

Farms Multifunctionality, Households Incomes and Sustainable Rural Development

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Abstract

Sustainable rural development has become one of the main pillars of the Common Agricultural Policy in European Union. This creates new demands to the statistical system on agriculture and, in particular, new information needs on farms economic results and on rural households income addressed to NSI.

This paper deals with an assessment of statistical relationship among variables related to farms multifunctionality, farms economic performance and households off-farm incomes. The analysis is performed on micro-data gathered in Italy by different surveys on farms belonging to the same population: the 2000 Farm Structural Survey (FSS) and by the Business Survey on Agriculture (RICA-REA). The former was conducted as a decennial census survey, the latter is a sample survey on farms, that has been carried out yearly since 1998. The results of the statistical analysis are discussed in order to point out the strengths and weakness of the Italian approach implementing an integrated system of economic statistics applied to the agriculture sector.

keywords: multifunctionality, households incomes, sustainable development, rural development.

1. Introduction

The aim of this work is to evaluate the capacity of statistical analysis over key economic issues related to the agriculture sector disclosed by the integration of data produced by different surveys on farms belonging to the same population.

Multifunctional farms and the income structure of agriculture households are the economic aspects discussed through the paper. To this perspective new needs of statistical information arise from the agricultural policies, that in European Union are increasingly focused on rural development in a context of socio-economic and environmental sustainability. It follows that new nomenclatures have to be defined, specific variables have to be introduced in farms' statistical surveys and final results have to be evaluated in terms of enhanced statistical information for policy making.

Two statistical aspects are further discussed through the paper. First of all, the overall design of statistical surveys has to be orientated to data integration, facing the well known constraints in terms of direct costs of data collection and statistical burden on respondents. Secondly, data integration techniques may be different in relationship to data collection methods. In this work, the integration of data from the agricultural census and from a sample survey has been done at farm's level with respect to the same reference year. Nevertheless further integrations of estimates coming from different sample surveys will become feasible in Italy, if based on the same population list derived from census or administrative registers.

In the first two sections of the paper definitions are presented to measure the multifunctionality of farms, to identify the household dealings with agriculture and to represent their income structure divided between agricultural and non-agricultural components. In the third section data available in Italy and information used in the paper

are presented. After that, main structural characteristics of Italian farms, caught by the 2000 Agricultural Census, are examined. Next, the estimations of main farms' economic results and performance by a 2000 sample survey are discussed. Finally, analysis results on the sub-population of households dealing with agriculture are discussed through a comparison between multifunctional and monofunctional farms. In this context, data on income structure are analysed with a special attention to off-farm sources.

2. The multifunctionality of farms

The concept of multifunctionality was introduced to highlight a peculiar character of agriculture and farms in nowadays economy. Beyond their primary function of producing food and raw materials, farms perform other collective functions: they contribute to food safety and to socio-economic viability in many rural areas; they bring environmental benefits such as soil conservation, sustainable resource management and biodiversity conservation. These functions, which are called "non-market functions", are increasingly in demand for sustainable development policies at the national and the international level, in developed as well as in developing countries.

The relevance of these functions depends on the externality effects potentially generated by the production activity of farmers and it depends on the type of agriculture, on the dimension of farms, on the local environmental and socio-economic conditions, on the cultural weight that agriculture has in the history of a geographical area. There are several positive externalities of farms' activity, but also some negative ones with respect to the previous conditions.

Besides, the multifunctionality of farms can be connected with some market activities different from the typical ones of agricultural production and breeding, such as tourist activities, processing of agricultural products, aquaculture or landscape's maintenance.

As a first approximation to measure multifunctionality, some of the mentioned market activities are considered in our analysis. The data on multiactivity of farms are combined with their structural dimensions in order to study the profitability of Italian farms and so to assess the economic sustainability of agriculture.

3. Households and incomes

Several kinds of management are possible for farms. A typical one is a farm conducted by an holder with some degree of his work and of his family components. Following the EU definition in agricultural statistics, this is the case of the so called "direct management farm".

