency of the implementation of direct support with respect to achieving the income objective. The evaluation also examined the coherence of direct payments with measures under the Single Market Organisation (Single CMO) and rural development measures with respect to this objective.

The geographical scope of the evaluation was EU 27. The coverage was regional and the examination period started on the 1st January 2005. However, in order to highlight the transitional effects of policy change and to allow for a clear distinction of income changes due to market developments, data from 2001 onwards were analysed.

The analyses were done at two levels: i) at macro-economic level, based on regional data (NUTS II); ii) at micro-economic level, based on individual farm data and distinguishing among different farm types according to the following classification criteria: seven types of farming, economic farm size, farm location and type of farm organisation

Before illustrating the main findings, it is opportune to recall that the evaluation focused on farm business income, for which available statistical data were able to satisfy the analysis requirements. The farm household total income was analysed in a qualitative way through a review of available studies and statistics (see below § 10.4).

Furthermore, it is important to note that the results of the analysis may be influenced by changes in the structure and economic situation of farms. The main changes have been:

Structural characteristics
The average number of annual work units (AWU) per farm in the Eastern European Member States and in Germany East & North-East is noticeably higher than in EU 15. Furthermore, comparing pre- and post-reform averages, the following were noted: a general fall in average AWU/farm in the macro-regions of France, Belgium, Portugal, Austria, Greece and Ireland; an almost global increase in the macro-regions of Italy, Germany, Denmark, Luxembourg and Sweden; a more mixed situation (increase or fall depending on type of farming and/or macro-region) in other EU15 (e.g. United Kingdom, Spain, Netherlands, Finland).
The average number of AWU per hectare. The comparison of pre- and post-reform averages (EU15) highlights a general decrease of the number of labour units per hectare of agricultural area. The most important regular exceptions were found in the Italian macro-regions for permanent crops and in the macro-regions of southern Spain.
Economic situation
In most regions, the annual average growth rate of Intermediate consumption/AWU is higher than the annual average growth rate of Total output/AWU, and therefore there exists a trend indicating a narrower gap between costs and revenues.
In most regions, the annual average growth rate of Wages paid/ paid AWU is lower than the annual average growth rate of Total output/AWU, and therefore the growth of wages is lower than that of Output/AWU.

Such factors may well play a role in addition to direct payments' effects on FNVA/AWU:

a) for equal levels of FNVA, income per labour unit (AWU) is structurally lower in the EU12 Member States compared to the EU15 (on average);
b) in the EU15 the total number of AWU has decreased after the 2003 CAP reform. Therefore, for equal levels of FNVA, after the reform income per AWU becomes higher;
c) changes of FNVA/AWU over time are influenced by changes in some of its components (total output/AWU; intermediate consumption/AWU; paid wages/paid AWU; number of AWU).

10.1 CONTRIBUTION OF DIRECT SUPPORT TO ACHIEVING A FAIR STANDARD OF LIVING FOR THE AGRICULTURAL COMMUNITY BY THE WAY OF ENHANCING AND STABILISING THE INCOME OF FARMERS

Main findings and conclusions at the macro-economic level

Macro-economic analysis has been used mainly for measuring the effects of direct payments in terms of level and stability of agricultural income per labour unit . The analysis has been carried out at the NUTS II level, using data from the EU regional statistics provided by Eurostat[114].

The statistical analysis shows a linear correlation (2004 and 2007) between the level of agricultural payments under I and II pillar and the level of the corrected factor income (CFI).

The econometric analysis shows that in all analysed years (2007, 2006 and 2004), the parameter estimates for the direct payments variables are statistically significant and positive in sign. Therefore, we can affirm that direct aid contributes to enhancing the income of farmers (i.e. CFI). The effects of coupled aids on CFI appear to be stronger than those produced by decoupled aids (years 2006 and 2007). Such a result seems to be confirmed by the analysis conducted on the sample sub-divided in two different economic groups: regions with a share of total GDP produced by the agriculture lower/higher than the median value.

Probit regression was applied to investigate the role of direct aid in stabilising the CFI over the observation period. The results have to be evaluated taking into account the statistical validity and the limitations of the model. Thus, we can conclude that decoupled payments provide a positive and robust contribution to the stability of income (i.e. of CFI). On the other hand, we are not able to draw unequivocal conclusions as to the effect of coupled payments.

Main findings and conclusions at the micro-economic level

At micro-economic level, the analysis is based on farm data from the FADN database (EU-FADN-DG AGRI L-3). The variable representing the income of farmers was Farm Net Value Added per Annual Work Unit (FNVA/AWU). The effect of direct payments on farmers' income was analysed across 55 Community macro-regions within the framework of seven types of farming and by class of economic size. The analysed issues were:

- role of direct payments in enhancing the income of farmers
- role of direct payments in stabilising the income of farmers
- role of direct payments in allowing farmers to achieve an income level able to guarantee a fair standard of living (comparison of farmers income with an overall income benchmark);
- effects of the 2003 reform on the income of farmers.

