Chapter 62

Production Systems and Agricultural Productivity Factors in the Municipalities of Aileu, Ainaro and Covalima, Timor-Leste

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ABSTRACT
The purpose of agricultural development is to eradicate hunger and poverty through sustainable production to ensure sustainable consumption in the context of ensuring food self-sufficiency. The study aims to characterize production systems and agricultural productivity factors at the research site. This study was carried out in the municipalities of Aileu, Ainaro, and Covalima and lasted 3 months, from August to October 2021. The descriptive survey method was used, and the intentional sampling method was used to determine the research sites based on the second data of the 2019 Agricultural Census. To determine the sample size, the Slovin method was used and the respondents were obtained using the simple random method. The variables observed, namely the age, experience, and degree of education of respondents, such as production support factors and the main factors of agricultural productivity, include the sales regime of agricultural products. The results revealed that the mean age of the respondents was between 42.12 and 48.06 years, with an experience of 15.65 to 24.18 years as a producer. The degree of education varies between the three municipalities, and the majority of respondents still with literacy occur in the municipality of Covalima. The minimum total agricultural areas are 0.20 ha and the maximum 11 ha with the average of operational areas between 0.75 and 1.98 ha, and abandoned areas between 0.81 and 1.97 ha per respondent. The highest production of rice and corn occurs in the municipality of Covalima, however, the municipality of Aileu and Ainaro showed lower production. About 65 to 85% of producers finance their productive activities on their own and the workforce is about 3 to 6 people per family. The frequency of agricultural productivity varies between the three municipalities, in the municipality of Covalima the production occurs twice of cultivation per year and in the municipalities of Aileu and Ainaro occurs once a year. The most used production systems are conventional systems (without the use of technologies) in the production of rice and corn and extensive systems in livestock. The results also showed that parents have less interest in encouraging young people to continue farming in the future. The regime for the sale of agricultural products varies depending on market access and the buyer arriving at the place of production.

Keywords: Characterization, productivity factors, sales regime

1 INTRODUCTION

The subsistence agriculture sector has gained prominence in government agendas in recent years and is still considered a starting point and strategy in development in general, considering relevant the aspects that combine property and work that assume in time and space a great diversity of

social form in sustainable agriculture that is a form of cultivation that respects more the environment, in addition to reducing costs and increasing agricultural productivity.

The development of the agricultural sector in Timor-Leste resumed in 2002 after the restoration of independence, the government through the Ministry of Agriculture and Fisheries initiated various types of programs that are fundamental to eradicating poverty and hunger through large-scale sustainable production, to ensure sustainable consumption in the country. However, the reality shows that for at least twenty years of independence, about 75% of domestic consumption still depend on imported products due to the still limited domestic agricultural production.

The 2015 household census results showed that about 76.29% of all registered heads of households were involved in agricultural activities. However, the result of the 2019 Agr ícola Census revealed that there was an increase of about 4% of new homes in four years, which leads to 204,597 domiciles in 2015 parturition a total of 213,417 domiciliation 2019, and also indicated that there was a drop of more than 10% in participation in agricultural activities, thus only about 66% of the total registered households were involved in agricultural activities.

Generally, the sustainability of agricultural development is aimed at the well-being of the nation and its people. The strong and strong agricultural development will stimulate popular eco nomia so that it automatically reduces poverty in general, since the agricultural sector is one of the productive sectors that is never exhausted. Maintaining and improving the sustainability of agricultural development is a more appropriate step toward reducing poverty and improving the national economy. In principle, if there is a food shortage, among others, it will greatly affect national stability and can cause several problems that indicate instability in the country. Even so, it is a very difficult task for the authors of development in the area of agriculture in the context of engaging and convincing farmers not to leave their jobs as productive, innovative, and sustainable farmers. According to the definition of the Commission on Social, Economic and Cultural Rights of the UN (Sustentative ... 2001) *apud* Costa et al. (2018) poverty must entity not only a deprivation of financial resources but, in the case of a broad standard of living and other inherent rights. If we have credible information on this issue, a study should be carried out to find out the factors that support and hinder agricultural productivity in the context of the provision of scientific data to the institutions responsible for its resolution. The study aims to characterize the production systems and analyze the factors of agricultural production at the site of the research.

2 THEORETICAL FRAMEWORK

The importance of agriculture is for economic development and poverty reduction in poor countries (Mosca, J. & Nova Y., 2019) and they also stated that agricultural production in Mocambique is carried out mostly by the family sector (small producers) with work-intensive technologies, in small-scale exploitation. Innovation in family farming is the key to ensuring global food security in the long

term (Wandelli et at., 2018). According to the World Bank, one in ten people, or 766 million worldwide, survive as much as $1.90 a day (Poverty..., 2016).

According to Avillez (2017), the productivity of all agricultural inputs is currently measured by an indicator called total factor productivity (PTF), based on which the total volume of *outputs is compared with* the total *volume of inputs used* in the production of *these outputs*. Gasques et al. (2014), internal comparations made by technicians from the department of Agriculture of the United States (Usda) show that Brazil is one of the countries whose productivity has grown the most, expressed in total productivity of factors (PTF) that is considered a good indicator of technological productivity. Agriculture has historically played a significant role in Brazilian economic growth (Bragagnolo & de Camargo Barros, 2015). According to these authors, this fact was not a Brazilian peculiarity, in the process of economic development of several countries, agriculture was important as a supplier of resources for investments in emerging activities, for the release of labor to other sectors, as a provider of savings for capital accumulation, as well as the supply of affordable food to the population. As Guedes et al. (2006) point out, indicators of partial productivity of a specific factor have in their favor the simplicity of calculation and the availability of information.

On the other hand, modernization for large producers who "had the framework of agro-business" and on the other, small producers who began to become invisible by not accompanying this change in production structure (Vieira et al., 2016). Denardi (2001) describes all human existence, history, and culture depend on the space of land he occupies or is not allowed to occupy. According to the author, in the historical study of civilizations primitive man learned on earth, on the banks of rivers, that it is possible to produce and create amines mats more efficiently, and the field worker knows very profoundly how important property is as a way of life (survival) in the rural environment is.

According to Vieites (2010), sustainable agriculture is a form of cultivation that respects the environment more, in addition to reducing costs and increasing productivity and the search for a healthy life, presupposes, among other conditions, the consumption of good quality products. The author also stated that concerns about food have been changing over time and changes in the food system are recent, but despite this, they have been causing social, economic, and environmental damage in a growing way. Thus, the benefits of sustainable agriculture in the food system refer to the set of processes that mainly include sustainable development in agriculture, in the genesis modifications of plants and animals are increasingly evolved to produce modified plants and animals with high resistance to abiotic and biotic factors. According to Vida (2014), the concept of sustainable agriculture can be defined system of ecological agricultural practices based on scientific innovations through which it is possible to produce healthy food, concerning land, air, and water, as well as the health and rights of farmers. For this, the goal of sustainable agriculture is to meet humanity's needs for healthy food, to improve the quality of the environment, maintain the basis of non-renewableand

agriculturalresources more effectively, to implement natural biological cycles, and to support rural economic sustainable development and the quality of life of farmers.