In our study, Italian farms with this form of management are considered to analyse their income structure and the weight of agricultural activity on it. An household involved in agricultural production can receive income from a combination of sources: strictly agricultural activity, connected activities in the farm and off-farm incomes. In this perspective, income from the "core" agricultural production could be just one component of households total income. Agricultural activity is only one of the possible sources of employment (full- or part-time) for households components. These phenomena can be relevant in rural areas close to urban settlements or in local areas with manufacturing or services activities.

4. Data available in Italy and the RICA-REA project

To study the connection between multifunctionality of farms and households income structure several sources of data are today available in the Italian NIS (Istat). Beside the data produced by the 2000 Agricultural Census, statistical information are available from the current sample structural surveys: the European Farms Structural Survey (FSS), based on a random sample of 55000 farms, updates Census information every two years.

In addition, the Business Survey on Agriculture (RICA-REA project) produces yearly estimations on the economic results of farms from a random sample of 17.000 units. Beginning with reference year 2002, the latter incorporates the European FADN (Farm Accounting Data Network). The statistical information obtained from the Census or from the FSS on one side and from the Business Survey on Agriculture on the other side can be integrated at farm level in a comprehensive database, with a record linkage through the farms statistical identification code. The data used in this work come from the last Census and the Business Survey on Agriculture, both referring to year 2000.

The 2000 edition of the Business Survey was carried out on a random sample selected from a list not updated with Census data. Furthermore the questionnaire didn't include any information on the physical and the production structure of the farms. For these reasons the integration between the Business Survey and the Census has been carried out in two steps.

In the first step, variables collected by the surveys have been joined at micro level (record linkage). About 90% of the farms observed by Business Survey linked with Census. Furthermore it should be stressed that the distributions of the main structural variables estimated on the linked units didn't differ significantly from the distributions resulting from the Census data.

In the second step, an integration at macro level has been carried out. In fact the sample weights of the Business Survey have been calibrated with respect to main results of the Census.

Starting with the reference year 2003 only the second level of integration between FSS and Business Survey will be necessary. In fact, starting by to this year, the first edition of the new Business survey has been carried out (RICA-REA Project). This is a random sample survey designed to satisfy both FADN and ESA '95 regulations. The characteristics of this survey can be summarised as follow:

- small farms are included in the population;
- units are selected using a stratified random sample design;
- data are collected using FADN methodology on bigger farms and using a short questionnaire for small farms;
- main structural variables are observed on each unit as well as economic variables to comply with National Accounts needs.

5.The structure of the Italian agriculture sector

The weight of Italian agriculture on national economy is very limited (Table 1), mainly as a direct consequence of the development of industrial and services sectors.

Table 1 – Main agricultural aggregates on Italian economy and on EU15 agriculture - year 2000 (percentage composition)

Agricultural Aggregates	On Italian Economy	On EU 15 Agriculture
Production of agricultural branch at basic prices.	4,5	15,0
Oil	-	39,9
Gross Value Added at basic prices	3,2	19,6
Labour cost	1,3	24,1
Total Annual Work Units (AWU)	5,1	19,3
AWU of Employees	2,8	27,0

Source: Istat – National Accounts; Eurostat

In terms of production at basic prices the agricultural sector is equal to 4.5% of the Italian economy and its weight reduces to 3.2% when the gross value added is considered. The

weight doesn't change much for employment (5.1% of total annual work units). Nevertheless, Italy represents a relevant share of the European agriculture and this is particularly evident in terms of employees and labour cost. The Italian agricultural production represent 15.0% of the European Union one (EU 15). In terms of value added the Italian weight is 19.6%; a similar figure is shown in terms of total Annual Work Units (AWU). In some respects the relevance of the Italian agriculture, especially in terms of employment, is the result of the kind of Italian cultivations, similar to those of others Mediterranean countries, but also a consequence of some specific structural characteristics of Italian farms.

In Italy there is a large number of small farms (Table 2); 80% of farms has less than 5 hectares of Agricultural Area Utilised (AAU) but employ a small quantity of inputs. As a result 79.9% of AAU is concentrated on farms with more than 5 hectares of AAU; they grow 87.5% of cattle and 79.7% of pigs.

