

THE AGRICULTURE OF AN ULTRAPERIPHERAL REGION OF EUROPEAN UNION: THE AZORES ARCHIPELAGO

EMILIANA LEONILDE DINIZ GIL SOARES DA SILVA

Departamento de Ciências Agrárias – Universidade dos Açores
Rua Capitão João D' Ávila
9700-042 - São Pedro, Angra do Heroísmo
Açores, Portugal
emiliana@uac.pt

ABSTRACT

The Azores archipelago is considered to be an ultraperipheral region of European Union, because some of the characteristics of their development, and some specific politics were applied in these regions. A specific European development program, Azores Rural Development Plan – PRORURAL – for 2007 to 2013, is supported by the European Agricultural Fund for Rural Development and is ongoing at this moment in Azores Archipelago.

The objective of this paper is to characterize the type of agriculture carried out in the Azores Region. It starts by a small introduction of the Azores according to the Statistical National Institute (INE) and its brunch SREA – Statistics of Azorean Region - and finally by the Farm Accountancy Data Network (FADN) Then it characterizes the agricultural farms and finally, it shows some relevant researches about Azorean farms, namely; (1) a classification of the Azorean farms and the type of objectives that can influence the decision-making of the Azoreans' farmers (2) the efficiency of dairy farms and (3) the analysis of the impact in the incomes' farmers.

In the Azores, agriculture is based on dairy cattle productions and the remainder agricultural productions are residual. The Azores' islands produce mainly cow's milk (in 2010 it represented 30% of Portuguese milk production), but also beef. And there products comes from quite different production systems ranging from extensive to intensive grazing systems.

The average agricultural area per farm is small (8.5 hectares) and the efficiency of the dairy farms is relatively low due in part to equipment amortization and is highly dependent of subsidies and - farms will not be economically sustainable if the subsidies were eliminated.

Key-words: Azores, Dairy milk, Decision, Efficiency, Grazing system.

INTRODUCTION

The objective of this paper is to present the Azorean agriculture and some researches applied in this region, namely in what concern to the importance of subsidies in Azorean agriculture.

The Azores archipelago is a part of Portugal and is composed of nine islands distributed by three groups; the occidental group with the Corvo and Flores Island; the central groups with S. Jorge, Graciosa, Pico, Fail, Terceira islands, and the oriental group with S. Miguel and Santa Maria islands. The Azores archipelago is in located in the middle of Atlantic Ocean between the North American and Europe, being the Flores Island the most occidental frontier of Europe, where the Europe Continent starts. The geographical coordinates of the Azores are; latitude (extreme points) 39° 43'23''N and 36° 55'43"N and longitude (extreme points) east 24° 46'15" WG and west 31° 16'24" (SREA, 2010).

The total area of Azores is 2322 Km² (SREA, 2010). The biggest island is S. Miguel (32% of total area) and the smallest is Corvo (1% of total area). Pico and Terceira islands represent about 19% and 17% of Azorean total area. The Pico Mountain is the highest point of Portugal with 2351m high.

The resident population in the Azores in 2009 was 245435 inhabitants, but the most part (77.49%) live in S. Miguel (54.71% of the total inhabitants) and Terceira (22.78% of the total inhabitants). Corvo Island only has 500 inhabitants (0.20% of total). The population density, according (SREA, 2010), was in the 2009 about 105.7 inhabitant/km², and ranges from 180.4 inhabitant/km² in S. Miguel Island to 29.2 inhabitant/km² in Corvo Island (similar to Flores Island – 29.4 inhabitant/km²). Terceira has the second highest population density - 139.7 inhabitant/km². The unemployment rate, according to the same source, was in 2009, about 6.7%.

The gross domestic product of Azores, in the 2008, represented about 2.03% of Portuguese product and the annual average rate in the consumer prices was 0.8% in 2009 (SREA, 2010).