3 RESEARCH METHODOLOGY

3.1 KEY INSTRUMENTS IN SURVEY *SURVEY*

Among other main instruments, the questionnaire was pre-elaborated in a semi-structured way to interview the respondents and disputable instruments in surveys. The semi-structured interview can be planned or happen spontaneously and offers a lot of important data, generating quantitative and qualitative information. In a general way, semi-structured interviews begin with generic topics and follow with questions using "How?", "What?", "Who?", "Why?" and "When?". It is important to respect the time and let the conversation go as naturally as possible (Hill and Hill, 2012).

3.2 SEARCH METHOD

In this research, the descriptive approach method was used, as recommended by Hill and Hill (2012). To determine the municipalities as research sites, the purposeful sampling method was used based on secondary data from the results of the 2015 myciliary census and the 2019 Agr í cola Census. Slovin's formula was used to determine the sample size according to the 2014 Sugiyono recommendation (p.65), as follows:

$$n= \frac{N}{N.d^2+1}$$ where:

n= Total sample (heads of families as the respondent);
N= Total population(heads of farmers' families);
d^2 = Desired percentage (in this survey we determine 10% of the total population).

The total number of heads of families of farmers who focus on the municipalities if taught is 25325 families. The result of the 2019 AgriculturalCensus aims at the total household households of farmers registered in the three municipalities, namely: Aileu 7393, Ainaro 7530, and Covalima 10402. So the formula is as follows:

$$n= \frac{25325}{1+25325x(0.1)^2} = 99.61 \approx 100 \text{ (minimum)}$$

According to Slovin's formula, the minimum sample size is 100 respondents. Thus, at least 100 heads of family are to be interviewed in the study or more depending on the needs of data in the study. In this study, 262 respondents were interviewed in the three municipalities, as detailed: Aileu 69, Ainaro 93, and Covalima 100 respondents, respectively. To select the respondents, the simple random

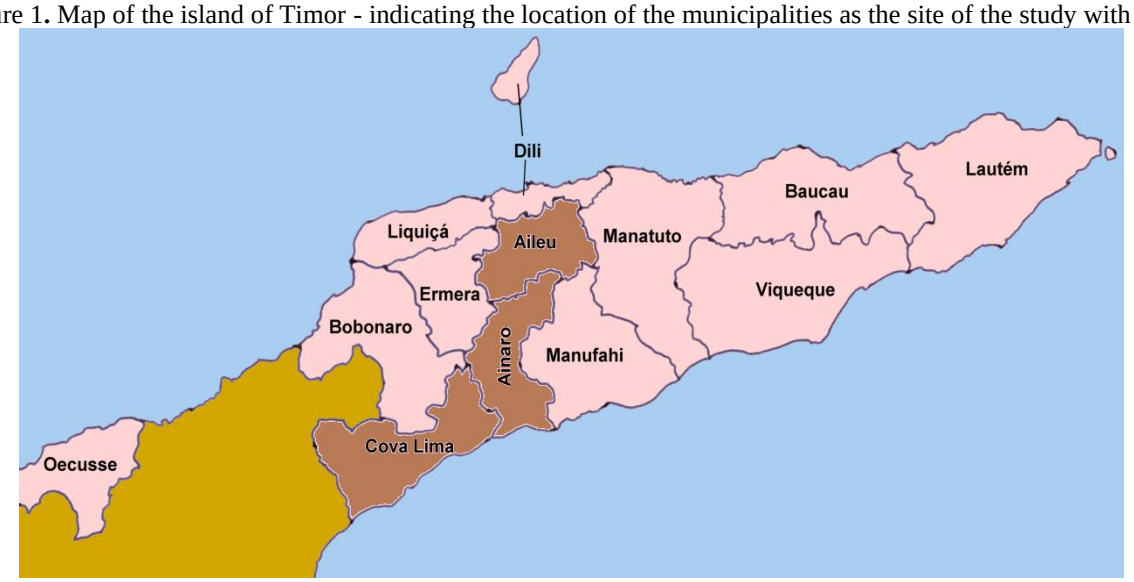
sampling method was used with the intention that all the producers registered in each municipality have the same opportunity to be selected as respondents of the study. According to Hill and Hill (2012), a simple random sample has the following two characteristics: when a **sample of n** different cases is taken from a **Universe with N** cases, all **possible samples of n size must have** the same probability of being taken from the Universe. Second, each of the N **cases** in the Universe has the same probability of being included in the sample taken. Some prerequisites that respondents need to meet including as respondents in this study are that they were involved in agricultural activities in the last 12 months.

The design is the implementation of a *survey is a process* whose objective is the collection of thematic, valid, and reliable information, obtained from the individual answers given to a set of questions by a representative group of respondents, around which conclusions are produced that can be generalized to the universe of the population under study (Thaeyer-Hart, et al., 2010). According to Coutinho (2011), the basic objectives that preside over the survey (describe exploring /explaining) behaviors, attitudes, values, and situations), *five types of surveys (descriptive*, explanatory, exploratory, transversal, and longitudinal) are differentiable(descriptive, explanatory, exploratory, transversal and longitudinal), whose limits in practice are sometimes tenuous (*tenuous*).

3.3.1. Search Location

The study was carried out in the municipalities of Aileu, Ainaro, and Covalima, Timor-Leste, with a duration of 3 months, from August to October 2021. Details on the location of the municipalities can be found **in Figure 1.**

Figure 1**.** Map of the island of Timor - indicating the location of the municipalities as the site of the study with **côr** brown.



The municipality of Aileu is situated in the northern part of East Timor and is one of the landlocked municipalities. It borders Dili to the north, Manatuto to the east, Manufahi to the southeast, Ainaro to the south, Ermera to the west, and Liquiça to the northwest, and the capital of the municipality is Aileu Vila. The municipality of Ainaro has plenty of rivers and fertile land for agriculture. It has a coastal zone in the Timor Sea, but also mountainous areas, including the highest point of Timor-Leste, Mount Ramelau (2,960 m), also known as Tatamailau, which is close to the border with the municipality of Ermera. The borders of the municipality of Ainaro are identical to those of the municipality in Timor Portuguese. the municipality borders Aileu to the north, Mannufahi to the south, Covalima to the southwest, Bobonaro to the west, and Ermera to the northwest. The capital of the municipality is Ainaro Vila. The municipality of Covalima is a municipality in Timor-Leste, in the southwestern part of the country. It has an area of 1230 km2. The capital of the municipality is Suai, which is 136 km from Dili. Covalima borders the Timor Sea to the south, the municipalities of Bobonaro to the north, Ainaro to the east, and the Indonesian province of Nusa Tenggara Timur to the west (Timor-Leste in número, 2019).

