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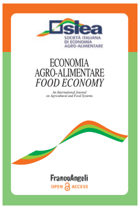

Organic and conventional farms in the Basilicata region: a comparison of structural and economic variables using FADN data

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Abstract

Organic farming in Italy is growing fast thanks to an increased focus on environmental sustainability and consumer demand thus challenging the farmers to create new working models and territorial systems.

Organic land in Basilicata is more than 21% of the regional UAA, an area that has more than doubled in size since 2015. This study compares Lucanian organic farming systems with conventional farming systems and their economic benefits and is based on 2019 FADN data made up of 24% organic farms. This study could help regional policy makers to design guidelines for the 2021-2027 programming period reinforcing the green

growth strategy. In fact, agricultural policy continues to focus on environmental themes (Green Deal and Farm to fork), proposing new challenges to agricultural businesses who take advantage of the competitive advantages of new models and territorial systems.

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Introduction

Organic farming is an integral part of the new and ambitious green growth strategy for Europe, details of which are outlined in the United Nations Sustainable Development Goals and the 2030 Agenda.

In Italy, the incidence of organic land reached 15.8% of the national Utilised Agricultural Area (UAA) in 2019, which places it well above the EU average (7.5%) (SINAB, 2020).

In Basilicata, the number of organic farms and dedicated agricultural area have also grown over the last few years, particularly in 2019.

This study aims to analyse the structural characteristics and economic results of organic farms and their peculiarities and compares them to conventional farms using the Lucanian Farm Accountancy Data Network (FADN), the most important source of statistics available in the European Union (Cesaro & Marongiu, 2013: 38).

The results could help regional policy makers design guidelines for the 2023-2027 programming period whilst also responding to consumer demand.

There is a substantial amount of literature analysing the economic aspects of organic agriculture (Röös *et al.*, 2018: 13), most of which concentrates on the comparative evaluation of the economic results of organic and non-organic farms at case study level or homogeneous farm samples selected on the basis of structural and/or productive variables (Abitabile & Arzeni, 2013: 33). There are also in-depth qualitative studies on specific farm cases and sector-specific thematic studies identifying the strengths of the organic sector within the territory and its networks and outline development paths based on the basic principles of organic farming (D'Oronzio & Pascarelli, 2016a: 10). Some Basilicata case studies highlight elements of a network and also social and cultural innovation (local identity, landscape and behavioral stakeholder models) elements of considerable importance (Sturla & Vigano, 2019: 15; D'Oronzio & Pascarelli, 2016b: 576).

Many studies have concluded that organic farms are frequently more profitable than conventional farms thanks to government price premiums and support from European Union (EU) policies.

Organic production profitability varies considerably between products, regions and individual farming methods and the reasons for buying organic food vary, including health and nutritional concerns, perceived superior taste, environmental and animal welfare concerns and distrust in conventional food production (Hoffmann and Wivstad, 2015; Lakner & Breustedt, 2017).

Consumer demand for organic products has risen dramatically, with global sales increasing more than threefold since the turn of the century with substantial financial benefits for the industry (Reganold & Wachter, 2016).

Some European countries, for example, are currently witnessing a boom in sales of organic foods and in 2019, Denmark, Switzerland and Austria had the highest consumption of organic products per capita ("The world of organic agriculture", 2021).

Reasons for buying organic food vary from health and nutritional benefits, taste, environmental and animal welfare concerns to a distrust in conventional food production (Hoffmann & Wivstad, 2015: 978; Abitabile *et al.*, 2015), and can justify the higher premium (Zander, 2011: 11). The recent approval of the European Green Growth Strategy for Europe (the Green Deal) and the Farm to Fork strategy has further strengthened organic farming and offers development opportunities in European rural areas. As a result, organic farming will be able to create new jobs and attract young farmers by generating sustainable territorial development models.

1. Basilicata organic farms

Basilicata has exceptional natural ecosystems and agro-ecosystems within two national parks, two regional parks and many protected areas that form part of the Natura 2000 network and thanks to financing and community support, the practice of organic farming has so far been successful (De Vivo & D'Oronzio, 2012: 263).