In 2009 the utilized agricultural area (UAA) of Azores, was 112 054 hectares (3.23% of total of Portugal) and comprised 13149 farms (4.8% of Portugal farms). The arable area is about 8.4% of the area and about 52.9% of the farms. The vegetable farms represents about 0.42 of total area and 54.4% of the total farms. The permanent crops represent about 1.9% of the total area and 47.3% of total farms. The meadows and permanent grassland is about 89% of the area and 65.5% of the holdings. This means that the most important culture in the Azores archipelago is the meadows and permanent grassland and the permanent crop and vegetable farms are marginal. The average agricultural area per hectare in Azores, in 2009, was 8.52 hectares per holding (SREA, 2011). In 2007, the average agricultural area per hectare in Portugal was 13 hectares and in Hungary 7 hectares ((Martins and Tosstorf, 2011)

The UAA per holding is 8.9 hectares, but they have some dispersion. The most representative (34% of total UUA) class size area is from 20 to 50 hectares and higher than 50 hectares (31.8% of total UUA). The holdings with 5 to 20 hectares represent 25.6% of total area. About 8% of holdings have less than 5 hectares (SREA, 2011).

In 2009 there was about 13 541 sole holders and 133 companies. The most part of farmers (84%) is on their own and a small part in a leasing regime or both (SREA, 2011). The annual working unit is 1.3, and the labor force is mostly familiar work (holder, spouse and other family members). There are 11 532 people working on agriculture and of these, 74.1% are men (SREA, 2011).

The main temporary crops production in Azores is cereals (maize-grain, maize-forage and potato). The main permanent crops are citrus fruits (orange and tangerine); fresh fruits (apple); subtropical fruits (pineapple and banana); nut fruits (chestnut) and vine for wine. There are also, others cultures, namely tobacco, sugar beet and tea (the only place in Europe with a relevant production).

The main agricultural production in the Azores islands is animal production, especially cow's milk production (540 199 225 liters per year). In 2010, it represented about 30% of Portuguese cow's milk production. But beef is the other important production in Azores. There were about 245 thousands heads of bovines in the Azores islands (SREA, 2011). The dairy cow represents 79.8% of the cows in the Azores. There are about 28.2 dairy cows per farm and 32 cattle per farm. The live stock unit per UAA in Azores was 1.71 in 2009. The cattle slaughtered in the Region, was mainly the cattle 50 385 heads accounting for about 11 565 tons. Pigs, sheep and goats and also aviculture are not relevant in the Azores archipelago.

Agricultural researches in Azores

SILVA AND BERBEL (2006), in a previous research, defined types of Azorean farms from a panel data of 174 farms of The European database of Farm Accountancy Data Network of the Azores, Portugal. This study used cluster analysis, the Ward method. The results,

allowed the identification of three types of grazing systems of dairy farms as follows: 1) extensive grazing systems (less than 1.4 cows per hectare); 2) moderate intensive grazing system (1.4 to 2.4 cows per hectare); and 3) intensive grazing system (more than 2.4 cows per hectare).

SILVA *ET AL.* (2004) measured the Azores dairy farms technical efficiency by applying a non-parametric efficiency analysis to a panel data of 122 dairy farms from the Azores, Portugal for the year 1996. The analysis used DEA with constant and variable returns to scale models, with an input-oriented model approach. Two outputs (milk production and subsidies) and three inputs (agricultural area, number of dairy cows and variable and fixed cost) were considered relevant. The results suggested that the average technical efficiency is very low (66.4%) compared with published research data and only a few (7%) dairy farms were found to be efficient. The meaning of the average technical efficiency (0.664) is possible to produce the same amount of milk while saving approximately 33.6% of resources (or inputs).

