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Article

The Evolution of Multifunctional Agriculture in Italy

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Abstract: This study dealt with multifunctional farming, which is meant as a dynamic strategy that is carried out by Italian farms. The path alongside the multifunctional paradigm is carried out through both supply chain and territorial strategies, which deserve more attention. These strategies reinforce sustainable business models characterized by the presence of both deepening and broadening strategies. The first ones are centered around product differentiation and valorization through geographical indications, organic farming, etc. Broadening strategies are implemented through new on-farm activities, such as agritourism, and other gainful activities carried out at the farm level. Set against this background, the article discusses the evolution of farms according to the Farm Accountancy Data Network (FADN) database by putting forward an empirical analysis, which considered the evolution of farm typologies oriented toward multifunctionality in the last decade. The analysis underlined the positive dynamics and the evolution of farms adhering to the multifunctional paradigm. Moreover, as evidenced in the econometric analysis, the adoption of multifunctional farming activities provided a sound contribution to income formation. This addressed some policy issues that were identified at the beginning of the new programming period for rural development of the EU and their resolution aims to reinforce the virtuous trajectory toward multifunctional farming.

Keywords: multiple functions of agriculture; broadening and deepening strategies; Italian farm typologies; FADN

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1. Introduction

This study dealt with the transition toward multifunctional agriculture as a strategic choice to raise a farm's competitiveness. More precisely, it aimed to evaluate, on the one side, transition processes among Italian farms located in different rural contexts; on the other hand, it tried to provide evidence of (eventual) positive performance connected to the adoption of multifunctional practices to address dedicated strategies of endogenous integrated models of rural development [1,2]. In recent years, multifunctional farming has been identified as an economically sound alternative for farmers in different types of rural contexts. Some authors emphasized the relevance of multifunctional activities in peri-urban contexts [3,4], while others pointed out how multifunctional agriculture provides contributions to rural regeneration [5], also in remote rural areas [6].

As a consequence, the paradigm of conventional farming, which is grounded on modern distribution channels and globalized modes of food provisioning [7], has been recently revised. Three main negative effects have been pointed out in recent decades [8]:

(a) A disconnect between producers and consumers;
(b) Progressive displacement of production, with the consequence that the quality of products is not linked to the area of origin, which adds to the loss of territorial embeddedness;
(c) A loss of relational assets among producers of goods and services.

Moreover, new driving forces, like food scandals, a growing demand for rural goods and services, and a worrying phenomenon of price–cost squeeze affecting farmers' capability of resilience, have engendered new place-based strategies of sustainable rural development, which has brought about a functional repositioning of the farming activities that have flourished around the concept of multifunctional agriculture. As pointed out by Marsden and van der Ploeg [9]: "sustainable rural development paradigm attempts to reintegrate agriculture as a multifunctional set of practices that have the potential to enhance the interrelationships between farms and people, both within rural areas and between rural and urban areas". Multifunctional activities are developed through a diversified set of strategies that retain various dimensions of sustainability, like economic [10,11], environmental [12,13], and social [14,15].

Set against the background of transitional frameworks [16], multifunctionality is the outcome of an entrepreneurial behavior framed within a functional reposition of farming activity [17]. Multifunctionality is identified as a new kind of locally embedded model of agriculture [18] that aims to produce both commodity and non-commodity outputs [19]. In order to compensate for the non-commodity output, rural development policies provide farmers with incentives and compensative mechanisms for producing positive externalities and public goods. Therefore, multifunctionality depicts a territorialized model of farming, which is rooted in competitive types of rural entrepreneurship as an embedded-type entrepreneurial activity in the sense well expressed by [20]. According to the authors, differently from entrepreneurship in the rural (which identifies entrepreneurial activities with limited territorial embeddedness and a mobile logic of space), rural entrepreneurship represents entrepreneurial activities strongly rooted in rural contexts. The way through which farmers build up competitive strategies of territorial anchoring is the exit of entrepreneurial activities aimed toward setting up "mixed farms" that combine both agricultural and non-agricultural activities [21,22].

The transition toward multifunctional agriculture is identified as a socially constructed process, which is subject to be reconstructed, renegotiated, and appropriated [23].

The multifunctional paradigm of agriculture is usually adopted at the farm level through a variegated set of strategies that are synthesized by van der Ploeg through the concept of a boundary shift [24]:

- Deepening, which brings about value creation strategies through the production of high-quality products, typical local specialties, organic food, or directly selling the products at the farm level.
- Broadening activities are centered around diversification of the farming activity through farm-related (processing of agricultural products or delivering agricultural services in other farms) or farm-diverse (bioenergy, rural tourism, landscape preservation, etc.) activities.
- Regrounding through the search for new sources of income or forms of cost reduction.

Consequently, a "portfolio strategy" is available for the farmer, with the purpose of either retaining more added value at the farm level or diversifying farming activity through both on-farm and off-farm activities joined to farm-related or farm-diverse activities [25]. This may provide a sound contribution to rural regeneration; as stressed by Sivini and Vitale [5], this could be based on multiple possible patterns, the sustainability of which must also be validated from an economic point of view. As a matter of fact, the choice of adhering to a strong type of multifunctional farming [26] is the outcome of a strategy that relies on new business models that contribute to value creation and a positive social return on investments, which benefit the wider community [27,28]. This means that entrepreneurship is at the center of a new path of farming, where not only economic but also environmental and social dimensions are considered in the decision-making process [17]. This kind of agricultural entrepreneurship relies on the farm's constructive capacity supported by an orientation toward growth and higher resilience capability [29]. This is particularly true in marginal rural contexts; as demonstrated in recent analyses, multifunctional agriculture contributes to building up sustainable and resilient agrifood chains through value-creation strategies, which generate economic, environmental, and social values [30].

In the Italian agricultural sector, the transition toward multifunctionality was demonstrated to be a winning strategy. In the last report on Italy [31], the multifunctional role of the farming sector was strengthened through the aforementioned processes of boundary shifting. From the report, it emerged that multifunctional activities represent more than 20% of the total value provided by Italian agriculture, with a continuously growing percentage in recent years. Against this backdrop, the role of rural policies in boosting the transition toward multifunctional farming cannot be neglected. Actually, the institutional recognition of multifunctional agriculture is a cornerstone.

From a normative viewpoint, the OECD [32] has provided a rigorous definition of multifunctional farming, underlying how beyond the production of food and fiber, agriculture may offer other non-commodity output (positive environmental externalities, social services, landscape management, etc.). In some cases, the market is not able to compensate for the provision of these non-commodity outputs, which boosts market failure mechanisms and the necessity for policy action to compensate for these market mechanisms.

The new European agricultural model points out this new perspective, and the recent rural development policies of the EU are strictly correlated and rooted around the concept of multifunctional agriculture. Actually, the new European agricultural model, which was launched in 1996 as part of the Agenda 2000 document [33], identifies multifunctionality as the new paradigm for a competitive and sustainable model of agriculture in the EU.