Table 2 – Distribution of structural variables (inputs) by classes of AAU

Classes of AAU (hectares)	% Farms	% AAU	% ESU	% Cattle	% Pigs	% Annual Working Days
<= 1	40.25	3.65	6.85	0.95	7.30	22.25
1-5	40.05	16.65	21.45	11.45	14.80	34.90
5-15	13.05	20.35	22.30	26.35	12.80	21.75
15-50	5.00	23.35	23.00	31.45	42.70	12.55
>50	1.65	36.00	26.40	29.80	22.40	8.55
	100.00	100.00	100.00	100.00	100.00	100.00

Source: Istat – Agricultural Census

To the other end, annual working days have a different distribution as a result of increasing labour productivity with respect to the farms' dimension in AAU terms. In the first two classes of AAU is concentrated 57% of annual working days with respect to just 20% of AAU. In the next three classes 43% of the annual working days correspond to 80% of AAU.

If the results of the Business Survey on Agriculture are considered, it is possible to analyse some characteristics of outputs distribution among the classes of AAU (Table 3).

Table 3 – Distribution of structural variables (outputs) by classes of AAU

Classes of AAU (hectares)	% Production	% Revenues	% Value Added	% Gross Operative Margin (GOM)
<= 1(*)	13.20	12.65	15.75	16.35
1-5	22.00	21.60	21.85	23.15
5-15	19.90	20.10	21.60	23.40
15-50	21.15	21.20	18.85	19.55
>50	23.75	24.45	21.95	17.55
	100.00	100.00	100.00	100.00

Source: Istat – Business Survey on Farms, Agricultural Census

(*)About 20% of the results in the first row are due to farms specialised in animal breeding.

Particularly evident is the weight of small farms in Italian agriculture. Those with less than 5 hectares have 35% of production, with just 20% of total AAU and a lower share of cattle. Their weight reduces in terms of revenues, due to a greater portion of production

consumed by the holders and their families, but increases in terms of value added and Gross Operative Margin (GOM), due to a lower burden of intermediate and labour costs. In brief, small farms use a combination of inputs different with respect to large farms and they substitute family work to other inputs. Moreover there is a suggestion that small farms are specialised on intensive cultivation and are often dedicated to high value added products. The large number of small farms with a relevant share of the national agricultural production, suggests to investigate the average values of main economic variables by classes of AAU (Table 4).

Table 4 – Average structural variables by classes of AAU (Euro)

Classes of AAU (hectares)	Annual Working Days	Production	Revenues	Value Added	Gross Operative Margin (GOM)	Self consumption
Italy	189.45	14881.85	13704.95	7684.20	6406.35	518.55
<= 1	104.80	4889.65	4311.15	3006.25	2598.45	456.95
1-5	165.05	8170.00	7392.15	4193.15	3706.50	524.90
5-15	315.35	22660.70	21091.75	12706.40	11486.45	632.90
15-50	476.70	63080.60	58237.45	29053.35	25086.80	587.70
>50	979.65	213619.45	202378.30	101875.40	67933.75	752.50

Source: Istat –Business Survey on Farms, Agricultural Census

In relationship to small farms with less than 5 hectares, the average annual working days indicates that less than an Annual Working Unit (AWU equal to 280 annual working days) can be employed with low average gross incomes (GOM). Only from 5 to 15 hectares class, farms can employ at least an AWU with an average gross income of 11486 euro.

On the other end in small farms a significant part of the agricultural production is consumed and it contributes to the holder and his family support. However, in absolute value, the support to disposable income from self-consumption is rather weak, even if it represents an average increase of 21% of GOM for farms up to 1 hectares of AAU and an increase of 16.5% for farms between 1 to 5 hectares of AAU.

Finally, it is evident that average gross income by working day in small farms is much lower with respect to larger ones: from 24,8 Euro of GOM by working day in farms up to 1 hectares, to 36,4 Euro in farms from 5 to 15 hectares and 69,3 Euro in farms over 50 hectares.

In order to exemplify a micro economic analysis, for each respondent unit the economic indicators per hectare and per working day have been computed. Tables 5 and 6 contain, for each AAU class, the median of these indicators. Median has been preferred to the mean because of its robustness and as a consequence of the observed skewness of the distribution of the indicators in each class.