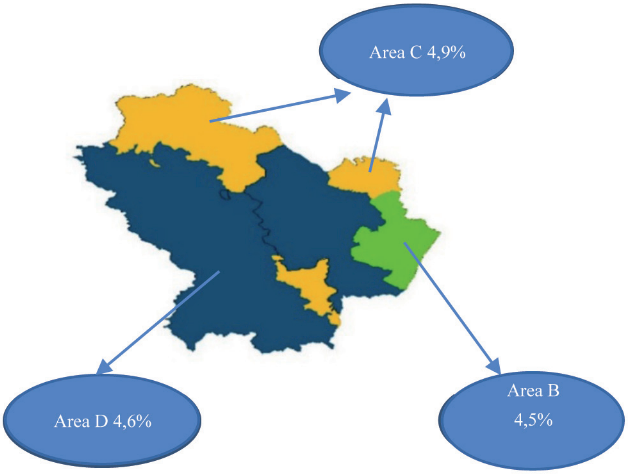
Organic land is more than 21% of the entire Basilicata UAA, an area that has more than doubled in size since 2015 (49,904 ha) (Sinab, 2017; 2020). According to the organic production method, over 103,234 hectares were cultivated in Basilicata in 2019 with a large proportion of organic land (over 52%) dedicated to crops (36% cereals and 16% fodder), reflecting the region's needs, fruit and vegetables account for 5.2% and the same for olive farming.

Data from Basilicata's organic farms register shows that organic farms are on average larger than conventional farms, the average organic farm land is 43.1 ha compared to an average conventional farm land of about 12.6 ha (ISTAT SPA, 2016). Organic farms are mainly single farms, one third of which are managed by men 50% of whom are between 40 and 60 years old. The territorial distribution sees a prevalence of farms located in the province of Matera (about 60% in total), with a substantial uniformity in the three rural areas that characterize the region in the 2014-2020 programming period, namely area B, C and D[1]. These areas approximately correspond to

1. Rural areas with development problems (D), including rural municipalities in the southern hills and mountains with lower population density. Intermediate rural areas relating to hillside municipalities with higher population density. Rural areas with intensive agriculture (B) including municipalities located in lowlands.

the metapontino plain (B), Matera, the Vulture-Alto Bradano and Agri hills (C), and the remaining Lucanian mountains (D).

Figure 1 - Organic farms percentage per rural area



In 2020, there were 2,414 organic farms in Lucania, a slight increase of 2.3%, compared to 2019, although the number of producers is growing, their numbers are still very low.

The regional organic sector, which mainly consists of a network of small businesses and farms, uses "short supply chain" logic, a social phenomenon that has opened up new frontiers and posed commercial challenges to both the producer and the consumer whilst, simultaneously, educating the consumer on variety, quality and cultivation methods (De Vivo & D'Oronzio, 2012: 269).

In addition, and as a result of consumer demand, the organic farming world in Basilicata is growing thanks to a whole range of products available in farms, restaurants and canteens which often cater to a clientele who are not strictly "healthy" yet are mindful of the product origin and authenticity. (De Vivo & D'Oronzio, 2012: 269; Sturla, 2019: 72).

There are two organic producer consortiums in Basilicata, ConProBio and FIRAB who contribute to strengthening regional organic businesses through guidance, knowledge and support. ConProBio, based in Metaponto, Basilicata, is a consortium of more than fifty organic and biodynamic producers and supports businesses and consortiums in the Puglia and Calabria regions, whils also supporting participates in regional and national research projects.

Both FIRAB and AIAB Basilicata are carrying out some interesting research on the dissemination of the principles of agroecology and organic farming in the region.

Basilicata has invested considerable financial resources through the Rural Development Programs (RDP) in the last programming cycles to encourage farmers to change their farming methods in favour of systems more respectful of the environment, biodiversity and food quality. Measure 11 of the 2014-2020 "Organic farming" RDP has allocated around 13% of the financial resources to support farmers in the introduction and maintenance of organic farming. In addition, Basilicata Rural Policy is financing "organic districts" in the Alto Bradano inner area.

Finally, the establishment of the regional organic farms register, the financing of producer consortiums and initiatives aimed at encouraging the use of organic products in schools demonstrates the focus of the Region on issues which could develop by the next Organic Action Plan from 2022.

2. Methodology and materials

The analysis was conducted on data from FADN samples in 2019, a year that saw a high number of farms registered regionally. The sample amounts to 374 farms, 24% of which were organic farms, covering about 36% of the UAA. On a national level, organic farms are on a par at 6.2% of total businesses, 21% of the UAA. The percentage of organic farms in total is greater than the FADN sample. The FADN samples consist of professional market oriented farms, whose standard output[2] is over 8,000 euros.