The design of the new European agricultural model depicts an innovative idea of the competitiveness of agriculture in rural areas. Drawing on this perspective, van der Ploeg [34] underlined that "Competitiveness does not stand on its own. It crucially depends on other, increasingly decisive features such as quality, sustainability, animal welfare, contributions to the quality of life, and trust (i.e., the acceptance on the part of society at large)".

This perspective is strengthened in the recent document of the EU: "A long-term vision for the EU's Rural Areas–Towards stronger, connected, resilient and prosperous rural areas by 2040" [35]. In this document, four main dimensions are proposed to relaunch rural development by addressing strong, connected, prosperous, and resilient rural areas through a diversified set of initiatives, one of the most important of which is surely a diversified rural economy. Therefore, the aforementioned strategies of deepening and broadening are the basis of the new paradigm of competitiveness in rural areas that is grounded on multifunctional agriculture. Empirical analyses have demonstrated the positive impact of rural development policies (pillar 2) on farm strategies, which have boosted the transition toward multifunctionality (see, among others, Bartolini et al. [36]).

The strategies are implemented through processes of differentiation and diversification of farming activities, which need to be adequately measured and interpreted.

This study was set against this background and tried to provide a contribution to the literature by answering the following questions: Is there an ongoing process of transition toward multifunctionality in Italian agriculture? Is this process supported by positive economic performance obtained by the farms adhering to the multifunctional paradigm? Therefore, this study aimed to (a) investigate the dynamics of farm typologies in Italy by focusing on the eventual increase in the relevance of multifunctional farms and (b) identify which factors may affect the economic performance of farms by enlightening the eventual influence of variables connected to multifunctional agriculture.

2. Materials and Methods

2.1. Data Source

The empirical data for analysis was drawn on the Farm Accountancy Data Network (FADN) Italian dataset. FADN is a sample survey of paramount importance at the European level that collects information on the economic situation of farms. It is conducted yearly within the European Union on the basis of a common methodology for all Member States and defined by the EU regulations (starting from no. 79/1965 substituted with regulation no. 220/2015 and regulation no. 1652/2020) [37–39].

The Italian FADN sample examines about 11,000 farms that have an economic size of EUR 8000 of standard output since 2014. The field of observation is based on the Agricultural Census, which is carried out every ten years and is updated every three years through the Farm Structures Surveys (FSSs).

The survey is based on a stratified random sample and farms are selected in order to be representative according to the administrative region, the economic size, and the type of farming (ToF). A system of weights allows for extending the results obtained in the survey to the entire reference population.

Farms are extracted according to an equiprobabilistic method and are allocated in the strata of the sample using a combination of Neyman and Bethel methods [40]. This method allows for minimizing the expected error at the national and regional levels of the standard output (SO), the utilized agricultural area (UAA), and the livestock units (LSUs).

The amount of information gathered by the FADN survey is very large and it has an accounting and non-accounting nature, such as economic, financial, and structural aspects of the farm but also those related to environmental and social aspects. Therefore, the FADN database is frequently used to realize different kinds of analysis, such as the monitoring of agricultural incomes and the evaluation of the impacts of agricultural policies and agricultural activities on the environment.

The Italian FADN survey is realized by the Council for Research in Agriculture and Agricultural Economic Analysis (CREA), which manages the processing and data collection of the survey. CREA also chooses the data collectors on the basis of their education, skills, and experience in the field, and they conduct face-to-face interviews with farmers, utilizing a questionnaire, and software for data collection named GAIA (for more information about the FADN methodology please consult https://agriculture.ec.europa.eu/data-and-analysis/farm-structures-and-economics/fadn_en (accessed on 4 April 2023); for more information about the Italian FADN, please check https://rica.crea.gov.it/ (accessed on 10 April 2023)).

Many works in the literature [41–48] demonstrate the importance of the FADN as a source of data for research.

For this article, we utilized the data related to the 2010 and 2020 accounting years to conduct the descriptive analysis, while the 2010, 2015, and 2020 accounting years were considered to carry out the econometric analysis. The descriptive analysis was undertaken to verify the dynamics of a transition toward multifunctional types of farming, while the econometric analysis had the purpose of verifying whether the variables linked to multifunctional farming affect the farm's income.

2.2. Descriptive Analysis

From the FADN Italian dataset, we extracted all information concerning the following farm typologies [49–51]:

- Microenterprises: very small farms with less than EUR 15,000 of gross tradable production (GTP).
- Conventional farms: more than EUR 15,000 of GTP with a low orientation toward quality and diversification strategies.
- Differentiated farms: more than 30% of the GTP is occupied with deepening activities.
- Diversified farms: more than 30% of the GTP is occupied with broadening activities.
- Differentiated and diversified farms (both deepening and broadening strategies).

The transition toward multifunctional agriculture was verified when the share of differentiated and diversified farms increased.

As far as the territorial dimension was concerned, the farms' classification we used in our analysis derived from the Rural Development Programme (RDP) 2007–2013 [52], which identified four areas:

A. Urban poles: this included provincial capitals that were urban in the strict sense and groups of municipalities with a rural population of less than 15 percent of the total population.

B. Rural areas with intensive and specialized agriculture: this included rural municipalities (whether they are urbanized rural, significantly, or predominantly rural) located predominantly in the lowland areas of the town, where, although in some cases the average density was high, the rural area appeared to always have a significant weight (more than 2/3 of the total).

C. Intermediate rural areas: this included rural municipalities in the hills and mountains with the highest population density and the location of intermediate development (urbanized hill and mountain, significantly and predominantly rural north-central hills, relatively rural mountainous).

D. Rural areas with comprehensive development problems: this included rural municipalities of southern hills (significantly and predominantly rural) and those rural mountain municipalities with the lowest population density in all regions.

2.3. Econometrics

The information contained in the Italian FADN database was also used to carry out an analysis of the economic results of the financial statements of the farms to evaluate the economic performance of multifunctional farms. The FADN is a tool used to monitor the income and business activities of agricultural holdings and to evaluate the impacts of the Common Agricultural Policy (CAP) [53].

The analysis was realized by starting from the economic results of Italian farms in FADN and we analyzed the farm's net income, i.e., the capacity of the earned income to remunerate the inputs needed for the farm's production of goods and services, as well as the factors, which, over time, had manifested some influence on its formation.

Specifically, the technical and economic data derived from the FADN were used to estimate the evolution of the diversification strategy implemented by the farms, meaning the various kind of production activities and/or services, which extended the range of activities practiced by the farms alongside the path of multifunctionality.

In order to avoid reaching biased estimates, we verified the presence of anomalous values or outliers in the distribution of the farm net income.

Identifying outliers in data plays a crucial role in statistical analyses, even if there is no general rule for finding outliers. In this work, the empirical rule developed by Tukey [54] was adopted, which is based on data quartiles and the use of box and whisker plot diagrams.