Table 5 shows a decreasing efficiency in the use of AAU factor: more than 50% of first class units have a production greater than 2000 Euro per hectare while in the last class the median of the production per hectare is 843 Euro. The opposite relationship is observed for the labour factor (Table 6): the value of production by worked day increases fast from the median units in first class to those in the last one.

In fact in the first class more than 50% of the units have to use more than 120 day per hectare while the median of this indicator is 7,75 in the last class.

Table 5 –Economic indicators in AAU terms by classes of AAU (Median values)

Classes of AAU (hectares)	Annual Working Days	Production	Revenues	Value Added	Gross Operating Margin (GOM)
Italy	58.25	1340.85	793.10	586.55	509.30
<= 1	123.35	2107.05	608.85	844.40	841.00
1-5	46.90	1125.05	849.25	415.05	400.65
5-15	33.05	1147.45	802.15	509.30	443.45
15-50	15.30	1131.15	1002.85	479.05	420.35
>50	7.75	842.45	783.45	332.90	258.10

Source: Istat –Business Survey on Farms, Agricultural Census

Table 6 - Economic indicators in AWU terms by classes of AAU (Median values)

Classes of AAU (hectares)	Production by worked day	Revenues by worked day	Value added by worked day	GOM by worked day
Italy	25.88	18.11	11.76	10.35
<= 1	17.85	6.47	8.12	7.39
1-5	28.09	20.70	11.64	10.95
5-15	40.71	34.42	18.52	16.72
15-50	78.36	71.12	34.15	30.36
>50	107.70	104.09	44.87	36.63

Source: Istat –Business Survey on Farms, Agricultural Census

6. Multifunctionality and households income

To assess the impact of farm’s multifunctionality on households income, it is useful to split all Italian farms in two clusters. First of all, farms with a direct management by an holder and family work are considered. This is the most diffuse typology of farms and it corresponds to 92.2% of total farms counted in 2000 Census (Table 7). The percentage is very high (more than 91%) in all the classes of AAU and it declines only in the last one with more than 50 hectares of AAU by farm (76.1%).

Table 7 –Distributions of Households and multifunctional farms by classes of AAU (%)

Classes of AAU (hectares)	Multifunctional Farms	Households	Households managing multifunctional farms
Italy	9.25	92.25	9.48
<= 1	5.15	92.95	5.45
1-5	8.65	92.30	8.92
5-15	18.20	92.30	18.27
15-50	19.55	91.35	20.10
>50	25.10	76.15	24.79

Source: Istat –Business Survey on Farms, Agricultural Census

A second group of farms has been extracted from the total population as the subset of units carrying out multifunctional activities.

In practical terms, a farm has been considered as “multifunctional” if at least one of the following revenues is positive:

- Selling of transformed agricultural products (animals and vegetable products);
- Agritourism;

- Wages from labour supply to other farms;
- Revenues from aquaculture;
- Revenues from landscape maintenance;
- Revenues from other activities connected to agriculture-

In Italy, 9.25% of farms fit this definition of multifunctionality. Notwithstanding, the share of multifunctional farms increases with classes of AAU: from 5.15% in small farms, to 25.10% in larger ones. Among the households (farms with a direct management by an holder and with family work) the share of multifunctional farms is 9.48% and the distribution by classes of AAU is close to the previous one.

It is now possible to compare the performance of the two groups of households (managing multifunctional or monofunctional farms) in terms of economic indicators from the Business Survey on Agriculture (Table 8).