[114] Since data from Eurostat do not allow to disaggregate the contribution of different types of agricultural subsidies to the factor income, we have integrated the more detailed subsidy data available from the CATS database (Clearance of Audit Trail System, provided by DG Agri). This operation resulted in the computation of a new factor income variable, termed Corrected Factor Income

Role of direct payments in enhancing the income of farmers

The statistical analysis to assess the role of direct payments in enhancing the income of farmers (the farm business income) has been done on the basis of the 2004-2007 average. The farm income per labour unit (FNVA/AWU) was analysed by converting the original values of the FADN database into Purchasing Power Standard (PPS) values, in order to take into account the differences in existing purchasing power across Member States.

The first finding is that, even though calculations were done in PPS, there is a big difference between the average farm income per labour unit in EU15 and in EU12: the average FNVA/AWU of the EU15 Member States is double the average FNVA/AWU of the EU12.

The analysis clearly indicates that direct payments have played a particularly important role in generating farm income in grazing livestock farms (beef, sheep and goats), field crops, mixed farms and dairy farms: direct support represents about 50% of the income of grazing livestock farms, over 40% of the income of field crop farms and of mixed farms and over 30% of the income of dairy farms. In the two sectors for which the share of direct payments is the lowest, i.e. horticulture and permanent crops, the average incomes are lower than the average income in the farm sector overall.

The results of the simulations made by deducting direct payments from the weighted average of farm income (FNVA/AWU) for the period 2004-2007 indicate that the removal of direct payments would have led to a 27% fall in farm income.

The analysis highlights strong differences between regional average incomes in all analysed sectors (coefficients of variation > 40%). However, in the absence of direct payments (simulated situation for the period 2004-2007), the variability would have increased in all sectors, and in a particularly important way in those sectors where the share of direct payments on income is the highest (field crops, milk sector, other grazing livestock and mixed farms). Therefore, in particular in these sectors it is possible to conclude that direct payments have also played a role in strengthening the cohesion between regions.

In more detail, the analysis conducted on farms from the FADN sample broken down by class of economic size[115] shows the existence of a close and direct relationship between the level of individual farm income and the economic size of farms.

In general, small farms have a lower average income per labour unit. Considering that the analysis has allowed to establish that family farms are concentrated in the small economic size class, it is possible to conclude that, on average, family farms have relatively lower income per labour unit.

In the simulations (by deducting direct payments from farm income for the period 2004-2007) the gap between small and large farms would have increased, in particular in field crops specialized farms and in mixed farms. It is therefore possible to conclude that direct payments have allowed a reduction of the existing income gap between small and large farms.

The application of econometric models at micro-economic level, using FADN data, allowed to estimate the net effects of direct payments on farmers' incomes[116] differentiating across the analysed types of farming.

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[115] Three classes of ESU: Small, up to 16 ESU; Medium, from 16 to 100 ESU; Large, greater than 100 ESU. One ESU corresponds to a farm's Standard Gross Margin (SGM) of 1.200 Euro/year.

[116] We recall that the econometric approach has been used to identify the statistical relationships between income level and a number of explanatory variables expected to influence farmers' income (e.g. direct payments, market interventions, economic or social factors, etc). Thus, regression models allowed to assess the effectiveness of direct payments (i.e. the net effect) in terms of enhancing the income of farmers. The regression parameters estimate the impact of an additional Euro of direct payments on farm income. If parameters are statistically different from zero and positive in sign, it can be assumed that direct payments contribute to enhancing farm incomes. The magnitude of the parameters provides an estimated measure of this contribution.

The estimated coefficients of coupled and decoupled direct payments are statistically different from zero and positive in all considered cases: seven types of farming and whole sample, years 2004 and 2007).

These results confirm that direct payments contributed to enhancing the income of farmers.

The regression parameters estimate for coupled payments lay around 0.5 (whole sample, 2007), the regression parameters estimate for decoupled payments are higher and around 1.2. The coefficient for decoupled direct payments is greater than the one of coupled direct payments in all sectors, which means that one additional Euro of decoupled support translates into an increase of income greater than one additional Euro of coupled support.

Both regression models, macro and micro, estimate the positive effect of direct payments on income. However, estimations show different relative effectiveness of coupled and decoupled direct payments. If in the micro model decoupled aids seem to be more effective, in the macro model the opposite is true. This difference could be due to the fact that the analysis has been developed at two different levels: the macro model has been developed at aggregate regional level and the micro model at individual farm level. In any case, the combined reading of the two analyses does not allow to express a judgment on this issue.

Further on, an analysis according to the type of payment scheme applied (i.e. SPS vs. SAPS) has been performed by means of the unrestricted-SPS models in 2007. The results suggest that the effectiveness of direct payments may be slightly higher in SAPS farms than in SPS farms.

Role of direct payments in stabilising the income of farmers

The contribution of direct payments to farm income stability was measured by comparing the variability of farm income with and without direct payments. The analysis covered the macro-regions of the EU15 for which long enough income series were available (2001-2007). The trend component was removed from the time series in order to separate long-term changes caused by exogenous factors.