In this regard, the three quartiles of the distribution and the maximum and minimum values were calculated:

Q_1—first quartile

Q_2—median

Q_3—third quartile

The minimum (Q_0—min) and maximum (Q_4—max) values;

Indicating with IQR the interquartile range IQR = $Q_3 - Q_1$, we defined the quantities that identified the following:

The lower adjacent value (LAV), which is defined as the smallest (minimum) observed value that is greater than or equal to

$$\text{LAV} = Q_1 - 1.5 \times (\text{IQR}) \tag{1}$$

The upper adjacent value (UAV) is defined as the largest (maximum) observed value that is less than or equal to

$$\text{UAV} = Q_3 + 1.5 \times (\text{IQR}) \tag{2}$$

If the two extreme values are contained within the range between LAV and UAV, there are no outliers in the collected data, while the values outside these limits can be defined as potential outliers.

Therefore, it was decided to exclude the anomalous values identified by the Tukey procedure from the subsequent analyses.

In this study, we evaluated variables that contributed to the adoption of more sustainable and multifunctional agriculture in Italy during the period 2010–2020. In this regard, we selected all the Italian FADN farms and extracted information on various topics by identifying key explicative variables for the aforementioned differentiated and diversified farms.

Panel analyses work particularly well with data on multiple subjects and over multiple years, but as the FADN sample has an annual rotation of around 20–25% of farms, it was not possible to use a given panel for the time frame examined and we chose a multiple regression model.

Therefore, using the information present in the FADN database, in particular starting from the balance sheet of the farms, the application of multiple correlations was developed with the technique of ordinary least squares (OLS) for the calculation of the determinants of diversification processes.

Specifically, to determine the factors that affected the farm net income (FNI), a multiple regression equation was employed to examine the magnitude and direction of the independent variables. The empirical model specification, assuming that there is a linear relationship, can be written as follows:

$$FNI = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + \varepsilon_i \quad (3)$$

where FNI is the farm net income, which was the dependent variable; $X_1, \ldots, X_n$ are the independent variables (that is, the factors that contributed to the formation of the farm net income); the parameters β_i were estimated; and finally, ε_i represents the error, i.e., the effect of the variables that were omitted from the equation (present in all models). The explanatory variables (or independent variables) used in the three different regression models are summarized in Table 1.

Specifically, α represents the constant term (or intercept), i.e., the expected response of FNI when all independent variables are equal to zero; $\beta_1, \ldots, \beta_n$ indicate the angular coefficients of the line (also known as the regression coefficient). In other words, the regression coefficient β describes the change in the value of the FNI to a unit change in one of the independent variables while all other independent variables are held constant.

In this way, we estimated the parameters β_1 and β_2 that lay on the line that best interpolated the data. The values obtained for β_1 and β_n, therefore, constituted the least squares estimates obtained for a particular sample.

Specifically, a backward stepwise regression method was followed (also known as backward elimination regression), which consists of initially adopting a full (saturated) regression model, i.e., that includes all the available explanatory variables. Then, the model results are evaluated and the explanatory variable with the least significant regression coefficient based on the *t*-test is eliminated. The model is then recalculated (and, therefore, the estimates of the coefficients of the remaining explanatory variables) by repeating the procedure described above. This method stops when the lowest value of the *t*-test is in any case significant and other explanatory variables cannot be eliminated. In conclusion, we identified the reduced regression model that best explained our data. This procedure allowed us to reduce the number of explanatory variables to be included in the model; was also useful for reducing the multicollinearity problem; and finally, turned out to be one of the ways to solve the overfitting.

The variables related to the quality of production, the processing and selling of agricultural products, and the diversification of farming are the variables that synthesize differentiated and diversified typologies of farms.

Table 1. Description of the variables used in the regression models.

Variables	Description
	Structural variables
Altimetry	Location of the farms: mountain, hill, plain
Geographical area	Location of the farms: north, center, south, islands
Type of farming (TOF)	Production specialization of the farm
Economic size group (ES)	Economic size of farms, as measured through the standard output
Utilized agricultural area (UAA)	Area used for farming, measured in hectares
Livestock units (LSUs)	Aggregation of livestock from various species and age as per convention
Power of machines (KW)	Power of the machines available per farm, measured in kW
Family working units (FWUs)	Amount of family work performed in the year; this is equal to 2200 h per year
	Socio-economic variables
Age	Farmer's age, in years
Gender	Farmer's gender (male, female)
Level of education	Farmer's education level
Total farm revenue (TFR)	Value of all farm production
GSP	Gross saleable production (GSP) (EUR)
GSP crops	Gross saleable production (GSP) related to the crop activity (EUR)
GSP livestock	Gross saleable production (GSP) related to the livestock activity (EUR)
GSP renewable energy	Gross saleable production (GSP) related to the renewable energy activity (EUR)
GSP quality	Gross saleable production (GSP) related to the quality productions activity (EUR)
GSP processed products	Gross saleable production (GSP) related to the transformed products activity (EUR)
GSP direct sales	Gross saleable production (GSP) related to the direct sales activity (EUR)
Subsidies	Public support received by farms, in EUR
Agritourism	Revenues related to the agritourism activity (EUR)
Hire of machinery (contract labor)	Revenues related to machinery hire activity (EUR)
Active rent	Revenues related to the active rent activity (EUR)
Specific costs	Sum of the expenses for the purchase of non-farm consumption factors, other miscellaneous expenses, and third party services (EUR)
Multi-year costs	Costs incurred for the purchase of goods that exhaust their usefulness in several financial years, but are accounted for only in the quota pertaining to the year (EUR)
Distributed income	Sum of the expenses for covers wages and social security charges and passive rent (EUR)
Farm net income (FNI)	This is the overall economic result of the farm that identifies the ability to remunerate all the production factors used in the farm and represents the dependent variable (EUR)

The results obtained with the multiple regression model were subjected to validation and verification tests. In this regard, the White and Breuch–Pagan tests were used to verify heteroskedasticity. On the other hand, multicollinearity was verified by calculating the variance inflation factor (VIF) for each of the independent variables. In addition, potential endogeneity was also investigated using the Ramsey RESET test. Finally, testing the residuals for normality allowed us to verify the distribution of the residuals.

The data were analyzed using the open-source software Gretl (Gnu Regression, Econometrics, and Time-Series Library).

Specifically, in order to evaluate which factors played a role in the formation of the farm net income, we implemented various multiple regression models: the first related to the 2010 accounting year; the second analyzed what happened in the 2015 accounting year; and finally, the third regression model examined the 2020 accounting year. In this way, it was possible to verify and study the evolution of the components of the farm net income. Furthermore, it was possible to highlight how, over time, the role played by each farm diversification activity (other gainful activities) in the formation of revenues changed.

The analysis of the regression residuals ex post allowed for evaluating whether the hypothesized regression model was correct.