Table 8 – Ratios between median values of multifunctional farms over monofunctional ones, belonging to households

Classes of AAU (hectares)	(Production of multi- farms) / (Production of mono- farms)	(Revenues of multi- farms) / (Revenues of mono- farms)	(Value added of multi-farms) / (Value added of mono-farms)	(GOM of multi-farms) / (GOM of mono-farms)	(Annual Working days of multi- farms) / (Annual Working days of mono- farms)
<= 1	1.20	1.45	1.40	1.20	1.60
1-5	3.05	3.50	5.95	3.95	2.40
5-15	1.15	1.25	1.60	1.75	1.45
15-50	1.45	1.45	1.40	1.40	1.30
>50	1.25	1.05	1.70	1.40	1.00

Source: Istat –Business Survey on Farms, Agricultural Census

In all classes of AAU multifunctional farms have better performance with respect to monofunctional ones in terms of median production, revenues, value added and gross operating margin. The difference is particularly high for the class of farms from 1 to 5 hectares of AAU, where the economic performances of the first group are three times the performances of the second one. For any class of AAU the improvements of multifunctional farms are particularly high with respect to value added and gross operating margin. This is because the secondary activities in multifunctional farms increase revenues more than intermediate and labour costs. At the same time multifunctionality has a positive effect on employment, acting as a multiplier of the labour demand, especially in small classes of AAU. This is particularly important for households managing farms of small dimension in order to compensate the limited average number of worked days to be used in agricultural production.

A further important information comes from the Business Survey on Agriculture: it regards data on off-farm incomes of the households components (Table 9).

Table 9 – Households with off-farm incomes by sources and classes of AAU

Classes of AAU (hectares)	Households with off-farm incomes (%)	Mixed income	Wages	Pensions	Interests and profits	Family components working in the farm (n°)	GOM by family component working in the farm (euro)
Italy	79.75	12.75	28.00	54.25	1.80	2.85	2247,84
<= 1	88.95	12.75	29.70	61.45	1.00	2.68	969,57
1-5	80.50	14.05	29.75	54.30	2.05	2.79	1328,49
5-15	62.90	10.15	23.15	41.70	3.40	3.19	3600,76
15-50	51.45	10.40	16.75	33.55	2.15	3.53	7106,74
>50	44.80	8.05	11.45	33.30	2.40	3.96	17154,99

Source: Istat –Business Survey on Farms, Agricultural Census

In Italy, slightly less than 80% of households involved in agricultural production receives off-farm incomes. This percentage increases to nearly 90% in the class of small farms with no more than 1 hectare of AAU, and reduces progressively in larger farms till 45% in those with more than 50 hectares. It is evident too that the pensions are the most frequent and highest source of off-farm incomes. This is in relationship with the share of holders over the retirement age established in Italy by the social security system for old-age benefits.

The relevance of off-farm incomes for Italian households involved in agriculture becomes more evident if the number of family components working in the farm and per-capita GOM are considered. The average number of family components is 2.85 and is high to small farms too (less than 5 AAU). These figures have to be evaluated in relationship to the small number of worked days in small farms and much less than 1 AWU (Table 4). It follows that in small Italian farms there is a division of working days among household components. Per-capita income can be very low too: per-capita annual GOM is less than 1000 Euro in farms up to 1 hectare of AAU and slightly more than 1300 Euro in farms between 1 and 5 hectares. Here is the reason for Italian households involved in agriculture to integrate the farms income with off-farm ones.

In this respect multifunctional activities in the farm play a central role for the income structure of households (Table 10).

Table 10 – Percentage composition of incomes of households managing a mono- or a multi-functional farm by classes of AAU

Classes of AAU (hectares)	Agricultural activity	Multifunctional activity	Mixed income	Wages	Pensions	Interests and profits	Total
Households with monofunctional farms							
Italy	45,66	0,00	7,96	20,66	25,13	0,59	100,00
<= 1	21,40	0,00	9,60	30,15	38,18	0,67	100,00
1-5	32,52	0,00	11,47	25,81	29,59	0,60	100,00
5-15	68,12	0,00	4,58	12,49	14,15	0,66	100,00
15-50	88,15	0,00	2,24	3,40	5,83	0,38	100,00
>50	94,57	0,00	0,76	1,22	3,13	0,31	100,00
Households with multifunctional farms							
Italy	45,65	30,66	2,63	9,19	11,09	0,77	100,00
<= 1	12,34	13,10	3,52	24,29	46,56	0,21	100,00
1-5	25,51	43,43	3,43	13,75	12,52	1,35	100,00
5-15	57,19	24,43	1,72	8,16	7,33	1,16	100,00
15-50	54,80	35,45	3,24	3,07	3,12	0,32	100,00
>50	74,15	21,57	1,00	1,12	2,04	0,12	100,00