One line of research in the Azores was the efficiency of farms. MAROTE AND SILVA (2002) had analyzed the importance of subsidies in the Azorean dairy farms efficiency from 1997 to 1999. The technical and economic variables of 82 dairy farms of the FADN (Farm Accountancy Data Network) were analyzed over the period of three years. The DEA (Data Envelopment Analysis) was the approach used to calculate the efficiency. The results shown that the subsidies were not so important in the dairy farms efficiency along the three years. The technical efficiency variable and constant returns do not present great differences between the model I (with subsidies as the output) and model II (without subsidies as the output). The number of efficient dairy farms was quite different and the decreasing subsidies seem to be compensated by the dairy production increase. In the Model I (two outputs and nine inputs) the average technical efficiency returns to scale (VRS) is high and very homogeneous (the standard deviation was less than 0.1). Its higher mean value was about 0.960 in 1999. The mean technical efficiency a VRS is higher than 0.950 in the three years, although it was possible that some farms increased its efficiency a VRS, as the minimum value confirms it (from 0.504 to 0.637). That means that these farms could produce the same using less inputs. The number of efficient farms goes from 62 % (51/82) to 71 % (58/82) and there were 34 farms that were simultaneously efficient in the three periods (they are about 41% (34/82) of dairy farms). In the model II (one output and nine inputs) the efficiency of the VRS was high along the period 1997 to 1999 and its value was about 0.943 and 0.953. Despite this, there were some farms that could improve their efficiency (the minimum value of efficiency ranged from 0.461 to 0.611). The number of efficient farms goes from 55 % (45/82) to 67 % (55/82). There are 28 farms which have always been efficient along the three years, but this value is superior in the model I.

SILVA *ET AL.* (2007) proposed to estimate the technical efficiency in agricultural grazing systems (dairy, beef and mixed) in Azores in the year 2002. This research used 184 agricultural farms of FADN- Farm Accountancy Data Network. DEA, a non-parametric methodology, was used to estimate efficiency, by means of DEAP software. The results have shown that the average technical efficiency in the dairy grazing system was 63.2% (CRS) and got higher (71.4%) in VRS and the scale efficiency was about 89.2%. In beef grazing system, the average technical efficiency (CRS) was 69.4% and VRS was higher (82.9%) and the scale efficiency was 84.2%. In the mixed grazing system, the average technical efficiency (CRS) was 89% and the VRS was higher (99.24%) and the scale efficiency was 89.8%. The mixed system is the "most efficient". In the dairy system grazing only 9.8% were efficient enterprise, nearly 11.1% were efficient farms in beef systems and about an half (46.7%) of the farms were efficient in mixed grazing systems.

The efficiency was generally higher in mixed systems when compared with the other two grazing systems (dairy and beef).

NONCHEVA *ET AL.* (2009) used the Canonical Correlation Analysis in variable selection to estimate the efficiency in Azores dairy farm. With this method, DEA models are used by PAR methodology to measure efficiency, making it possible to rank observations (Azorean farms) in terms of their dissimilarity to other observations in the data (other Azorean farms). This makes PAR appropriate to support public policies in agriculture sector in the Azores.

SILVA AND VENÂNCIO (2004) had used a stochastic frontier production (SFA) for three types of farms to estimate the efficiency and inefficiency of farms types. The Frontier Program allows the estimation of efficiency (model I) and inefficiency models (model II). The levels of efficiency are constant and similar along the time and their values are 82%, 93.2% and 85.1% respectively for the clusters A, B and C. The variables that cause inefficiency are subvention and equipment amortization. The variables more connected to efficient farms are lower rent fields, dimension and beef sales. The bigger farms seem more efficient, which was also observed by Hallam and Machado (1996) in the Portuguese farms from the north of Portugal.

In the Azores the subsidies are support by PRORURAL program approved by Commission Decision C (2007) 6162, on the 4th of December 2007. The PRORURAL has four center lines: 1) improving competitiveness of the agricultural and forestry sectors; 2) improvement of the environment and rural landscape; 3) quality of life in rural areas and diversification of economy; and 4) operation of LAGs, Acquisition of skills and entertainment in rural areas.

MATERIAL AND METHODS

In this survey 30 farms from AAIT (Farmers Association of Terceira Island) for 2007 were analysed. This database takes a part of Farm Accountancy Database Network – FADN.

On average, the main characteristics, of the farms of this survey are: small dimension of farm is 18.4 hectares, they are familiar (one worker, the owner, working 1920 hours a year); with 42 animals per hectare (about 62.5% are dairy cows) and the intensification level is about 2.29 animals per hectare. Two farms have also fruit production (banana).

The variable costs per hectare are about 978.8€ and represent 64.1% of total cost. The fixed cost per hectare are 526.5€ and represents 34.5% of total cost. The remains, 1.5%, are cost taxes.