The results of the tests carried out showed that there was neither multicollinearity nor heteroskedasticity. Instead, the hypothesis test results for the residuals model showed a slight deviation from the distributional normality, and thus, a tendency toward a greater sharpness occurred, with a fatter tail than usual (leptokurtic distribution).

This aspect, i.e., the non-normality of the distribution of the residuals, did not particularly worry us based on what is now widely known from the specific literature on the subject. Many studies demonstrated that in the case of large samples (as in our case), the violation of the normality of the regression residuals will have no effect on the estimation of the parameters of the regression model. In fact, the central limit theorem ensures that the sampling distribution of the estimates converges toward a normal distribution as the size of the analyzed sample increases [55–58].

3. Results

The empirical analysis was articulated in two parts: in the first step, we showed the evolution of Italian farms according to the farm typology described in the previous section. The aim of this part was to evaluate the strengthening of the multifunctional role of agriculture through the increase in differentiated and diversified typologies of farms. In order to identify whether variables connected to the multifunctional role of farming affected the farm's income, the second part involved an econometric analysis with the purpose of identifying the main variables of impact by considering also typical multifunctional variables (e.g., quality, bioenergy production, and direct selling).

3.1. Results of the Descriptive Analysis

Table 2 shows the farm typologies extracted from the FADN database and the percentage variation between the different typologies extracted. The sample that was used for the empirical analysis included 11,252 farms in 2010 that were categorized as follows: 2775 big conventional farms, 4919 small conventional farms, 122 differentiated farms, 108 differentiated and diversified farms, 1575 diversified farms, and 1753 microenterprises.

As can be seen in Table 2, the largest share of farms in 2010 belonged to the small conventional typology (43.7%), followed by big conventional farms (24.7%), while a very small portion of the farms under investigation adopted a strategic profile of being differentiated or differentiated and diversified (respectively, 1.1% and 1.0%).

With the purpose of analyzing possible migrations from one strategic profile to another in particular (in the time between 2010 and 2020), a comparison was then made with the same statistics collected for the year 2020.

As evident from Table 2, the 10,761 farms of the 2020 sample showed quite significant increases in the shares of differentiated farms (from 1.1% to 2.2%), differentiated and diversified farms (from 1% to 1.1%), and especially diversified farms (from 14% to 16.5%), while the share of big conventional farms slightly decreased over the considered period.

Table 2. Farm typologies in different rural contexts.

Year 2010						
Strategic Profile	**RDP Area**					
	Urban Poles	**Rural Areas with Intensive and Specialized Agriculture**	**Intermediate Rural Areas**	**Rural Areas with Comprehensive Development Problems**	**Total**	
	Farms	**Farms**	**Farms**	**Farms**	**Farms**	**%**
Big conventional	388	1106	803	478	2775	24.7
Small conventional	551	1294	1594	1480	4919	43.7
Differentiated	4	52	46	20	122	1.1
Differentiated and diversified	5	31	38	34	108	1.0
Diversified	107	331	632	505	1575	14.0
Micro	184	410	654	505	1753	15.6
Total	1239	3224	3767	3022	11,252	100.0
Year 2020						
Strategic Profile	**RDP Area**					
	Urban Poles	**Rural Areas with Specialized and Intensive Agriculture**	**Intermediate Rural Areas**	**Rural Areas with Comprehensive Development Problems**	**Total**	
	Farms	**Farms**	**Farms**	**Farms**	**Farms**	**%**
Big conventional	300	939	771	607	2617	24.3
Small conventional	435	1284	1626	1612	4957	46.1
Differentiated	23	53	72	86	234	2.2
Differentiated and diversified	9	14	64	34	121	1.1
Diversified	112	393	683	586	1774	16.5
Micro	49	242	423	344	1058	9.8
Total	928	2925	3639	3269	10,761	100.0

Table 3 shows the percentage variations among the typologies:

Table 3. Rates of change from 2010 to 2020.

Strategic Profile	**RDP Area**			
	Urban Poles	**Rural Areas with Specialized and Intensive Agriculture**	**Intermediate Rural Areas**	**Rural Areas with Comprehensive Development Problems**
Big conventional	−22.7	−15.1	−4.0	27.0
Small conventional	−21.1	−0.8	2.0	8.9
Differentiated	475.0	1.9	56.5	330.0
Differentiated and diversified	80.0	−54.8	68.4	0.0
Diversified	4.7	18.7	8.1	16.0
Micro	−73.4	−41.0	−35.3	−31.9

The most remarkable percentage variation recorded involved differentiation strategies, especially in urban poles (+475%) and in rural areas with comprehensive development problems (+330%), thus confirming that the new paradigm of multifunctionality can represent a useful tool for enhancing competitiveness in these areas. Moreover, the share of diversified farms increased across all four areas identified by the RDP. Strategies of both differentiation and diversification particularly increased in urban poles and intermediate rural areas, while reducing in specialized agricultural contexts. In contrast, other strategic profiles were subject to minor variations.

Given the migrations previously described, it is also worthwhile mentioning some of the main structural characteristics of farms belonging to the different strategic profiles, also highlighting any possible variation between 2010 and 2020.

To begin with, as shown in Figures 1 and 2, the average utilized agricultural area (UAA) of small conventional farms exhibited an increase over the 10-year reference period (from 22.4 to 23.4). Considering, instead, the strategic profiles toward which the transition has been most evident (as described at the beginning of the paragraph), the UAA indicator went up significantly in differentiated farms (from 23.3 to 32.7), decreased in differentiated and diversified farms (from 39.2 to 24.5), and remained quite stable in diversified farms.

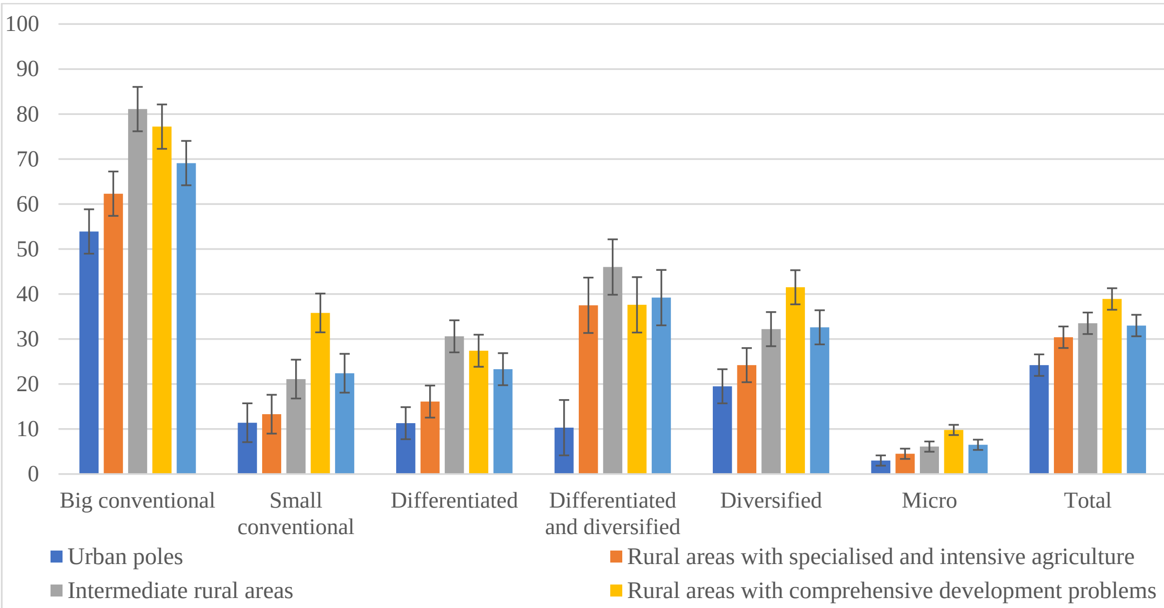

Figure 1. Average values of the utilized agricultural area (UAA) in 2010 (hectares). The graph includes the standard error bars.