3.3.2 Observed variables focus on the characterization of the factors:

The variables observed in this study are divided into two parts: the first is the factors that support agricultural productivity, such as age, experience, and producer's education, and the second part, are the main factors of agricultural productivity, such as the size of farms, especially agricultural areas, size of areas in operation and abandoned, productivity and production of corn, rice, and livestock, desired agricultural production systems, capital/investment, family workforce, technical and socio-economic assistance.

3.3.3 Primary Data Collection Step

The duration of the study is 3 months and can be given in two stages, namely: the first step: is preliminary surveys and analysis of secondary data and the second stage is, collection of primary data through interviews and also making direct observations to the objects under study. In the planning phase, it is essential to define the concepts or constructs that want to evaluate and perform the operationalization in variables. It is notable that in the consistent review of the literature, it appears as essential for a correct framing of the problem that intends to study among others: definition of problems, research target, instruments to be used, method data collection, organization and analysis of data, interpretation, and conclusions.

To perform the pre-test of the questionnaire addressed to farmers and relevant institutions, we request the collaboration of a restricted group with attributes (age, education, gender, experience in the area under study) that tended to be close to the average profiling of the respondents. The choice of open or closed issues is a serious dilemma. According to Thayer-Hart, et al. (2010), open questions

enable the respondent to express himself freely, expressing his or her precise view on the subject. It is true that this is a more complicated response typology to codify and presents a greater number of non-responses as unappropriated answers (Reja et al., 2003).

3.3.4 Data analysis

The data collected in this study were tabulated, coded and analyzed according to Coutinho's recommendations of 2011, to investigate the causes that result in a non-increase in productivity and agricultural production and are increasingly abandoned by farmers.

4 RESULTS AND DISCUSSION

The results obtained in this research include results of descriptive analyses on the personal identity and number of the family member of the respondents as supporting factors for agricultural production, main factors and agricultural production systems in the municipalities of Aileu, Ainaro, and Covalima, as presented in the Tables and Figures below.

4.1 AGRICULTURAL PRODUCTION SUPPORT FACTORS

4.1.1 Age of Respondents

There was variation in the age of the study respondents between 19 and 81 years, with a general average of 41.12 to 48.06 years. Most respondents were between 35 and 40 years old (**Table 1**). It was also observed the participation of family members in agricultural activities such as the workforce in the municipality of Aileu between 2 and 13 people, Ainaro between 2 and 15 people, and Covalima between 2 and 10 people per head of the family. The average is 6.81; 6.44 and 5.57 people respectively.

Table 1**.** Result from descriptive analysis on age, experience and member number of family of respondents in the municipalities of Aileu, Ainaro and Covalima

Aileu (n = 69)	Descriptive analysis result						
Variable	Minimum	Maximum	Average	WITHOUT	Fashion	Freq.	% Valid
Age	19	81	43.86	1.93	35	4	5.8
Experience	2	50	16.9	1.66	5	11	15.9
M. of the Family	2	13	6.81	0.28	7	15	21.7
AINARO (n = 93)							
Variable	Minimum	Maximum	Average	WITHOUT	Fashion	Frequency	% Valid
Age	19	80	41.12	1.37	38	7	7.5
Experience	5	60	15.65	1.19	20	21	22.6
M. of the Family	2	15	6.44	0.3	7	17	18.3
COVALIMA (n = 100)							
Variable	Minimum	Maximum	Average	WITHOUT	Fashion	Frequency	% Valid
Age	22	79	48.06	1.35	40	7	7
Experience	4	56	24.18	1.25	20	12	12
M. of the Family	2	10	5.57	0.18	4	21	21

Note: SEM: Standard Error of the Mean; Family M.: Family member

Age and experience can be considered supporting factors for agricultural production. Productive age is a human natural force and the greatest experience is a resource capital that increases human capacity in dedicated activities. The number of family members participating in the agricultural activity determines the workforce of the same family, which contributes to the reduction of the cost of labor in agricultural production.

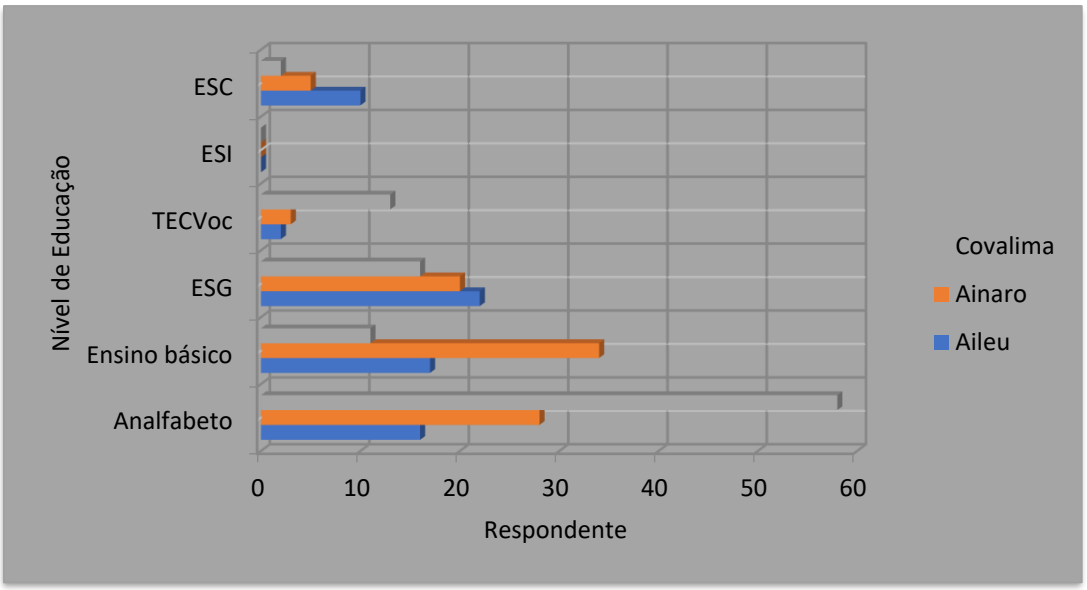
In the decision-making process of staying or leaving as a farmer, it is usually a process of collecting, interpreting and analyzing alternatives, often incomplete, the result of which is the making of a satisfactory and not optimal decision. In this sense, Panno et al. (2014) and Machado (2014) present four guidelines for the decisions of rural producers namely: instrumental, social, expressive and intrinsic orientation, that the farmer acts with satisfaction and enjoys the agricultural work outdoors values hard work and independence in decisions.