The analysis allows to conclude that direct payments have made a positive and robust contribution to the stability of the income of farmers. As already observed, also in this case the largest effect on income stability is shown in sectors most supported by direct payments (field crops, other grazing livestock and mixed farms). Consequently, in sectors with a lesser share of direct payments in the total farm business income, incomes show a higher variability, as they are more exposed to product and factor market conditions.

Nevertheless, within each sector, the analysis highlighted a diverse contribution of direct support on income stabilityaccording to to the economic size of the farms: larger in small farms than the other two classes. The absence of direct payments would have made farmers' income volatility even higher in the smaller farms (small compared to medium and large size farms and medium compared to large size farms), that already have the lowest farm income stability in the actual situation compared to larger size farms.

Role of direct payments in allowing farmers to achieve an income level able to guarantee a fair standard of living

One of the key objectives of the CAP is "to ensure a fair standard of living for the agricultural community". However, the European Community has never defined the concepts of 'agricultural community' and 'fair standard of living' as they appear in Article 39 of the TFEU Treaty. There are therefore still no clear concepts or criteria which can be applied to measure these variables.

In this context, to assess the contribution of direct payments to the income objective, the analysis had to compare farm income with an income variable to be used as benchmark. For the purpose of this evaluation, the examination of the available income measures in the official EU statistics (e.g. basic

national minimum wage, annual gross earnings, industrial mean earnings, Gross Domestic Product) and considerations about comparability issues led to choosing the Gross Domestic Product (GDP) per employee as a benchmark (Eurostat, average 2004-2007).

Indeed, it is commonly accepted that income is an appropriate proxy to measure the standard of living. We recall that in this case the analysis focuses on farm business income, i.e. the income generated by the main activity of farmers. Accordingly, regional GDP is a measure of a region's overall economic output and it represents an overall income benchmark (i.e. income generated by all sectors of a regional economy) to be compared with farm income expressed in terms of value added generated by all production factors.

The analysis was carried out at regional level for each sector. The ratio between farm income per labour unit and GDP per employee was computed in the real and simulated situation (farm income computed by deducting direct payments) for the period 2004-2007. The original values expressed in Euros were converted into PPS values.

The analysis shows that in most cases, farm income per labour unit is lower than GDP/employee (average for period 2004-2007). In 60.5% of regions the farm income is lower than half of the regional the GDP/employee. Conversely, in only 2.2% of regions the farm income exceed the regional benchmark. In the simulated situation, without direct payments, 84% of regions would have not reached half of the regional GDP.

Moving on to the analysis by sector, the contribution of direct payments to bringing average regional farm income per labour unit closer to the regional GDP per employee varies from sector to sector and from region to region. In all four most supported sectors (field crops, milk, other grazing livestock and mixed farms), the simulations carried out without direct payments and based on 2004-2007 data show that the absence of direct aid would have caused a further widening of the gap between farmers' income and GDP per employee in a large number of regions. In the livestock sector farm income per labour unit would not have reached half of the regional GDP/employee in 100% of regions.

Further on, the analysis by class of economic size (period 2004-2007) shows that, even in the presence of direct payments, in 98,1% of regions average farm income for small farms is lower than half of the GDP/employee. Concerning medium farms, 73% of regions do not reach the threshold of half of the benchmark. In the group of large farms, the average farm income in the EU regions is lower than half of the benchmark in 24,8% of regions.

These results lead to conclude that direct payments have helped reduce the gap between average farmers' income and Gross Domestic Product (GDP) per employee for the period 2004-2007.

A further analysis was conducted with a view to assessing whether in the analysed period, and to what extent, direct payments make it possible for the family labour units to attain an income (FFI/FWU) corresponding to at least the average wage of farm employees calculated at a regional level for all sectors (source: FADN farms). Should this level not be reached, it would cease to be convenient to carry on the activity, as it would be more convenient to be employed elsewhere[117].

Bearing in mind some limitations, the comparison of the actual and simulated situations makes it possible to state that in the more supported sectors (field crops, milk, other grazing livestock and mixed farms), direct payments have played a crucial role for the period 2004-2007. In these sectors, the simulations without direct payments indicate that farm income per family labour unit would have

[117] It should be stressed that the FFI/FWU value does not correspond exactly to work remuneration, as it also includes remuneration of capital and profit. Therefore, a value of the ratio amounting to 1 (or lower) indicates a fragile situation in which either family labour or capital is under-remunerated

fallen below the remuneration of paid employment in the reference region in a large number of regions (35.4%). In the livestock sector the farm income per family unit would not reach the remuneration of paid employment in 78% of regions.

Effects of the 2003 reform on the income of farmers

The aim of the analysis was to verify whether the changes in farm income observed before and after the could be attributable to the main changes introduced through the reform of the direct payments system. Due to data availability, the analysis was conducted solely for the EU15 macro-regions by comparing average values for the period 2001-04 (pre-reform) and the period 2006-07 (post reform) in each sector.