The FADN data sample can be attributed to the presence of agricultural businesses oriented towards more profitable markets with an output of more than 8.000 €. FADN organic farms cover 68.7 ha of land, however, organic registered farms cover 21 ha of land.

The analysis is carried out on two sub-samples (organic and conventional farms) differentiated by gender and age group, structural characteristics and economic indicators. For structural characteristics, the analysis will focus on average farm size, working units and their availability in terms of UAA, livestock units (LU) and machine hours per unit.

The following indicators were considered for the economic analysis to identify the economic flow of farms. Average and standard deviations are shown for each indicator.

2. The standard production is the sum of the values of the standard productions of the individual production activities, multiplied by the number of hectares and/or animals present on the farm under analysis.

Table 1 - List of economic indicators

		Avarage	Standard deviations
Total Revenue	Value of sales and services, changes in stocks, own consumption, public aid from CMO, and revenues from complementary activities	106,711.80	88,680.86
Current costs	Given by the sum of expenses incurred for the purchase of non-corporate inputs, other miscellaneous expenses and third-party services	39,746.00	35,286.80
Farm Net Value Added (FNVA)	As between gross saleable production (GVA) and current costs	66,966.00	53,014.35
Depreciation	Given by depreciation and provisions	7,818.00	6,703.15
Net product	As the difference between FNVA and multi-year costs and expresses the gross operating result net of fixed costs	59,418.00	47,458.60
Operating Income (OI)	Economic result of the characteristic management of the agricultural enterprise, which includes all costs and revenues generated by production processes and by active and passive services related to agricultural activities	42,421.00	37,564.84
Non-CMO public aid	CAP Pillar II aid	3,562.00	3,693.41
Farm Net Income (FNI)	The overall economic result that, compared to OI, also includes costs and revenues originating from activities not considered typically agricultural, the so-called extra-characteristic management	45,160.00	40,095.59
Labour Factor	Labor units (1 UL corrisponds to 2200 hours)	2.19	1.45

Source: our elaboration on FADN (2019).

On the whole, the standard deviation did not vary from the average, highlighting a relatively low dispersion of data.

These indicators are related to Total Revenue which include the value of sales and services, changes in stock, own consumption, public aid from (CMO), and revenues from complementary activities.

3. Result and discussion

The territorial distribution of organic farms by altitude shows a concentration in the hills, 16% higher than conventional farms and 17% higher than the corresponding UAA. The percentages do not differ in the plains, while conventional farms prevail in the mountains. This distribution is similar for Italian FADN organic farms in the period 2016-2019 (National Rural Network, 2021).

Table 2 - FADN distribution by altitude (%)

	Organic		Conventional	
	% farms	**% UAA**	**% farms**	**% UAA**
Mountain	22%	32%	38%	47%
Hill	60%	64%	44%	47%
Plain	18%	4%	18%	6%
Total	**100%**	**100%**	**100%**	**100%**

Source: our elaboration on FADN (2019).

There are a higher number of organic farms managed by women and people under 40 (Table 3), highlighting the organic farms propensity towards multifunctionality, data supported by increased revenue from related activities compared to total farm revenue which is almost double that of a conventional farm (Table 5).

Table 3 - Farms managed by women and young people (%)

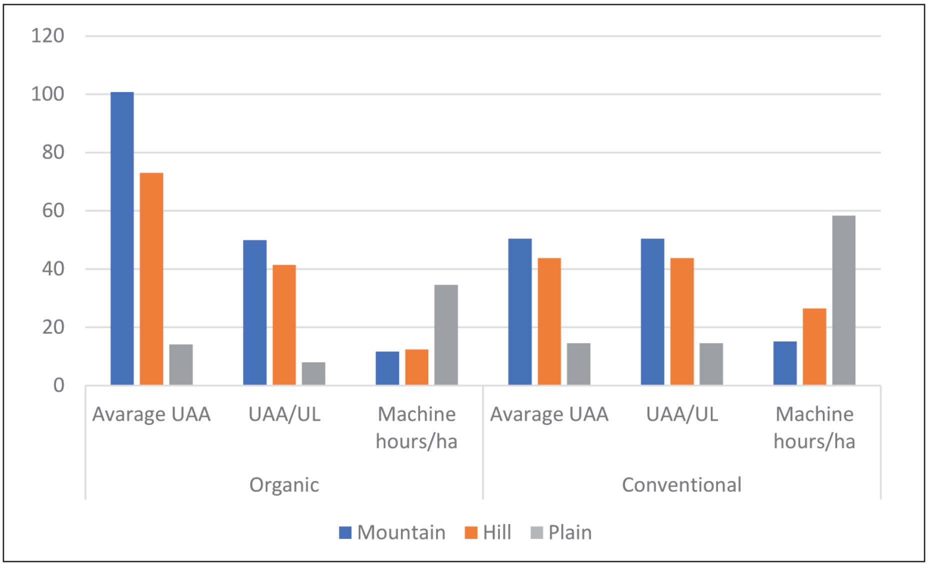
	Organic	**Conventional**
Farms managed by women	29%	26%
Farms managed by young people < 40 years	33%	14%
of which women	30%	34%