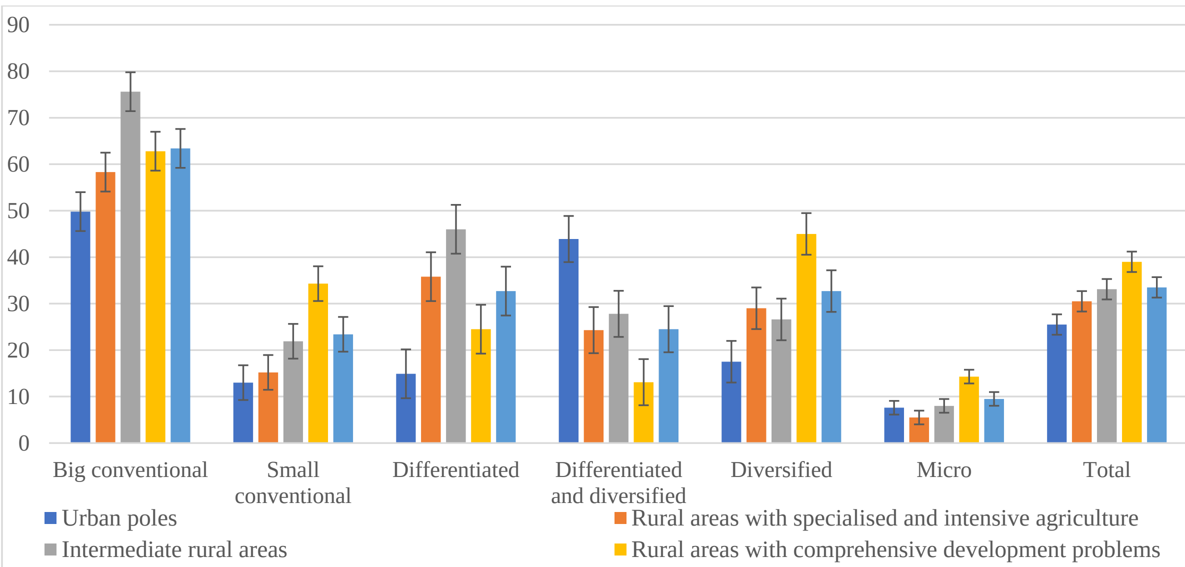

Figure 2. Average values of the utilized agricultural area (UAA) in 2020 (hectares). The graph includes the standard error bars.

Another measure of interest is the gross saleable production (GSP) that the farms recorded between 2010 and 2020. Results for this indicator are shown in Figures 3 and 4.

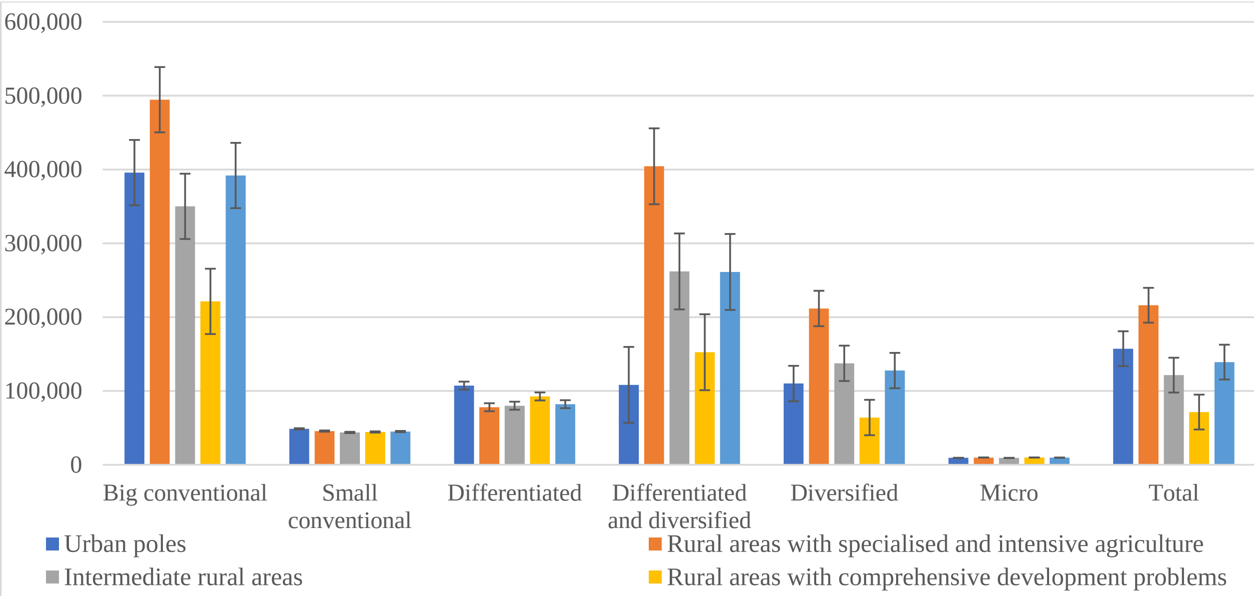

Figure 3. Average values of gross saleable production (GSP) in 2010 (EUR). The graph includes the standard error bars.