4.1.2 Level of Education of Respondents

The results of the study showed that there was a variation in the students' schooling, as described in **Figure 2**. It is noticed that there is a variation in the education of the respondents from no schooling to complete higher education. In the municipality of Covalima, most respondents still had an education level without schooling, about 58%. However, respondents in the municipality of Aileu and Ainaro without schooling around 23.19% and 30.11%, respectively. For this, the education of the respondents can also be considered as one of the factors that interfere with changes and productivity in agricultural activities due to the lower capacity in the process of absorption of technologies to improve the activities dedicated. In general, people with less knowledge in specific areas have difficulty increasing their capacity and updating their knowledge daily to facilitate the activities to which they dedicate themselves.

The productive value of education has its roots in two different parts: a higher level of education can allow the producer to achieve more with the resources he has at hand, this is called the effect of the worker. Thus, the marginal product of education, measured by the function of production, is the effect of the worker, and the second, to distinguish is the allocator effect. According to Ribeiro et al. (n.d.), people with higher education levels can increase the producer's ability to acquire and codify information about new in sums and costs, facilitating the donation of new production factors and consequent modernization.

Figure 2 - Level of education of respondents



Note:ESG: General secondary education; TecVoc: Vocational Technician; ESI: Incomplete Higher Education; ESC: Complete Higher Education.

4.2 MAIN AGRICULTURAL PRODUCTIVITY FACTORS

4.2.1 Size of Agricultural Areas

The results of the study revealed that the size of the agricultural areas of the respondents in the municipality of Aileu was 77.43 hectares and 51.65 hectares of productive agricultural areas in use, that is, 66.70% of the productive agricultural areas were in operation, and approximately 33.30% of the hectares are abandoned. In the municipality of Ainaro, the productive agricultural area of the farmers interviewed was 136.15 hectares and the area in use was 107.15 hectares, that is, only about 78.70% of the productive area was being used. However, in the municipality of Covalima, the total productive agricultural area of the farmers interviewed was 362.25 hectares and the area used was about 198, i.e., 54.66% that was being used. Respondents in the three municipalities work with a total of 0.75 to 1.98 hectares and abandon at least about 0.81 to 1.97 hectares per head of family respectively. The reason for the abandonment of agricultural areas due to lower manpower capacity, less investment capacity and production facilities. The production areas are privately owned since the visas, some were acquired by the respondents themselves. Details information is found in **Table 2**.

Table 2. Size of the Agricola area of the respondents in the municipalities of Aileu, Ainaro and Covalima

Aileu (n = 69)	Descriptive analysis result						
Variable	Minimum	Maximum	Average	WITHOUT	Fashion	Freq.	% Valid
Agricultural TAA (ha)	0.25	11	1.12	0.17	0.50	24	34.8
AA in operation. (ha)	0.25	6	0.75	0.09	0.50	44	63.8
AA. abandoned (ha)	0.20	5	0.81	0.16	0.50	16	51.6

Ainaro (n = 93)							
Variable	Minimum	Maximum	Average	WITHOUT	Fashion	Freq.	% Valid
Agricultural TAA (ha)	0.2	5	0.75	0.1	1	29	31.2
AA in operation (ha)	0.2	4	1.21	0.7	1	35	37.6
AA. Abandoned (ha)	0.5	4	1.16	0.18	1	11	44
Covalima (n = 100)							
Variable	Minimum	Maximum	Average	WITHOUT	Fashion	Freq.	% Valid
Agricultural TAA (ha)	1	11	3.62	0.18	3&4	25	25
AA in operation (ha)	0.5	10	1.98	1.5	2	29	29
Abandoned AA (ha)	0.02	7	1.97	0.16	1	22	26.5

Note**:** TAA: Size of agricultural areas; AA: Agricultural area; SEM: Standard error of the mean. Freq.: Frequency

4.2.2 Rice and Corn Production

It is noticed that there was variation in the productivity of agricultural areas, with emphasis on rice and corn production in the three municipalities. In the municipalities of Aileu and Ainaro, production occurs once a year according to the normal cultivation session. However, the municipality of Covalima can grow rice and corn twice a year, the first occurs in the normal cultivation session and the second occurs in August to October of each year, which is a dry period for other municipalities. It is also observed that the amount of rice and corn production per period in the municipality of Covalima is higher than that of the municipality of Aileu and Ainaro (**Table 3**).

Table 3**.** Produtivity of theagrícolas areas in use in the municipalities of Aileu, Ainaro and Covalima

Municipality	T.M. agricultural areas in use (ha)	Freq. Production /year	Rice Production (kg)		Corn Production (kg)	
			Period	Year	Period	Year
Alieu	0.75±0.10	1	-	391.18±47.75	-	171.43±19.66
Ainaro	1.21±0.70	1	-	1782.15±68.33	-	176.56±17.33
Covalima	1.98±1.50	2	2460±123.96	6365±1027	913±103	1838.41.±208.33

Note**:** T.M...: Average size of agricultural areas in use; Freq....: production frequency per year

The productivity of agricultural areas of the municipality of Aileu, with an area of 0.75 hectares with the average production of rice and corn per period is 391.18 and 171.34 kg, respectively. However, in the municipality of Ainaro, with an average size of the agricultural area of 1.21 hectares, it is capable of producing rice 1,782.15 kg and corn 176.56 kg. Unlike the productivity of agricultural areas of the municipality of Covalima with an average area of 1.98 hectares, it is capable of producing 6,365.00 kg of rice and 1,838.41 kg of corn per year.

Agricultural productivity is essential for many reasons providing more food and increasing productivity affects the growth of the agricultural market, the labor market, and the income of many families. According to Ferreira et al. (2016), the stabilization of the economy, trade opening, and globalization caused concerns about the efficiency and productivity of the different chains to increase.

4.2.3 Investment

The results of the study showed that in the municipalities of Aileu, Ainaro and Covalima, agricultural production activities are financed mainly by the producers themselves, with much less access to some credits, or financial support. As shown in **Figures 3, 4 and 5**, in the municipality of Aileu about 85%, Ainaro 83% and Covalima 65% of producers as respondents finance their own productive activities, respectively, and less than 15% to 35% who obtained credit, loans and supported by NGOs and the government. The interviewees reported that the financial factor is one of the indisputable factors in the implementation of productive activities. In the context of improving agricultural productivity, greater investment is needed, and there are usually three types of investment in agricultural areas, which vary according to the objectives of productive activity, short, medium and long-term. According to Betarelli Junior et al. (2019) already when credit resources are intended to finance agricultural costs, the amounts received are destined to buy the in sums in the production process of agricultural goods (intermediate sums and production factors).