Source: our elaboration on FADN (2019).

Organic farms have a higher average UAA in line with FADN data (NRR, Bioreport, 2019). The difference between the UAA is particularly significant in the mountains where organic farms have a UAA (100.8 ha) that is double conventional farms (50.4 ha). There are less differences between organic and conventional farms, particularly in the mountains and hills, if we compare the surface area to the number of working units.

Organic farming reveals a higher number of machine hours per hectare of UAA in all the higher altitude areas. However, this indicator is 40% in the plains for organic farms, highlighting a less intensive use of the land and the adoption of agronomic practices aimed at soil conservation.

Figure 2 - Structural characteristic



Source: our elaboration on FADN (2019).

The number of livestock units (LU) for the average number of farms and UAA, is lower in organic farms than conventional farms in all altitude zones/ areas. This result indicates an increase in livestock farming, also confirmed by the relationship between LU and agricultural work units, which, for organic units presents as a lower value.

Work units are predominantly family based in the sub-samples and in mountains and hills. However, the work unit in the plains favour wage earners, with a percentage of family labour almost doubling in organic farming. As a result, fruit and vegetable production in lowland agriculture requires a huge wage labour commitment, particularly for harvesting.

Balance sheet indicators show a similar situation between the two sub-samples. Organic operating income[3] is 44.4% of total, six percentage points higher than conventional farms. The figure could be attributed to the added

3. Operating income relates to revenues to production processes and services linked to purely agricultural activities.

Table 4 - Comparison of structural characteristics - Average farm data

		Organic	**Conventional**
Mountain	LU (nr)	28,3	49,0
	LU/UL (nr)	14,0	28,7
	LU/UAA (nr)	0,3	1,0
	FLU/UL (%)	76,0	82,0
Hill	LU (nr)	25,9	23,7
	LU/UL (nr)	14,7	15,0
	LU/UAA (nr)	0,4	0,5
	FLU/UL (%)	63,0	62,0
Plain	LU (nr)	0,0	18,8
	LU/UL (nr)	0,0	4,4
	LU/UAA (nr)	0,0	1,3
	FLU/UL (%)	58,0	26,0

Source: our elaboration on FADN (2019).

pressure of related activities and to the lower impact of current costs linked to the reduction in use of products such as fertilizers, pesticides, etc, a gap which is highlighted in operating income. The net income was influenced by EU aid from the second pillar of the CAP, in fact, the Rural Development Programmes (RDP) provided specific support to organic farming through measure 11 "Organic farming" which was aimed at encouraging the introduction and maintenance of organic practices. The impact of financial aid on total revenue is low for the FADN sample, the average is 9%. In 2019, the net organic and conventional farm income did not change significantly between 2016 and 2019 (National Rural Network, 2021).

The improved economic performance of organic farms is linked to their considerable physical size: organic net income is 78% for conventional farms, despite increased aid.

An analysis of economic data by altitude does not show variations in the percentage of the various items of total revenue apart from aid, with consequential impact on net income.

An analysis of net farm income for type of farming[4] shows improved results for organic farms and an increased gap for farms specializing in plants, then livestock and finally for mixed farming.