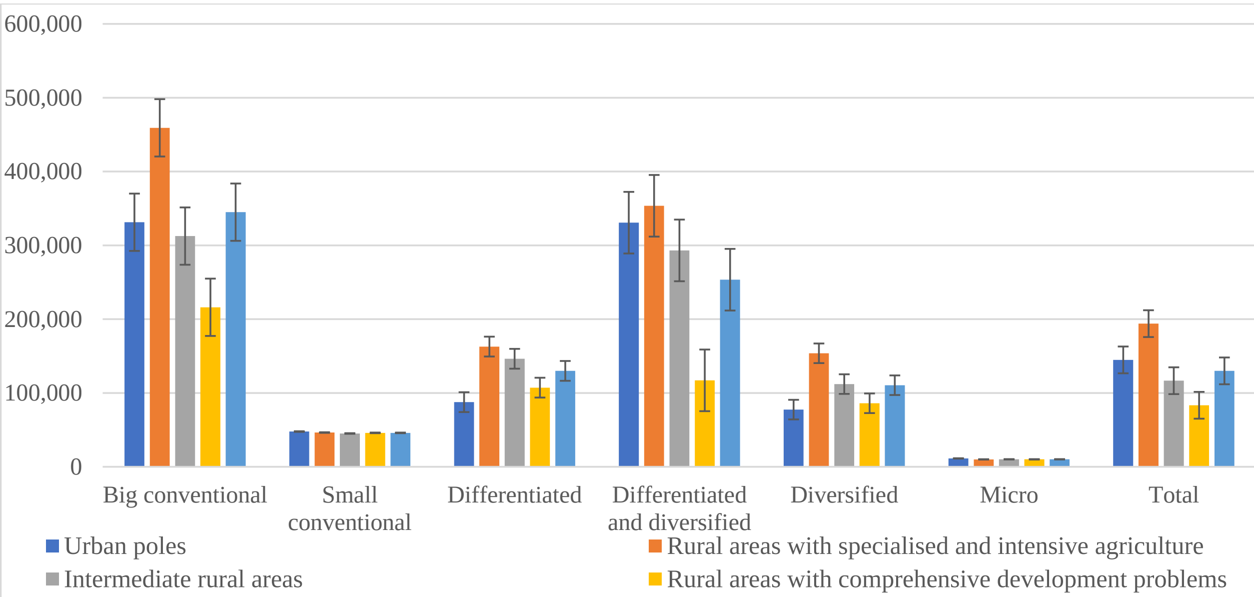

Figure 4. Average values of gross saleable production (GSP) in 2020 (EUR).

The remarkable transition toward differentiation was confirmed in these figures by an increase in the average GSP of differentiated farms from 2010 to 2020 (equal to EUR +47,833). The strategy of diversification, despite showing a relatively good GSP, evidenced a reduction (from EUR 261,247 to 253,460 in differentiated and diversified farms and from EUR 127,647 to 110,524 in diversified farms).

Finally, we could observe how the operating income (OI) of the farms under investigation changed over the reference period. As Figures 5 and 6 illustrate, the strategy of differentiation produced an increase in the average OI (from EUR 38,290 to 50,336), while both diversified farms and differentiated and diversified farms witnessed a decrease in the OI from 2010 to 2020 (equal to EUR 6058 and 4245, respectively).

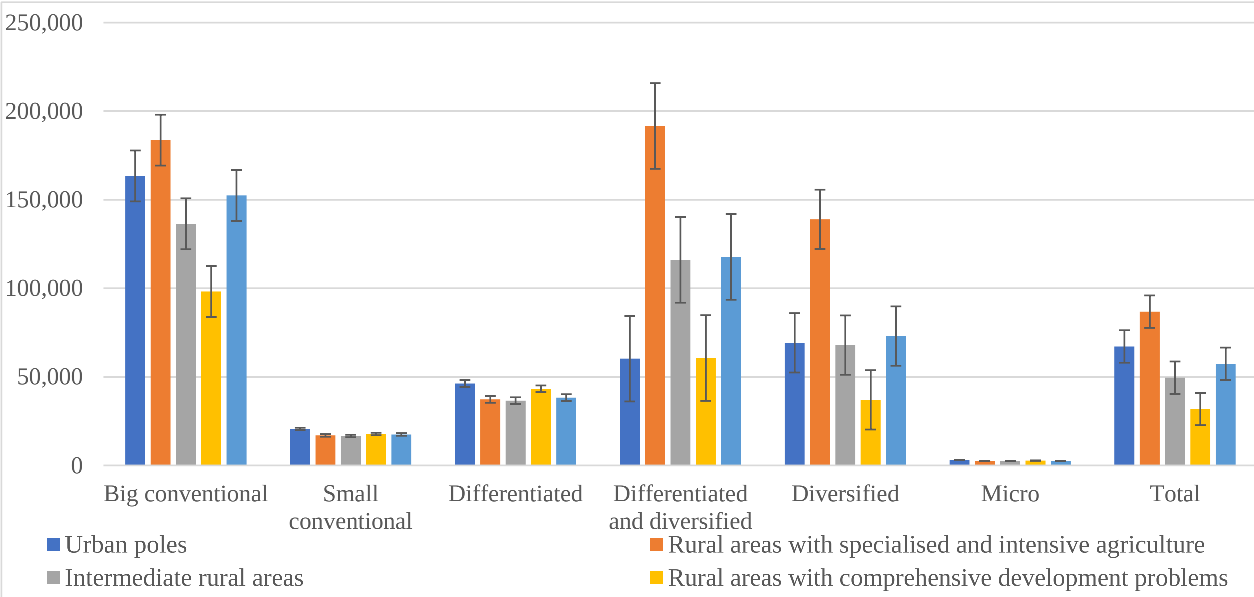

Figure 5. Average values of the operating income (OI) in 2010 (EUR). The graph includes the standard error bars.

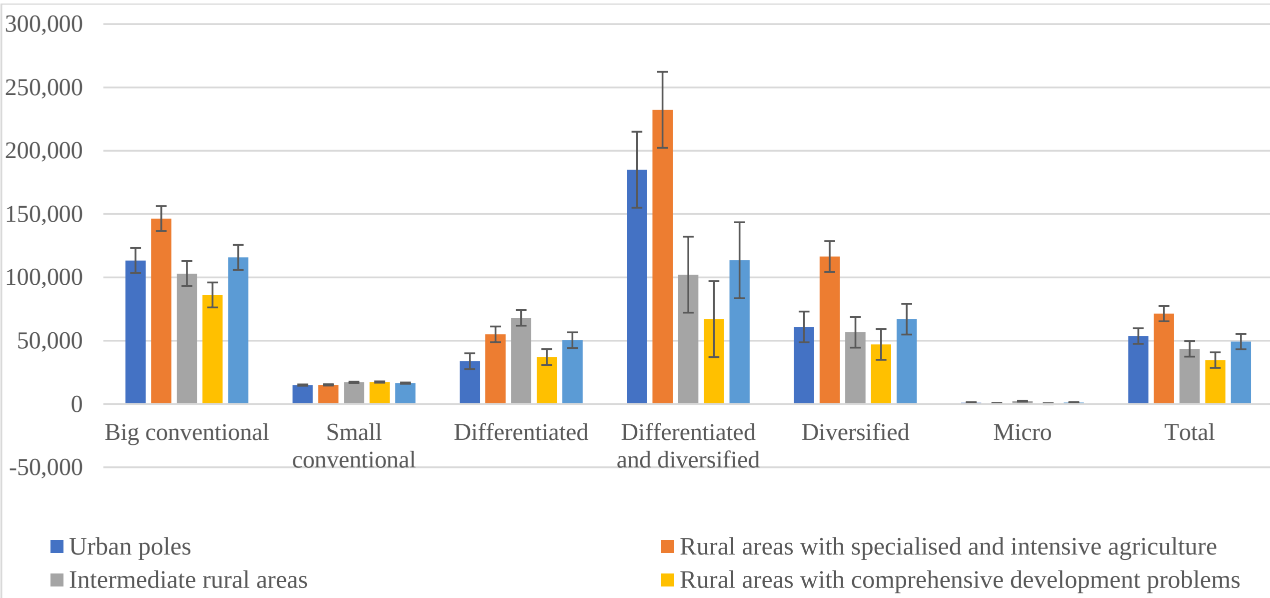

Figure 6. Average values of the operating income (OI) in 2020 (EUR). The graph includes the standard error bars.