RESULTS

The main costs of these farms are: concentrated feeding (38% of total cost); fertilizers (14.1% of total cost); equipment amortization (14% of total cost); land rent paid (7.8% of total cost); and fuel (7.3% of total cost). All other costs accounts for less than 5% of total.

In this research (2007) the subsidies contributed to the total farm production with a quarter – 25.3% of farmers' income. This value is quite similar to previous researches. It was showed that the importance of subsidies were 15.3% in the Azorean dairy farms of the total output (SILVA, 2001), MAROTE AND SILVA (2002) presents the amount of subsidies received from 1997 to 1999, and it was decreasing value (from 19,3% in 1997, to 15,9% in 1998, and to 11,8% in 1999). SILVA AND VENÂNCIO (2004) observed that the amount of subsidies in total product for Faial island farms were 16.3%, 27.5%, 22% and 20%

respectively to the years of 1996, 1997, 1998, 1999. That means for the amount of 10 000€ of farmers income, 2500€ were from subsidies, the same value presented for agricultural farms in 2004 (SILVA, 2004). The main important subsidies in Azorean agriculture were POSEIMA, ranging from 43.4 to 32.6% of total subsidies from 1998 to 2003, and compensated payments ranging from 24.6% to 22.8% from 1998 to 2003 (SILVA, 2004).

As can be seen in *Table 1*, the gross margin per hectare and year is about 17 208.4€, but if it was divided by twelve months, it would remain 1 434.0€, which means that it is an adequate income for the Portuguese reality. But if the gross margin without subsidies is considered, the value decreases, to 9 632.2€ per year and to 802.7€ per month. That means that if the subsidies are taken off then the income decreases 7 576.2€ per year and per 631€month.

The net margin per hectare was about 11 600.2€ per year and 966.7€ per month, and it is a satisfactory income in the Portuguese context. The net margin without subsidies decreased a lot – 4 024.0€ per year and 353.3€ per month, due not only to the amount of subsidies, but also to the increasing amortization cost. The net margin per month was less than the minimum Portuguese wage.

Table 1. Standard Gross and Net Margin in Azorean Farms based on FADN-A Data.

Average (euro)	Per hectare (year 2007)	Per hectare and per month (2007)
Standard Gross Margin (with subsidies)	17208.4	1434.0
Standard Gross Margin (without subsidies)	9632.2	802.7
Net margin (with subsidies)	11600.2	966.7
Net margin (without subsidies)	4024	335.3

The standard gross margin (SGM) per hectare, in 2007, was in Portugal 738€ in smaller farms and 166€ in larger farms. In Hungary, The standard gross margin per hectare was 605€ in smaller farms and 463€ in larger farms (MARTINS AND TOSSTORF, 2011). In the Azores archipelago, the value of the SGM (with and without subsidies) is higher than in Hungary or Portugal.

The standard gross margin per hectare in 2007 was for smaller farms 738€ and for larger farms 166€. In Hungary, the score of the standard gross margin per hectare was lower in smaller farm (605€) but higher in larger farm (463€) (MARTINS AND TOSSTORF, 2011). According to EU Dairy Report 2011 (EUROPEAN COMMUNITY, 2011) for milk specialized farms, the farm net income in Azores, Portugal and Hungary was respectively, 23 039€, 15 905€ and 8 020€. The net margin with coupled payments were 150€, 110€ and -19€, respectively to Azores, Portugal and Hungary. The scores of gross margin with coupled payment were 141€, 155€ and 75€ respectively to Azores, Portugal and Hungary.

CONCLUSIONS

The subsidies are an important component of the Azorean farms, representing about a quarter of the total income. The most part of subsidies are supported by European Union, especially by PRORURAL program. In Azores, to maintain the agriculture and the farming production within a level of satisfaction it is only possible with European financial support. It is important to realize that there are not other activities in Azores archipelago that can

employ the Azorean people. Without the support of this agriculture a lot of farmers will abandon agriculture having no job alternatives, which mean that the door is open to the Azorean emigration, an usual practice in the history of Azores.

The optimization of agriculture is urgent, the farms must substitute the way of animal feeding, using more forage (pastures source), and need to find other alternatives for decreasing the cost of equipment amortisation. In this way they could increase the profit and the competitiveness of their agriculture.

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