Source: Istat – Business Survey on Farms, Agricultural Census

Income from the agricultural activity covers the same share (45.6%) in both groups of households. At the aggregate level, it seems to be a substitution effect of all off-farm sources of income with income from multifunctional activities. But at a disaggregate level, there is a much lower percentage of income coming from the agricultural activity for households with multifunctional farms with respect to the other group of households. A first possible conclusion should be that incomes from multifunctional activities to one side integrate income from the agricultural activity and to the other side substitute off-farm incomes. The relative intensity of these effects depends on the farm's dimension:

- in households with small farms (up to 1 hectare) the integration effect on the agricultural activity income is stronger than the substitution effect to off-farm incomes; the share of multifunctional incomes (13.1%) is equivalent to that of agricultural income (12.3%), and the share of off-farm incomes (74.6%) is similar to that observed among households with monofunctional farms (78.6%);

- in households with medium dimension farms (1 to 5 hectares) multifunctional incomes cover a share much higher (43.3%) than other sources of income and substitute off-farm ones; besides, the share observed for the latter (31.0%) is less than half with respect to the same sources in monofunctional farms (78.6%);

- in households with farms over 15 hectares of AAU integration effect of income to the agricultural activity is stronger than the substitution effect of off-farm incomes; actually, in households with multifunctional farms incomes from the agricultural activity cover higher shares than those coming from other sources of income and, at the same time, the shares observed from the off-farm incomes are only slightly less than the same ones observed for households with monofunctional farms.

Conclusions

From an economic point of view the main results of the present work are the following:

- multifunctional activities have a low level of diffusion among Italian farms; among those managed by households the diffusion is slightly higher and increases with the dimension in term AAU;

- among farms managed by households, at each class of AAU, multifunctional ones have a better performance than monofunctional ones in terms of value added and gross operating margin (GOM); this is because the secondary activities on multifunctional farms increase revenues more than intermediate and labour costs;
- improvements in the performance of multifunctional farms are more relevant in relationship to small farms (from 1 to 5 hectares of AAU) managed by households; furthermore multifunctionality has a multiplicative effect on working days of the holder and his family components;
- in households with farms up to 15 hectares of AAU, the agricultural income integration by off-farm incomes is relevant and spread;
- multifunctional activities of farms allows the households a further integration of their agricultural income and to substitute off-farm sources too;
- nevertheless, the relative effect of the two phenomena is different among classes of AAU: the integration effect of the agricultural income is stronger for households managing small farms; the substitution effect of off-farm incomes is higher in households managing farms in the intermediate classes of AAU; these are the farms where the economic results from multifunctionality have been higher.

An overall evaluation of multifunctionality effects on farms performance and on households income is too early. Anyway, from the analysis of Italian case becomes evident that multifunctionality, in our definition, is a way to improve the economic conditions of households dealing with agriculture and to reach an economic sustainability in the agricultural sector. Nevertheless the operational definition of multifunctionality applied in this work considers only market-activity connected to agricultural production. In any case the economic evaluation of multifunctionality can't be without consideration of the externality effects of agricultural activities. In this direction the official statistics has to work more to produce appropriate definitions and measurement methods of social costs-and social benefits connected to agriculture activities.

From a statistical point of view the analysis carried out in this paper suggests that the integration between a Business Survey and a structural one is a suitable tool, at least in the European context, for micro and macro analysis applied to agriculture. Nevertheless, some conditions have to be satisfied in order to reach a reliable and useful data base without a significant increase of the response burden for agricultural holders:

- business surveys should include farms without a relevant agriculture production but important for rural development monitoring;
- business surveys should be carried out on a random sample to avoid significant bias due to voluntary sample designs;
- business and structural surveys should be coherent with respect to the definitions of statistical units and common structural variables used to obtain consistent estimates;
- in the case of non overlapping samples, the business survey must collect a minimum set of structural variables useful to calibration of the structural survey results and for microeconomic analysis.

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