Figure 3. Investment in agricultural production activity in the municipality of Ainaro

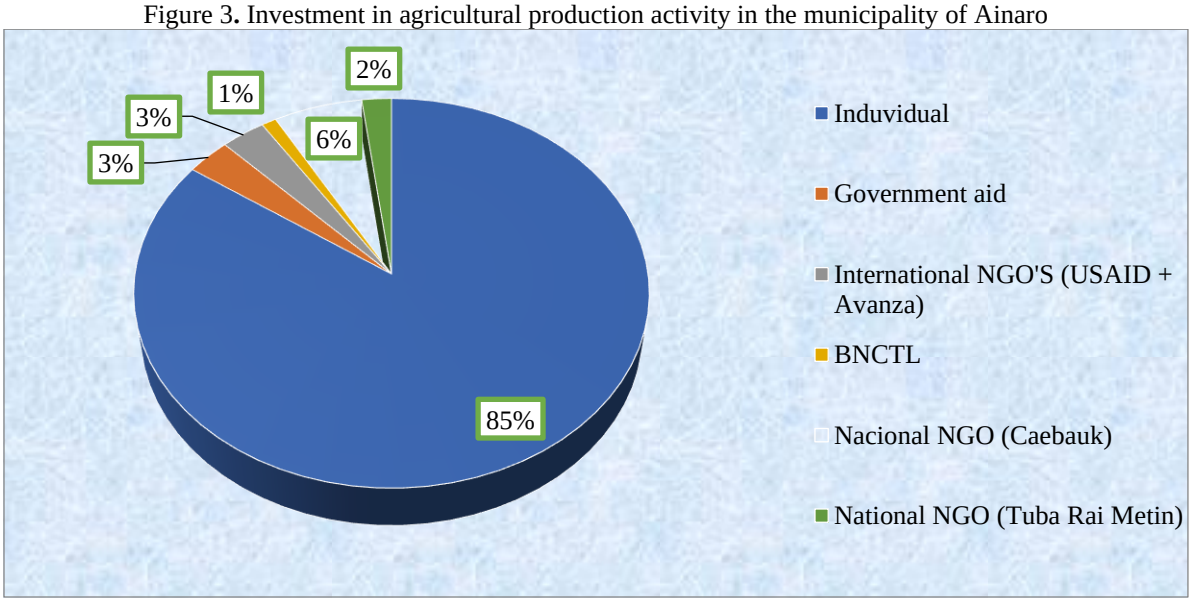


Figure 4. Type of investment in agricultural production activity in the municipality of Aileu

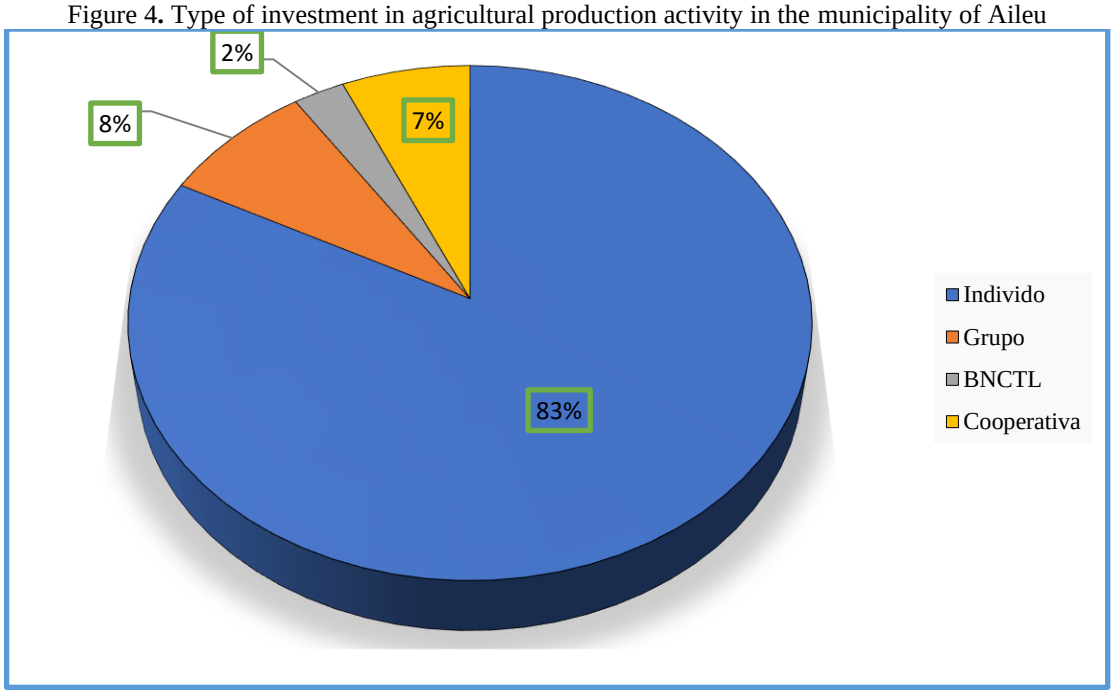
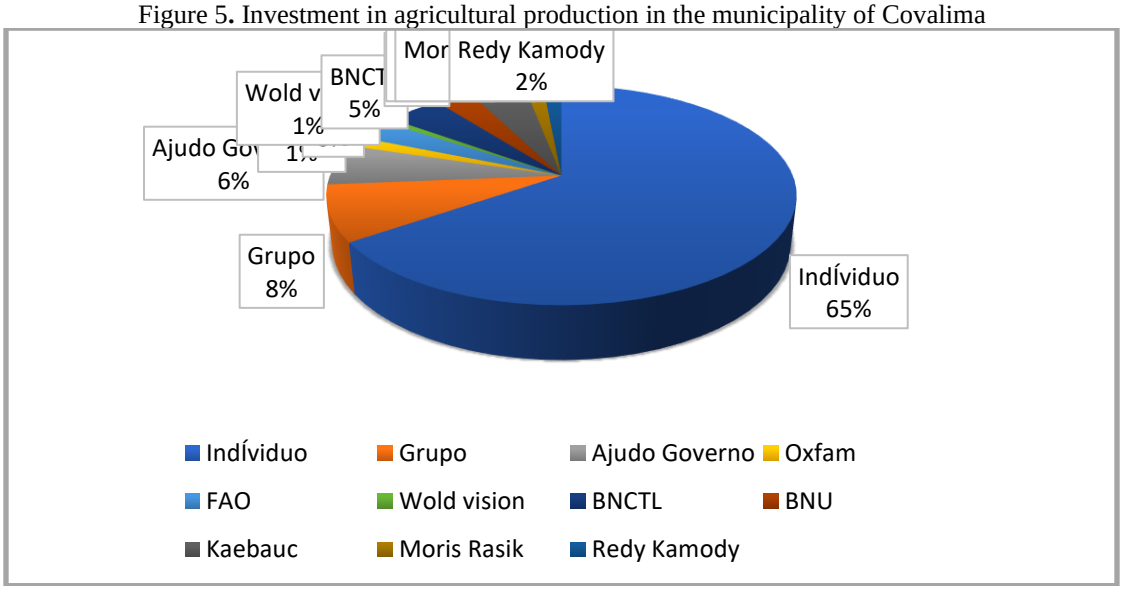


Figure 5. Investment in agricultural production in the municipality of Covalima



4.2.4 Workforce

The result obtained in this study showed that the average workforce per family of the interviewees **(Table 4),** especially in gender participation, is still balanced. Thus, it is perceived that it is a very strong and important indicator in the process of agricultural development, especially in the three municipalities and observed s and that each family can employ on average 4.76 people in agricultural areas. The result of the description by gender showed that about 39.70% of the total family members are men and 35.20% are women. Regarding the participation of young people, about 14.44% are male and 10.67% female. Therefore, it was found that gender participation in agricultural activities in the three municipalities was still balanced, and it is expected that this situation will continue, i.e. it would be better in the future in the context of improving the sustainability of agricultural production.