3.2. Results of the Statistical Analysis

In order to detect any possible association between the strategic profile of farms and the area to which they belonged (as officially classified according to the RDP), a chi-square (χ^2) test of independence was conducted for the year 2020 [59].

To begin with, Table 4 shows the contingencies between the two variables (RDP area and strategic profile) for each pair of modalities, considering the strategic profile as the dependent variable and the RDP area as the independent one. Our interest, in fact, was to discover the eventual association between the strategic profile a farm decided to adopt and the RDP area in which it was located.

Table 4. Contingencies for the χ^2 test.

Year 2020				
Strategic Profile	**RDP Area**			
	Urban Poles	**Rural Areas with Specialized and Intensive Agriculture**	**Intermediate Rural Areas**	**Rural Areas with Comprehensive Development Problems**
Big conventional	74.3	227.7	−114.0	−188.0
Small conventional	7.5	−63.4	−50.3	106.2
Differentiated	2.8	−10.6	−7.1	14.9
Differentiated and diversified	−1.4	−18.9	23.1	−2.8
Diversified	−41.0	−89.2	83.1	47.1
Micro	−42.2	−45.6	65.2	22.6

This table reveals that the highest deviation (i.e., the difference between the observed frequencies and expected frequencies under independence) was recorded for big conventional farms located in rural areas with specialized and intensive agriculture (contingency = 227.7), followed by small conventional farms placed in rural areas with comprehensive development problems (106.2). These statistics suggested some kind of association between the two variables. Instead, the highest negative count in the table (−188.0) pointed out that there were fewer big conventional farms in rural areas with comprehensive development problems than what we would have expected in the case of independence between the two categorical variables.

In the next step of our analysis, the χ^2 test statistic was computed in order to measure the association between the variables through the following formula:

$$\chi^2 = \sum \frac{(Observed\ frequencies - Expected\ frequencies)^2}{Expected\ frequencies}$$

The χ^2 test of independence was conducted in order to verify whether this association was statistically significant.

The obtained χ^2 statistic (Table 5) was equal to 282, which suggested that there was an association between the two variables and the *p*-value obtained (<0.0001) with 15 degrees of freedom (DFs), and thus, this confirmed the statistical significance of the χ^2 statistic.

Table 5. Results of χ^2 test.

Test Statistic	**DF**	**Value**	***p*-Value**
χ^2	15	282	<0.0001
Cramer's V		0.0935	

Hence, given the following set of hypotheses:

H0: $\chi^2 = 0$ (no association between RDP area and strategic profile);

H1: $\chi^2 \neq 0$ (there is an association between RDP area and strategic profile);

We could reject the null hypothesis and accept the alternative hypothesis that there was some association between the strategic profile of a farm and the RDP area in which it was located. However, although some substantive association existed between the two variables, Cramer's V (computed as an effective size measurement as the square root of the χ^2 statistic) equal to 0.09 suggested that this association was not so strong.

3.3. Results of the Econometric Analysis

Using multivariate regression methods, we tested three models to explain the determinants of the farm net income in the 2010, 2015, and 2020 accounting years. The results of the OLS models are presented as regression coefficients. In particular, the independent variables implemented approximated the factors that influenced the performance of the farms in terms of farm net income.

All signs of the estimated coefficients were significant and consistent with the expected signs. In particular, Table 6 summarizes the results of the OLS regression models relating to farm net income in the years under investigation.

Table 6. Results of the multiple regression models related to farm net income.

Variables	2010		2015		2020	
	Coefficients	*Std. Error*	*Coefficients*	*Std. Error*	*Coefficients*	*Std. Error*
const	2202.35 *	1275.9	11,541.7 ***	1978.90	−9499.11 ***	1643.22
Altimetry	-	-	−2117.21 ***	337.35	-	-
Geographical area	-	-	-	-	−1126.58 ***	420.12
Type of farming	487.07 ***	155.61	291.01 *	155.90	1255.32 ***	283.65
Economic size group	616.97 ***	230.81	-	-	4712.14 ***	422.74
Utilized agricultural area	15.65 ***	4.83	−25.13 ***	5.67	−61.98 ***	12.79
Livestock units	18.46 ***	1.52	−4.81 ***	0.70	84.84 ***	1.82
Power of machines	−1.92 **	0.95	−5.13 ***	1.46	-	-
Family working units	483.51	322.09	-	-	-	-
Age	−63.26 ***	17.11	−86.44 ***	19.30	-	-
Level of education	-	-	−936.76 ***	298.14	-	-
Total farm revenue	0.95 ***	0.003	0.99 ***	0.01	-	-
GSP	-	-	−0.17 ***	0.01	-	-
GSP crops	0.04 ***	0.003	0.13 ***	0.01	0.88 ***	0.01
GSP livestock	0.045 ***	0.003	0.12 ***	0.01	0.86 ***	0.01
GSP renewable energy	-	-	−0.01 **	0.01	0.86 ***	0.01
GSP quality	-	-	-	-	0.03 ***	0.01
GSP processed products	0.02 ***	0.0023	0.02 ***	0.00	0.05 ***	0.01
GSP direct sales	-	-	-	-	0.012 **	0.01
Subsidies	0.11 ***	0.009	0.39 ***	0.01	0.96 ***	0.02
Agritourism	-	-	-	-	0.84 ***	0.02
Hire of machinery (contract labor)	-	-	0.07 *	0.03	0.79 ***	0.05
Active rent	-	-	-	-	0.43 ***	0.12
Specific costs	−1.01 ***	0.003	−1.02 ***	0.00	−0.89 ***	0.01
Multi-year costs	−1.16 ***	0.016	−1.04 ***	0.01	−0.81 ***	0.03
Distributed incomes	−0.98 ***	0.006	−0.99 ***	0.00	−0.79 ***	0.02

	2010	2015	2020
Dependent variable mean	65,807.9	61,524.1	56,603.53
Square sum residues	7.27×10^{12}	5.32×10^{12}	2.31×10^{13}
Std. error regression	25,005.2	23,291.85	45,788.63
R^2	0.987583	0.985152	0.884968
R^2 adjusted	0.987567	0.985123	0.884780
F	61,623.57	34,228.7	4707.403
p-value(F)	0.000000	0.000000	0.000000
Obs.	11,638	9822	11,033

*, **, ***: significant at 10%, 5%, and 1%, respectively.