In the period following the implementation of the reform, farm income per labour unit has increased in all types of farming and in almost all ESU classes, even though this increase is not uniform. Farm income has increased more than the GDP per employee. Therefore, the gap between farm income per labour unit and GDP per employee becomes narrower.

However, the simulations did not make it possible to separate the effects of the reform from other factors that may have influenced the growth phenomenon, such as the improvement of market conditions in some sectors, the general fall in the average number of annual work units per hectare, (which presumably has brought about a rise in labour productivity), or other short-term factors.

The analysis does not highlight any differences in income growth related to the implementation model of the reform chosen by Member States (historic SPS, hybrid SPS).

10.2 DIFFERENTIATED ROLE OF DIRECT PAYMENTS ON FARMERS' INCOME ACCORDING TO FARM LOCATION

The judgment is based on statistical and econometric analysis. The statistical analysis is based on the comparison between farmers' income variables in three groups: the first group considers all farms located in non LFA areas, the second group considers all farms located in LFA areas and the third group is a sub-group of the second and it considers only farms located in mountain LFA areas. This comparison investigated whether direct payments contribute to reducing the gap between farmer's income of LFA areas and farmer's income of non LFA areas.

The comparison (FNVA/AWU net of the compensatory allowance) has highlighted that, at EU level on average in the period 2004-2007, the income of farmers located in LFA and of farmers located in mountain LFA areas is lower than the income of farmers in non LFA areas: respectively, around -12% and -19%.

On the basis of the results of the simulation (calculations made by deducting direct payments from farm income), we can conclude that:

- In the analysed period (2004-2007), the income of farmers located in LFA areas and the income of farmers located in the subgroup mountain LFA areas, apart from some exceptions, are more dependent on direct payments than the income of farmers located in non LFA areas. Indeed, in the simulated situation (by deducting direct payments) the gap between farmers' income of LFA areas and farmers' income of non LFA areas would have increased.
- Therefore, direct payments have reduced the existing differences between the farmers' income in non LFA areas and the income in LFA and in the subgroup mountain LFA areas.
- Concerning farmers' income of the subgroup mountain LFA, in the simulations the gap with non LFA farmers' income would have remained almost the same. It seems that farmers' income in LFA areas other than mountain areas are in general more sensitive to direct payments. However, this result, obtained at EU27 level, can be influenced by the fact that the subgroup mountain LFA

is more represented in EU15 Member States (higher average incomes) than in the EU12 Member States (characterised mostly by LFA areas with the lowest incomes).

Direct payments have had larger effects on farmers' income stability in LFA areas in comparison to non-LFA areas. Concerning mountain LFA areas the analysis does not produce homogenous results.

The analysis of the net effects of direct payments performed by means of the econometric models aimed at testing if the coefficients for direct payments differ in the farms located in mountain-LFAs and in other areas (i.e. the *unrestricted-LFA models*). Indeed, it has been shown that the estimated coefficients for coupled payments are often lower in mountain-LFA farms than in the other farms, especially in the most recent dataset (2007).

Such results suggest that coupled payments are relatively less effective in mountain-LFA than in other farms. This could be explained by the fact that production costs in mountain-LFA farms are generally higher than in the other farms. Therefore, because farmers have an incentive to increase the production level of the supported activity in order to increase the amount of coupled payments, this causes a a distortion in the allocation of farm resources (e.g. land and labour) among production activities and generates an efficiency loss that results in a reduction of the farm economic performance (e.g. farm gross margin net of direct payments). In this case, the coupled payment increases the overall farm income (gross of direct payments) even if such increase is lower than the amount of received coupled payments because part of these payments is needed to compensate the efficiency loss.

Moreover, the level of the decoupled payments coefficients is generally higher (or not significantly different) in farms located in mountain-LFAs than in farms located in other areas.

The analysis of the ratio between farm income per labour unit and GDP per employee (for 2004-2007 at regional level for each location) reflects the findings related to the level of farmers' income. Indeed, in all regions and across all types of farming the farm income in LFA areas and in the subgroup mountain LFA areas is lower than the regional GDP. Non LFA regions show also a situation of lower farm income compared to the regional GDP, but a less critical one compared with the situation of LFA areas and the subgroup mountain LFA areas.

These results allow to conclude that direct payments have contributed to reducing the gap between average farmers' income in farms located in LFA area and in the subgroup of mountain LFA areas and the regional GDP per employee.

10.3 DIFFERENTIATED ROLE OF DIRECT PAYMENTS ON FARMERS' INCOME ACCORDING TO THE ORGANISATIONAL FORM OF HOLDINGS

Conclusions are based on the comparative analysis of farm income per labour unit for the period 2004-2007, computed with and without direct payments by organisational form of holdings: individual farms, partnerships, farms having types of organisational form.