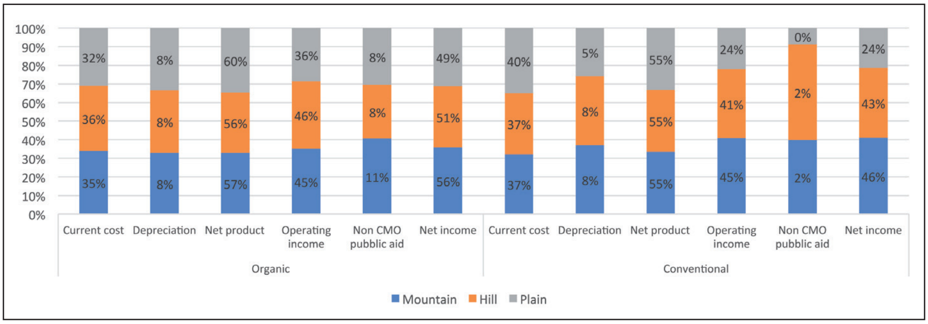
4. The Type of Farming is defined in terms of the relative importance of the different activities on the farm, measured as a proportion of each activity's Standard Output on the farm's total Standard Output.

Table 5 - Unit economic results for farm

	Organic		Conventional	
	Euro	Incidence on total revenues	Euro	Incidence on total revenues
Total revenue	106.149,4		106.899,3	
of which from related activities	7.013,5	6,6%	3.853,4	3,6%
Current cost	37.823,8	35,6%	40.386,7	37,8%
Added value	68.325,6	64,4%	66.512,6	62,2%
Depreciation	8.184,5	7,7%	7.696,3	7,2%
Net product	60.141,0	56,7%	58.816,3	55,0%
Operating income	47.162,6	44,4%	40.840,7	38,2%
Non CMO public aid	9.245,3	8,7%	1.667,8	1,6%
Net income	54.928,2	51,7%	41.904,1	39,2%

Source: our elaboration on FADN (2019).

Figure 3 - Budget items on total revenue per altitude zone



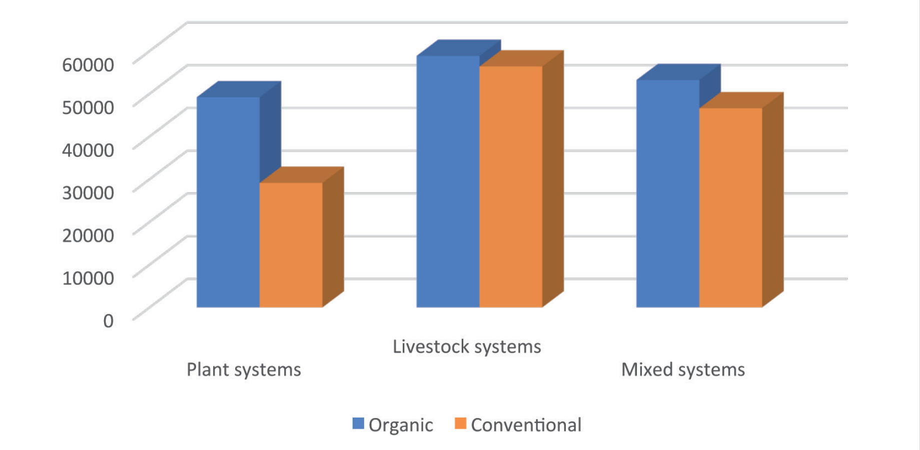
Source: our elaboration on FADN (2019).

The organic FADN farms mainly specialize in cereals, oilseeds and protein crops.

Table 6 shows organic farms have a higher net income per hectare than conventional farms which is linked to an increased impact from related activities, EU aid and total income, a fact attributable to higher prices, underlining the increasing consumer demand for quality organic products.

However, not all the organic farms in the sample receive aid under the second pillar of the CAP, RDP Measure 11, only 86%, which may be linked

Figure 4 - Net farm income by type of farming



Source: our elaboration on FADN (2019).

Table 6 - Economic result of cereals, oilseeds and protein crop farms

	Organic		Conventional	
	Euro	**Incidence on total revenues**	**Euro**	**Incidence on total revenues**
Total revenue	84.277		51.033	
of which from related activities	9.516	11,3%	903	1,8%
Current cost	32.638	38,7%	22.286	43,7%
Added value	51.639	61,3%	28.748	56,3%
Depreciation	8.137	9,7%	3.391	6,6%
Net product	45.273	53,7%	25.357	49,7%
Operating income	38.273	45,4%	21.794	42,7%
Non CMO public aid	10.806	12,8%	2.078	4,1%
Net income	46.263	54,9%	23.285	45,6%

Source: our elaboration on FADN (2019).

to a choice made by the farmer, who is discouraged by the lack of financial assistance or the administrative burden required to access support.