According to Allier (1980), in the peasant production units, it should also be up to the worker, in his capacity as head of the family and the one who embodies the family work unit, organizes the production, distributes the tasks to be performed and, himself, assume the leadership of the work. Description of age and gender of the interviewees as described in **Table 4**.

Table 4. Result of the analysis of the respondents' workforce according to the age and gender.

Municipality	Resp.	TMF	Descriptive analysis result							
			M	F	MJ	FJ	Average (M)	M (%)	Average (A)	F (%)
Aileu	69	355	131	113	65	47	2.8	55	2.3	45
Ainaro	93	334	166	132	29	8	2.1	58	1.5	42
Covalima	100	558	198	194	86	79	2.8	51	2.7	49
Total	262	1247	495	439	180	134	2.6	54	2.2	46

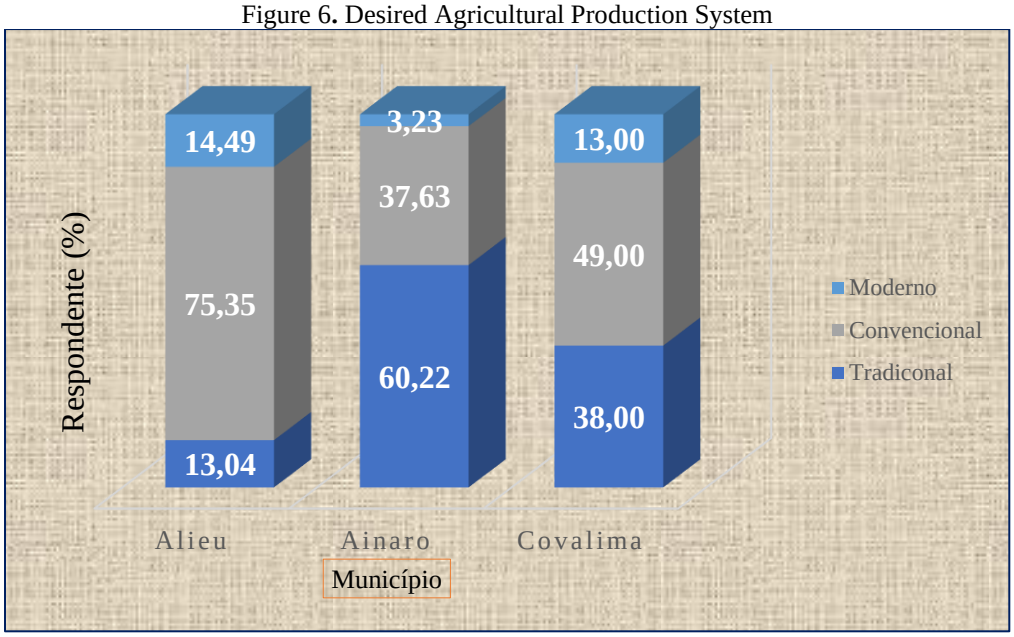
Note: Answerable; TMF: Total Family Member; M: Male; F: Female; MJ: Male young; FJ: Young Femenino

According to Cumaru (2006), in general, the whole family is involved in the production process that, in a way, becomes responsible for subsistence and income generation for families and communities. The author also stated that this type of agriculture preserves some traditional practices such as specific periods for planting different crops, little use of insums and activities in line with the cycles of nature.

4.2.5 Agricultural Production Systems

It is observed that there was variation in the use of agricultural production systems in the three municipalities. About 75.35% and 49.00% of respondents from the municipalities of Aileu and Covalima, respectively, said they preferred conventional production systems because they are low-cost and did not require specialized technicians **(Figure 6).** On the other hand, of respondents in the municipality of Ainaro, about 60.22% reported that they still prefer to use traditional production systems due to their much lower financial capacity. The production system used is also considered as one of the main production factors that affect the productivity of agricultural factors, especially factors such as land and seeds.

Figure 6. Desired Agricultural Production System



Agricultural systems are a set of technical, social and economic activities implemented in an agricultural production area. It can be classified in the intensive or extensive system. This classification will depend on several factors to know how to differentiate them, such as the productivity index obtained

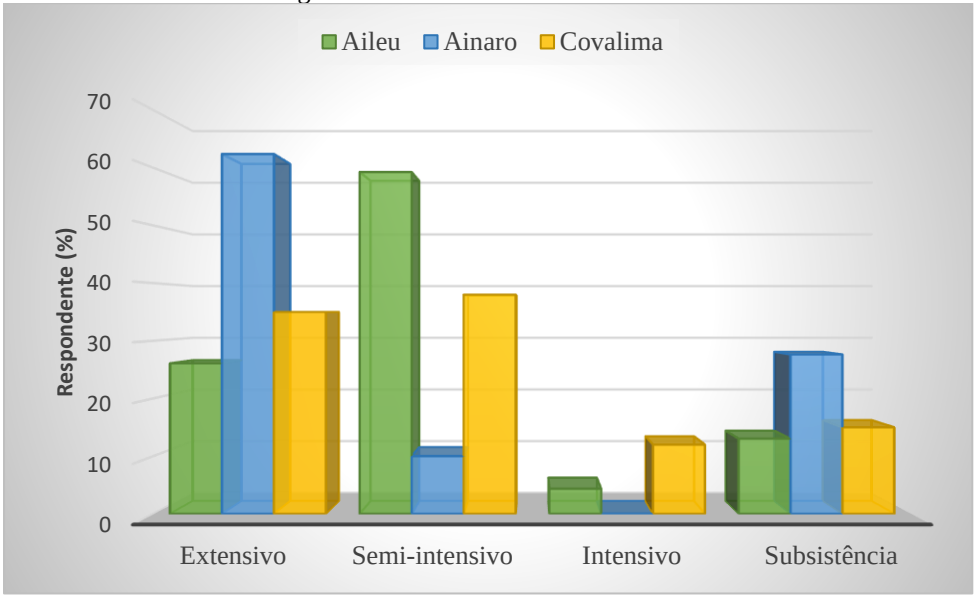
Integrated systems of sustainable agricultural production are strategies of productive innovation in a process that require innovation in management. According to Hirakuri et al. (2012) it is defined that: the agricultural system refers to the regional organization of the various plant and/or animal production systems, which considers the peculiarities and similarities of these different systems. This organization should allow the construction of models and productive arrangements that describe, in the most accurate way possible, the predominant production systems in the region. The production system is composed of the set of cultivation and/or rearing systems within the scope of a rural property, defined from production factors such as land, capital and labor, and interconnected by a management process. Integration system occurs when cultivation/rearing systems for different purposes (agriculture or farming, livestock and forest) are integrated into the same gleba, to maximize the use of the area and the means of production, and also diversify income.