The analysis allows to conclude that:

- In the EU15 regions, on average, the farm income of individual farms is more dependent on aid than that of the other two organisational forms. The calculations made by deducting direct payments indicate that in this simulated situation the income gap between different types of farm organisation would have been wider than the actual one.
- In EU12 regions, the situation appears to be the exact opposite: the loss of farm income per unit of labour following the simulated removal of direct payments would have been greater in farms having other types of organisational form compared to individual farms and partnerships.

These conclusions must be combined with the analysis of the average workforce per farm, that shows that, in the EU15, in farms having other types of organisational form the size of the labour factor is optimised in relation to farm activities, resulting in a higher level of efficiency. On the other hand, in the EU12 the same farms have an evident surplus of labour.

The analysis of farm income stability (EU15, 2001-2007) showed that there does not seem to be a pattern by which income variability is consistently higher (or lower) in one of the three groups. However, in general, direct payments appear to have had a larger income stabilizing effect in individual farms and partnerships compared to farms having other types of organisational form.

10.4 MAIN FINDINGS OF THE LITERATURE REVIEW CONCERNING THE FARM HOUSEHOLD TOTAL INCOME

Direct payments not only affect farm business income, but also farm household total income. In principle, it was therefore important to analyse the evolution of farm household income, for which, as already mentioned, there are no available EU official statistics. To overcome this shortcoming, a critical analysis of the existing literature (studies and statistics available for single Member States and, in some case, for groups of Member States) has been carried out.

It is important to underline that the literature review suffers from some limitations, related to: i) differences in the definition of households and farm households; ii) differences in the measurement of farm household income; iii) the lack of up-to-date studies and statistical data on farm household income.

Bearing in mind these limitations, the overall results of the review are summarised below.

- In some Member States the average farm household income (FHI) was higher than the average income of all households. The opposite was however true in other Member States. However, in Member States where the FHI is lower that the average income of all households, the gap is generally limited.
- In most of the considered Member States where data is available the differences between farm and non-farm household incomes are on average narrower than in the past. Indeed, farm household incomes across EU Member States have shown an improvement that has been often explained by a process of diversification of income sources and, in particular, by an increase of the role of income generated by off-farm activities (OECD, 2009)
- The share of low income households is often higher in the farm population than in the non-farm population. Farm households in which the relative importance of farm business income is relatively high are also found more frequently in low-income categories.
- Part-time farming is often reported to have relatively higher FHI than full-time farming. Consequently, diversification strategies based on looking for off-farm income opportunities can be very effective in terms of enhancing income. Indeed, the increase in the share of farms managed on a part-time basis has probably been one of the main drivers of the positive trend observed in the relative income condition of farm households.
- The relative importance of the farm business income in generating farm household income is declining over time and vary widely among farm households. For these reasons, the effect of policy support provided by agricultural policy on household income can change over time and can differ very much among farm households. For example, it is likely that this effect is more limited in part-time than in full-time farm households given that, in the former group, farm business income represents a smaller share of household total income than in the latter group. However, it is important to remark that, in some specific groups of farm households, even if the role of farm business is limited, policy support (including direct payments) can play a very important role in the generation of farm business income and, therefore, of farm household income.

- The sparse and limited available data do not permit to draw solid enough conclusions on the role of agricultural policies on farm household income
- The variability of farm income, due to the intrinsic characteristics of agricultural production, is partially compensated by lower variability of off-farm incomes. This suggests that off-farm incomes play an important and positive role in the stabilisation of farm household income.

10.5 CONTRIBUTION OF DIRECT SUPPORT TO THE ECONOMIC VIABILITY OF FARMS

A farm can be considered viable when it is able to guarantee a "sufficient remuneration" of family labour and farm capital. Two aspects have been taken into account:

- economic viability: the ability to guarantee remuneration of family labour at least equal to its opportunity cost and positive remuneration of farm capital
- economic and financial viability (considered together) : the ability to guarantee, besides the remuneration of family labour, the remuneration of farm capital at least equal to the average Interest Rate applied to medium-term loans.

Concerning economic viability, the analysis is based on the comparison (in the actual situation - with direct payments, and in the simulated situation - without direct payments) of two key indicators obtained from the FADN database, i.e. the Return on Investments (ROI) and the Return on Assets (ROA). Both indicators were measured net of the value of family labour, estimated at its opportunity cost of the average wage of farm employees.

The results of the analyses lead to the conclusion that on average, in four sector (field crops, other grazing livestock, mixed farming and partly in milk sector) in the simulated situation (absence of direct payments) economic results would not have been sufficient to adequately remunerate capital nor family labour. In other words, direct payments have been crucial (on average)in ensuring the economic viability of farms specialised in field crops, grazing livestock, mixed farming and, partly, in the milk sector.

Further analyses examined the same indicators distinguishing three farm types defined according to different shares of paid and unpaid labour. This analysis showed that farms in which the paid labour component is high (FWU/AWU <30%) are the most efficient in the EU15 and the least efficient in the EU12, suggesting in this last case an excess presence of paid labour. This leads to surmise that in farms belonging to this class the strategic goals being pursued might be completely different: aimed more at profit maximisation in the EU15, and employment maximisation in the EU12.