There has been a growing focus on reducing the use of synthetic products in agriculture to increase farming sustainability, improve product quality and reduce the negative impact on the environment.

ISTAT statistics shows a reduction of 7.8% in the quantity of fertilizers used in Italy between 2017 and 2019, a trend confirmed by Assofertilizzanti with a 5% reduction in fertilizer sales for the same period. Farmers use of lower dosages and more efficient products and a reduction in hectares in the production of cereals has also impacted these statistics.

Furthermore, Basilicata reduced its fertilizer use to around 21.5% in 2019[5], less than the rest of Italy.

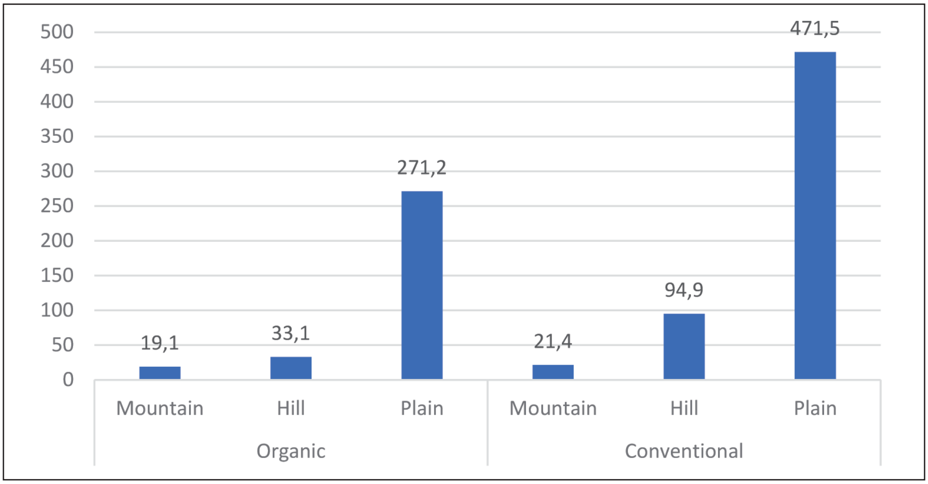
It is well noted that organic farming is a production method that does not use synthetic chemicals or pesticides which improve soil characteristics, and respects life forms and useful organisms. Slow releasing organic or mineral substances are used to fertilize and treat soils. It has been proved that organic farming increases the carbon content in the soil and is a useful measure to reduce greenhouse gases (Drinkwater *et al.*, 1998; Liebig *et al.*, 1999; Niggli *et al.*, 2009; Wells *et al.*, 2000; Coderoni & Bonati, 2013). Organic farming aims to provide high quality food with minimal environmental impacts, making production eco-sustainable. The release of CO_2 is certainly one of the most important of this type of agriculture. Consequently, several studies have revealed how the conversion to organic farming improves the soil content of organic carbon on average by 2.2%, while conventional systems did not promote this change or there was no significant change (Leifeld *et al.*, 2010). A study by Andreas Gattinger (Gattinger *et al.*, 2012) of the Research Institute for Organic Agriculture predicts that in the next few years organic farming can reduce CO_2 emissions caused by agriculture by 23% in Europe and by 36% in the United States. Furthermore, organically managed soils have more biomass and greater stability and biodiversity than conventional managed soils and therefore tend to be able to retain water, porosity and stability, representing an important form of protection in the event of drought and floods.

Only 66% of organic FADN's use fertilizers, compared to 81% of conventional farms. The amount of fertilizers distributed per hectare of UAA significantly varies between altimetrical areas, reaching peaks in the lowlands, where fruit and vegetable production is abundant. The organic farms present lower values in all three altimetries, with significant differences in the plains (–42.5%) and in the hills (–65.%), where the practice of green manure is widespread with positive effects on the conservation of soil fertility.