Regression models confirmed that the structural and economic characteristics of the farms played an important role in the process of farm income formation. However, as highlighted in Table 6, over time, there was a change in the factors that contributed to the formation of the farm net income. Specifically, various structural variables were analyzed, but the statistically significant variables (even if sometimes of opposite sign, for example, in the case of the UAA) were the altimetry for the intermediate year only (2015) and the geographical location (district) only for the year 2020. The type of farming, the farm's physical and economic size (measured, respectively, in terms of the UAA and standard output, although in 2015, not statistically significant at the desired levels), and the number of animals raised (livestock units) were statistically significant in the formation of the farm net income during the entire period. On the other hand, the power of the available machines and family working units (significant only for 2010) lost importance (in the formation of farm net income) over time and with an ever more marked transformation of farms toward a multifunctional agricultural model. Obviously, the evolution of the importance of economic variables in the formation of farm net income followed this agricultural conversion process. Over time, as can be seen from the analysis results in Table 6, the economic variables relating to multifunctional activities, such as the production of renewable energy (GSP renewable energy), agritourism, direct sale of products (GSP direct sales), and transformation of agricultural products, played an increasingly important role in the formation of farm net income.

Regarding the regression analysis, the economic variables differed the most in the three regression models performed. Specifically, the positive influence of the political support received by farms on the formation of farm net income in the years examined emerged and its weight increased over time. Conversely, the total farm revenue was statistically significant only in the 2010 and 2015 accounting years.

The results of the regression relating to the 2020 accounting year strongly confirmed the transformations that began to be observed in 2015. In fact, they showed a greater relevance of multifunctionality-related variables, like other gainful activities, in the formation of farm net income. In particular, high values were recorded for traditional diversification activities, such as agritourism; the hire of machinery (contract labor); and finally, active rent.

This represented a further confirmation of the role played by non-agricultural activities (for instance, agritourism, production of renewable energy, and partly the hire of machinery through contract work) in contributing to economic development and the creation of social welfare in different rural areas in Italy [60–62]. Among the "new" income diversification activities, the following were found to be statistically significant and relevant: renewable energies, product quality (such as protected designation of origin (PDO), protected geographical indication (PGI), and organic products), processed products, and direct selling. These strategies are located within the multifunctional paradigm, with special reference to deepening strategies aimed at valorizing and qualifying agricultural products [63].

Finally, there were the cost items: operating costs, long-term costs, and distributed income, in addition to the constant C (intercept).

4. Discussion

As recently pointed out by Henke and Sardone [64], the primary sector is undergoing a restructuring process inspired by a growing "demand for a different and multifunctional role from the primary sector and farmers, but also driven by the process of long-term policy reform". Our study tried to depict emergent strategies carried out by farms in rural contexts based on the idea that the choice of adhering to the multifunctional paradigm of farming could be a win–win strategy that combines good farm performance and positive externalities that benefit civil society [65].

The multifunctional paradigm confirmed its soundness to boost the functional repositioning of agriculture in rural areas by encouraging a sociotechnical transition [66], which called into action the relevant role of civil society. As pointed out by Mehrabi et al. [67], citizen-consumers have the ability to boost the agroecological transition, and thus, encourage more sustainable food systems. This process also involves smallholder farmers, which, through a boundary shift, may escape the price–cost squeeze. Therefore, the transition toward multifunctionality also represents a fundamental strategy for small-sized farms. Coherently with the literature, our analysis confirmed that this transition was realized through a double-entry door [16]:

a. The first one involved the agrifood supply chain via dedicated differentiation strategies. Our analysis evidenced how relevant this strategy was in the decade 2010–2020.
b. The second one involved the rural space, which is now not only a space of production but also a space of consumption. Consequently, diversification strategies emerged through on- and off-farm diversification activities [25].

This study contributed to the literature by identifying the evolution of multifunctional types of farming in Italy through descriptive and econometric analyses. From a descriptive point of view, our research demonstrated that a general boundary shift emerged, with higher rates of development of both diversified and differentiated farms. These dynamics were particularly relevant in specific contexts, like urban and rural marginal areas, where farms (especially smallholder farmers) adopted strategies of differentiation and diversification to escape the price–cost squeeze. This increased the rates of positive externalities by allowing for the provision of public goods from multifunctional activities [68].

The econometric analyses aimed to identify the eventual positive effects of multifunctional activities (bioenergy production, quality products, direct selling, etc.) on farm income. The regression model showed a clear relationship between farm revenue and the adoption of differentiation and diversification strategies. Therefore, jointly with other "classic" socio-structural strategies, deepening and broadening strategies were confirmed to be remunerative choices for farms in both rural and urban areas [5,69].

5. Conclusions

The purpose of this study was to provide evidence of the evolution of the multifunctional farming sector in Italy and to evaluate how multifunctional activities impacted farm income. Differently from previous analyses, which were mostly based on case studies, data were collected from secondary sources, which allowed us to take a wider picture of the positive choice of adhering to the multifunctional paradigm at the national level. Italian farmers showed a clear attitude toward multifunctionality, with a special reference to specific contexts, as evidenced in previous analyses [23]. Moreover, the strategic choice seemed to provide farmers with sound economic performance, as evidenced by the econometric analysis. As a consequence, rural regeneration was boosted by the adoption of farming practices, which provided positive effects on both farmers and civil society. Accordingly, the role of both local institutions and stakeholders was emphasized due to the nature of multifunctional strategies to be developed, not only at the individual (farm) level but also at the territorial one through policies of valorization of local resources and the promotion of integrated models of rural development [19].

The results confirmed how the new European agricultural model, which was launched with the *Agenda 2000* document, is a valid alternative to conventional farming systems. As pointed out by van der Ploeg [34], the new agricultural model relies on sustainable farming systems, where competitiveness is grounded on the contribution to the quality of life in rural areas, which also involves the recognition of the multifunctional role of farming in civil society.

The results of the empirical analysis are in line with recent European policy documents that address the issue of sustainable farming, like the *Green Deal* and *From farm to fork* strategy. Furthermore, they confirmed how the programming period 2014–2020 seemed to have effectively boosted a transition toward a more diversified and multifunctional farming sector, with special reference to territorial contexts that are less inclined to compete in terms of cost leadership strategies. Coherently, rural marginal areas and urban poles were more active in adopting differentiation and diversification strategies, acting alongside the broadening and deepening dynamics that were well designed in past research [9,24].

As far as the current and future programming period 2023–2027, measures for empowering rural areas with new strategies for valorizing both products and rural territories are still relevant, jointly with a new vision of rural areas that boost the digital transition as a tool for building more sustainable and prosperous rural development trajectories.

Therefore, it is foreseeable that in the near future, new changes may affect farm typologies alongside the trajectories of multifunctional agriculture.

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