In a perspective that is pre-hotly used by agrarian economists, the production system represents the combination of productions and factors within the production unit or decision center that is the company, being the productions (Pinto, 2010). The result of the activities to which the farmer is dedicated or intends to dedicate and the factors, the human and material resources needed and available, to achieve the desired economic result. In this context, it should be noted that, from this point of view, it is recognized that there is a link between the technical considerations and the economic implications of the system.

4.2.6 Livestock Farming Systems

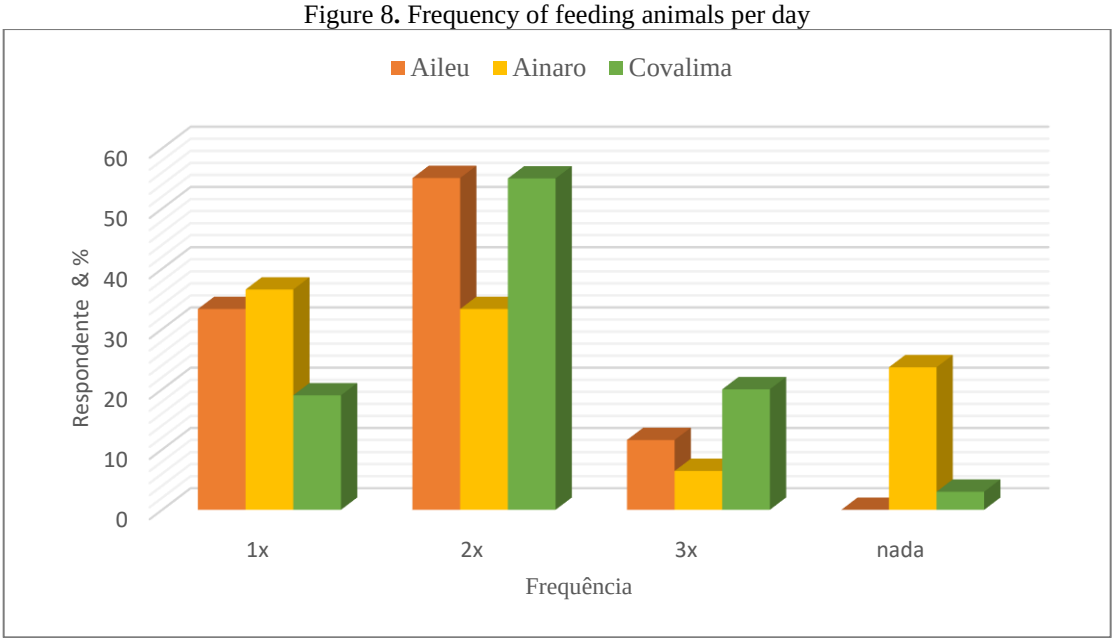
It was observed that most of the producers in the three municipalities still live with the extensive and semi-intensive conventional production system with and without some assistance in the production process **(Figure 7**), mainly in the context of the quantity and quality of food supplied. On the part of the frequency of feeding the animals, there was variation between the producers in the three municipalities. In the municipalities of Aileu and Covalima, most producers feed their animals twice a day, without worrying about the quality of the food offered. However, in the municipality of Ainaro, most producers feed the animals only once a day, also without worrying about the quality of the food offered.

Figure 7. Sistebut from creation animal



According to (Gomes & Mali Code, 2020), production in an extensive system without technical assistance, mainly food quality control, causes animals to have low productive performance. Most farmers still maintain their activities in the traditional extensive production system due to low production costs, less manpower, and no need for professional technicians. In addition, due to livestock activity is only a secondary family activity. (Gomes, 2021). In livestock, maintenance management will determine the success or failure of the production activity, especially the management of the food quality factor provided, in addition to reproductive and sanitary management. The frequency of feeding the animals is described in **Figure 8**.

Figure 8. Frequency of feeding animals per day



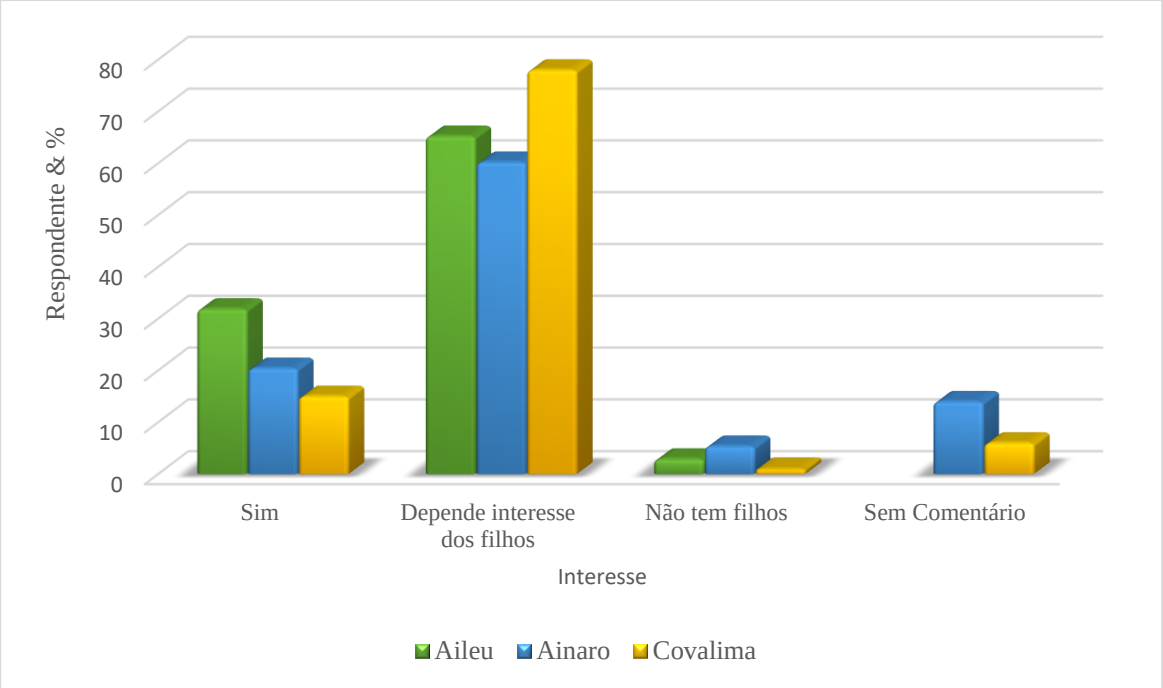
Concerning the difficulty of financial resources, integrated systems require a considerable initial investment because they are innovative in production with gradual return on time (Behling et al., 2014). In this sense, there are government incentive programs for the use of new technologies and low-carbon agriculture. The first aims to foster the use of new technologies and the second is aimed at stimulating integrated systems and sustainable production technologies.