At a regional level there is quite a large variability. On average, and with some differences across sectors, direct payments have enabled farms to adequately remunerate family labour (calculated at opportunity cost) and to remunerate to some extent the capital invested in the farms in about 76% of regions for the period 2004-2007. *Vice versa*, in about a quarter of the Community regions, on average, farms are not economically viable even with direct aid.

Nevertheless, in about 28% of regions[118], direct payments make it possible to adequately remunerate family labour at the opportunity cost, but not remunerate invested capital. In this case, farms have a problem of economic viability, since capital remuneration would presume an under-remuneration of family labour.

[118] Calculated as the difference between the percentage share of regions in which ROA would become on average < 0 in the absence of DP (52.1%) and the number of regions in which ROA is in any case on average < 0 even with DP (23.6%).

This situation is particularly evident in the class resorting most to family labour (in particular in three sectors: horticultural, other grazing livestock and mixed farms). It is thus quite likely that in many farms of this class there are elements of hidden unemployment, resulting in the use of family labour surplus to actual needs, dictated by technological progress.

Concerning economic and financial viability, the analysis compared ROA values and average interest rates paid on loans (IRL), the latter being considered as an opportunity cost of capital.

The results of the analysis lead us to conclude that on average, in the majority of regions direct payments have allowed the attainment of economic viability, but not of financial viability (the value of the ratio is between 0 and 1 for farms in most regions). Furthermore, despite the presence of direct payments, farms having an organisational model largely relying on the use of family labour find it more difficult to attain a state of viability compared with farms applying other organisational models.

With reference to the effects of the 2003 reform (analysis only for EU15 regions), a general growth in ROI and ROA values was seen, stronger in farms in which the family component of labour was higher. Furthermore, ROI and ROA values rose for a larger number of regions having adopted the hybrid SPS model compared with the number of regions having adopted historic SPS model (in all FWU/AWU classes, and in all types of farming except for granivores). Consistently similar results across the considered region groups lead to conclude that the phenomenon observed could not be random. In other words, and without prejudice to all other causes, the system implementing hybrid SPS would appear to have favoured to some extent the growth of ROI and ROA

10.6 EFFICIENCY OF DIRECT SUPPORT

The efficiency of direct support was examined in relation to: a) the goal of targeting the appropriate recipients; b) the goal of reducing income disparities; c) the relative efficiency of direct support compared to other policy instruments: measures under Single CMO and rural development measures.

Efficiency with respect to the goal of targeting the appropriate recipients

In relation to the objective of targeting the appropriate recipients, the higher the percentage of farmers receiving direct payments, even though they did not need them or did not need so much, the less efficient the system was considered. This case occurs when: situation a) farmers reached/exceeded their reference income benchmark (regional GDP/employee) even in the absence of direct payments; situation b) farmers reached/exceed the income threshold thanks to direct payments.

The analysis was conducted on the sample of FADN farms for all considered types of farming and for the years 2001, 2004 and 2007, with a calculation of the percentage share of farms having a farm income per labour unit equal or above the regional GDP per employee even in the absence of direct payments (situation A); the percentage share of farms having a farm income per labour unit equal or above the regional GDP thanks to direct payments (situation B).

We also calculated the corresponding percentage share of direct payments received by farms in situation A and in situation B (i.e. the amount exceeding the benchmark for farms that receive more direct payments than they need to reach the regional GDP/employee level).

Bearing in mind some limitations, in the years analysed (2004, 2006 and 2007), at global level the efficiency of direct payments in terms of targeting the appropriate recipients is quite high (although the level has dropped over time): just 6.1% of farms received direct payments when they do not need it, and 5.9% of farms received more aid than they need, for a sum of 12%.

If we examine the expenditure, 82% of it went to farms whose income did not reach the benchmark, i.e. the regional GDP per employee, even with direct payments, (2007). Conversely, 18% of the

expenditure went to farms whose income with or even without direct payment was higher than the reference benchmark (2007). Since the percentage of the amount of direct payment is higher than the percentage of farms that received support they do not need, it is surmised that this amount is concentrated in a proportionally more limited number of farms.

The results of the analysis conducted distinguishing among types of farming and region groups highlight important differences *vis-à-vis* the previous overall analysis. Indeed, the results may differ considerably since the seven analysed types of farming are characterised by different shares of direct payments on the farm income.

In sectors for which the share of direct aid is low, the analysis is not very pertinent. In sectors for which the share of direct payments is high, the differences among sectors are important, with field crops and grazing livestock at the two extremes:

- In field crops the percentage of direct payments exceeding the benchmark (from 13.2% in the group of regions applying the Regional SPS model to 31.4 in the SAPS group, 2007) has particular economic importance (in 2007, fields crops covered 40% of the total expenditure).
- For grazing livestock the targeting efficiency is high (in 2007, the share of direct payments exceeding the benchmark ranges from 3.5% in the group of regions applying the Hybrid SPS model to 9.9 in the SAPS group) and further rises in efficiency, would (probably) bring about only a very small improvement.