There are no significant disparities in the quantity of pesticides distributed, either in Italy or in Basilicata between 2017 and 2019. 54% of organic farms and 64% of conventional farms used pesticides. Chemical pesticides were not used in organic farming, in their place, plant preparations were used to effectively combat pests and are not dangerous to humans or the

5. In 2017 there was a reduction of about 4% in the UAA (our calculations based on ISTAT data).

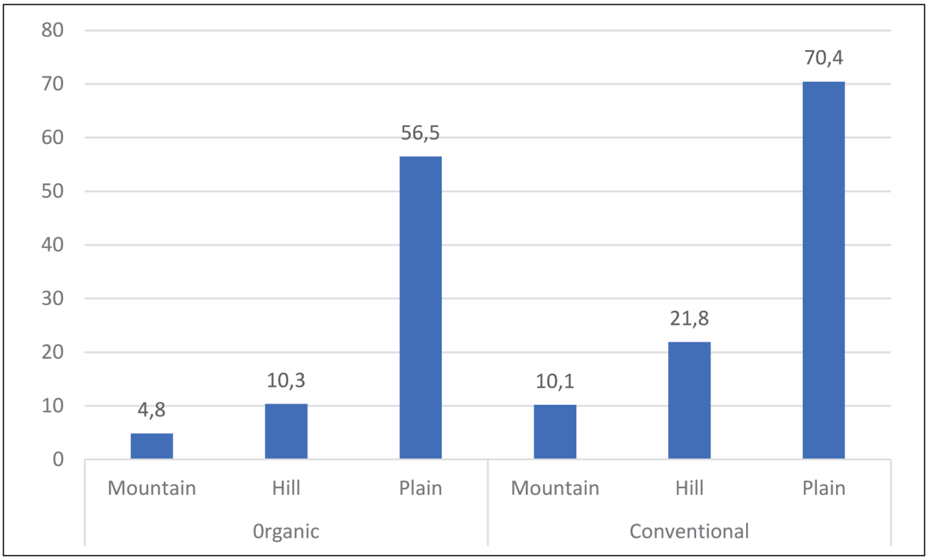
Figure 5 - Value of fertilizers distributed per hectare of UAA (€)



Source: our elaboration on FADN (2019).

environment. Insects, mites, nematodes are also useful to combat and limit populations of insects and/or pest mites in a targeted and specific way.

Figure 6 - Value of pesticides distributed per hectare of UAA (€)



Source: our elaboration on FADN (2019).

The value of pesticides used by organic farms per hectare of land is significantly lower than conventional farms in all three altitude zones as the cost of the products used by organic farmers is on average higher, a lower quantity is distributed.

Conclusions

This study began with a need to analyse the financial and environmental benefits of organic farming that in Basilicata is growing due to the increasing focus on environmental sustainability, biodiversity conservation and food quality by consumers. In some regional areas, organic farms are organizing in the "Organic district" concentrating on a new common specific development path. The organic farming market is also continuously evolving through the innovative farms ability to take diversified paths (Canali *et al.*, 2020: 7) to increase and stabilize their income and improve the marketing strategies to promote their products (BIOREPORT, 2019).

Experience and knowledge influence farmer behaviour with some organic farms adopting technological innovations already in use in conventional agriculture, paving the way for profitability and efficiency. The sharing of knowledge between farmers is important in improving management skills and management practices. The adoption of new technology is becoming easier and less costly as the it becomes more available thanks to the rural development policies which have encouraged the transfer of knowledge.

FADN results present a positive image of organic farms, from structural characteristics to economic performance. They are more dynamic with an increased presence of women and young people, and focus on multifuncionality in the market place (Gargano *et al.*, 2021: 5). An additional important element is the lack of assistance from PAC regarding total revenue which is challenging the farmers to work smarter.

The Lucanian results stress the importance of effective policies for knowledge sharing in how to improve yields and productivity in organic farming. These positive elements are part of the green growth strategy for Europe the "Green Deal", an integral part of the 2030 Agenda and the United Nations Sustainable Development Goals approved in December 2019. The main proposals concern the use of sustainable practices in agriculture, such as organic farming and a series of initiatives to foster a circular economy and to tackle biodiversity loss.

Finally, on the 19^{th} of April the European Commission approved the new Action Plan for Organic Agriculture for the period 2021-2027, which was in line with the Farm to Fork Strategy.

Hence the need to continue the research by developing ad hoc surveys useful for regional policy makers. The qualitative-quantitative analysis could also be developed with ad-hoc investigations using consistent FADN data over time, to understand the peculiarities of these farms and investigate the motivation of the new organic farming methods and processes adopted on social and territorial common paths.

The measurement of the reduction of CO_2 emissions and use of water in organic farms compared to conventional farms could be an important line of research for FADN through a revision of its methodology.

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