At the regional level, in 16.4% of the EU27 regions over 30% of the expenditure is going to farms that without direct payments (situation A) or with direct payments (situation B) achieve a farm income equal or above the regional GDP per employee. However, in further 36.4 % of regions, the percentage is 10%. Furthermore, across the regions the percentage of farms exceeding the reference benchmark rises from a minimum of zero to a maximum of 41%, whereas the direct payments exceeding the benchmark rises from a minimum of zero to a maximum of almost 60%.

The analysis leads to conclude that, while at a global level the efficiency of direct payments in directing income support to farmers whose income is lower than the benhmark is quite high, at the sector level (and even more at the regional level) there are remarkable differences.

Efficiency with respect to the goal of reducing income disparities

Concerning this objective, a first level of analysis concerns the assessment of the effects of direct payments in terms of their contribution to a more equitable distribution of farmers' incomes. The analysis is based on the comparison of income concentration coefficients (Gini coefficients) calculated for the distributions of FNVA/AWU (2001, 2004 and 2007) gross and net of direct payments.

The first conclusion immediately emerging from the analysis concerns the rather high level of inequity that characterises farmers' income in most sectors across all EU regions when compared to income inequity levels reported for the whole population of the EU27 and of individual Member States.

The disparity would be higher in the absence of direct payments: the comparative analysis of Gini coefficients clearly shows that direct payments contribute to reducing overall inequities in farmers income distributions in all considered types of farming, region groups and examined years.

The comparison of income distributions for each type of farming in the EU15 and EU12 in 2007 shows that the effects of direct payments on income equity are, overall, larger in the EU15, in particular in the sectors traditionally heavily supported through direct aid. Furthermore, in the EU15 the contribution of direct payments to the reduction of income disparities varies from sector to sector, whereas in the EU12 it is more homogeneous across the examined types of farming.

A further comparison of Gini coefficients across the four SPS region groups in 2007 suggests that, overall, direct payments bear a positive effect on income equity in the regions applying hybrid and regional SPS models than in the regions implementing the historic SPS model.

It is possible to conclude that, overall, direct payments are an efficient policy instrument because they are targeted in such a way that contributes to improving overall income equity, but with uneven income distribution persisting in most sectors and geographical areas.

A second level of analysis examines the contribution of direct payments to farmers' income according to income classes, this time making a distinction between coupled and decoupled payments. The analysis is carried out at the micro- and macro-economic level using quantile regression models. The results lead to the following conclusions:

- the analysis at the macro-economic level suggests that decoupled payments contribute to decreasing income disparities as their income effect is larger in the lower income classes and becomes smaller in the higher income classes (the value of the coefficients associated with decoupled aids decreases as the corrected factor income per agicultural employee increases). On the contrary, coupled payments contribute more to income in the higher income classes than they do in the lower income classes (the value of the coefficients associated with coupled aids increases as the corrected factor income per agicultural employee increases). Therefore, we are led to conclude that decoupled payments are efficient with respect to the targeting objective, whereas coupled payments are not;
- the quantile regression models developed at micro-economic level lead, for all analysed sectors, to the same conclusions on coupled payments: as they do not help reducing income disparity, they cannot be considered efficient with respect to the targeting objective. The results concerning decoupled payments are less clear-cut, showing, depending on the sector, a different level of efficiency with respect to this objective.

Relative efficiency of direct support compared to other CAP instruments

The analysis makes further use of the results of the linear regressions at the macro- and micro-economic levels.

The macro-econometric analysis suggests that direct payments are relatively more efficient than rural development measures in relation to the objective of contributing to the enhancement of farmers' income. The OLS coefficient estimates of rural development aids are negative and significant in all cases. Such a result could be related to the nature of the rural aids that comprise interventions much more oriented to improve life conditions in marginal territories, than to increase production and income of production factors. Indeed, if we had used a variable expressing quality of life as the dependent variable in the models, instead of a measure of income generated by agricultural production (i.e. CFI), then we would be likely to find that rural development aids have a significant and positive effect. Furthermore, the negative sign associated to rural aids can be further explained by considering the negative correlation existing between per capita GDP and per capita rural aids at the regional level.

The results of the micro-econometric analysis regarding rural development payments for individual sectors are less clear-cut.

The comparison between the effects of direct payments and measures under the CMO does not allow to draw such robust conclusions, either in the macro- or in the micro-econometric analysis.

10.7 COHERENCE BETWEEN DIRECT PAYMENTS AND OTHER CAP MEASURES: MEASURES UNDER THE SINGLE CMO AND RURAL DEVELOPMENT MEASURES

Coherence between direct payments and the other two types of CAP measures with respect to the objective of enhancing the income of farmers

The judgment is based on statistical and econometric analysis.

The statistical analysis shows that after the 2003 CAP reform, the overall support per work unit slightly decreases (the large decrease of support given through CMO measures is not totally compensated by the increase of direct payments and of rural development support). The average income of farmers (upward trend) appears to be more linked to market results. Thus, the policy development seems to have favoured the market reorientation of farms. On this basis, we can conclude that the three types of support measures complement each other as they substitute each other over time in order to maintain the overall level of support nearly constant. In this sense, direct payments have been coherent with the other support instruments.

The analysis conducted through the micro-econometric models focuses on the comparative impact (signs of the estimated coefficients) of direct payments and the other two policies in specific years. The regression estimates for the three considered groups of policies allow us to conclude that direct payments have been very coherent with the measures under Single CMO as farm income support tools. Concerning rural development policy, the results of the analysis are less clear-cut.

Coherence between direct payments and the other two CAP measures with respect to the objective of enhancing income stability

The comparative analysis of the effects of direct payments with, respectively, the effects of CMO support and rural development measures on income stability suggests that, overall, the three policy instruments act in agreement with respect to contributing to more stable farmers' incomes. Indeed:

- Overall, CMO support measures provide an additional positive effect towards reducing income volatility. Indeed, in four out six types of farming the share of regions where the two policy instruments act in synergy (the difference between the CV is positive) ranges between 82-91%. Only in two types of farming (other grazing livestock and other permanent crops) the share of regions where the two policy instruments act in synergy is lower (respectively 46.7% and 65.2%).
- In all analysed types of farming, rural development payments provide an additional positive effect on income stability: the share of regions where the two policy instruments act in agreement ranges between 75-82.8%. However, in field crops, granivores and mixed farming in approximately 20% of the regions, rural development payments do not provide additional positive effect on income stability.

Coherence between direct payments and compensatory allowance granted to farmers in Less Favoured Area with respect to the objective of reducing disparities

To measure the coherence and to identify possible cases of overlapping between the two instruments, the analysis looked at the ratios between the income of farmers located in LFA areas that have received the compensatory allowance, the income of the farmers located in LFA areas that have not received this allowance and the income of farmers not located in LFA areas, in the actual situation (with compensatory allowance) and in a simulated situation (without this allowance). The values of the two ratios should be < 1, meaning that LFA payments and direct payments contribute both to reduce the income gap between the analysed farmers. Conversely, if the value of the ratios is > 1 then there is an overlap of the two instruments.

Both in 2004 and in 2007, at EU level (considering all regions and types of farming together) the two ratios are always < 1, either in the actual or in the simulated situation. We can thus conclude that, in general, the compensatory allowance given to specific farms within a certain LFA area is justified and coherent with direct payments and the two measures complement each other in reducing income disparities among farmers.

However, the analysis by type of farming and by groups of regions according to the SPS implementation model highlights some situations of overlap (ratio >1). In any case, after the reform, in the regions implementing the hybrid model with prevalent regional component and in the regions implementing the regional model, the overlap observed before the reform seems diminishing.

11. RECOMMENDATIONS

On the basis of the evaluation results and the conclusions, the evaluator suggests the following recommendations:

1. The comparative analysis across the seven analysed types of farming shows that some of the lowest farm income levels per labour unit are found in the two sectors benefitting to a very limited extent or not at all from direct support, namely horticulture and permanent crops (except wine). In the EU15 Member States, the average farm income per labour unit of these sectors (post–reform period) is about 22% lower than the EU15 average income in the farm sector overall. Furthermore, these two sectors show the highest risk in terms of farm viability (in 37% and 21% of the regions, respectively for the horticultural and the other permanent crops sectors, average returns on assets are negative).

   In the light of these results, and given the positive effect of direct payments on farm income and viability confirmed by the evaluation, the evaluators recommend to extend direct payments to include farms operating in these sectors. It is noted that this possibility was already introduced by Regulation (EC) No 1182/2007 of 26 September 2007 laying down specific rules as regards the fruit and vegetable sector.

2. The analysis has revealed that in many regions the farm income of most farmers does not reach the reference benchmark (regional GDP per employee). This means that direct payments are basically granted to farmers who need them, and, therefore, the efficiency of direct payments in terms of directing income support to farmers that need it can be considered as good. However, the analysis has also revealed that there are cases where direct payments are granted to farmers whose farm income is above the benchmark, especially in certain sectors (i.e. in the field crops sector) and in certain regions.

   Therefore, it seems reasonable to recommend the identification of adequate assignment criteria and appropriate instruments able to redistribute at least part of the amounts that go to farmers whose income is above the benchmark to farmers who are most in need (i.e. for whom the current level of direct payments does not allow reaching the benchmark), regardless of the sector.

3. It was not possible to evaluate the role played by direct payments in farm household total income, in spite of noticeable interest in this matter. The analysis of the existing literature (studies and statistics) reveals the existence of heterogeneous definitions of agricultural households and, thus, of a variety of measurement criteria and data collection instruments (where they exist). In essence, therefore, the high heterogeneity of definitions and methods makes a combined reading of the existing information impossible.

   Consequently, it is recommended that a common definition of farm household and farm household total income be developed and that harmonised statistics be developed with respect to both the official national and EU statistics and the FADN, provided that the policy makers are sufficiently interested in this matter.