4.3 SOCIO-ECONOMIC

4.3.1 Interest in encouraging young people to work as farmers

In the context of the interest in encouraging young people to continue to engage in agricultural activities in the future, respondents reported that they depend on the interest of young people, including their children. There were the same responses from most respondents in the three municipalities **(Figure 9**). This result shows serious challenges in the development of agricultural production in the future due to the smaller number of people who want to keep rolling with agricultural activity. According to the interviewees, in recent years, the lives of producers have been getting worse, causing young people to start abandoning agricultural activities and in search of other effective activities that bring benefits in improving their daily lives. Panno et al. (2014), internal and external influences are crucial in the decision to leave, remain or return to the field, noticeable in the young people in question.

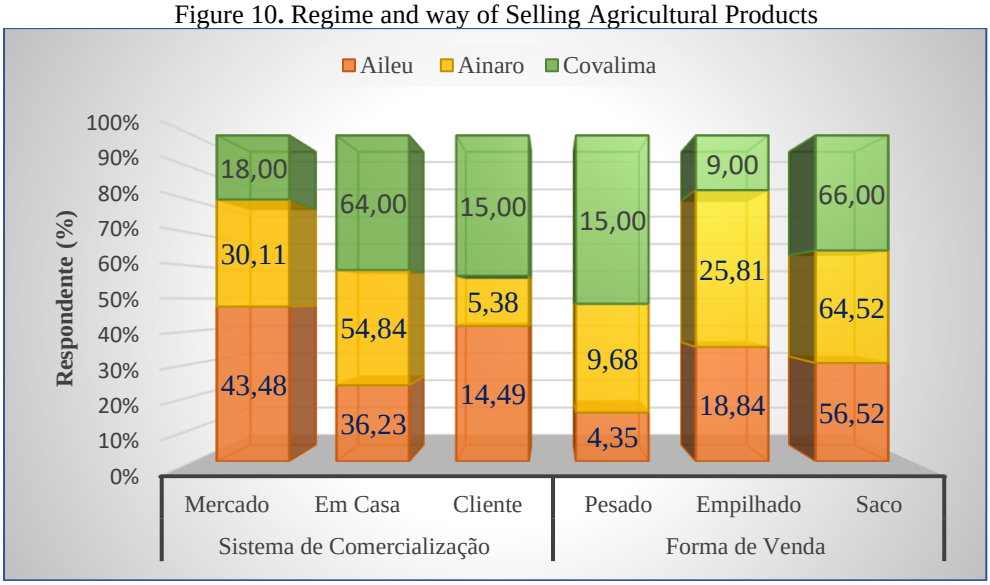
Figure 9. Encourage the younger generation to continue agricultural activities in the future



4.3.2 Agricultural Products Marketing System

It was found that the way agricultural products were marketed in the three municipalities varied according to access to the buyer market. In the municipalities of Ainaro and Covalima, most respondents **(Figure 10**) reported that buyers often go to their homes to buy products and generally sell them in 50 kg bags, for example, each bag of rice is sold at a price range between $21 and $24 ($0.42 to $0.48/kg) depending on consumer market demand. However, respondents in the municipality of Aileu reported that they usually sell agricultural products directly on the market and sometimes there are sales at the production sites.

Figure 10. Regime and way of Selling Agricultural Products

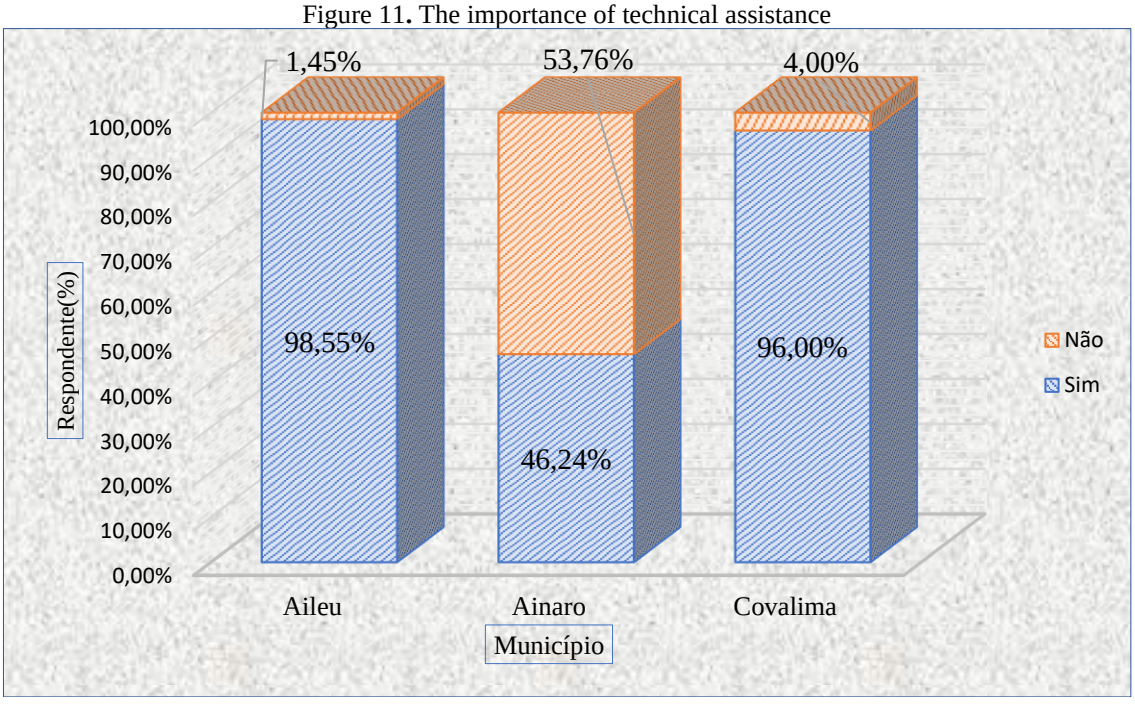


According to Tadeu et al. (2007), the marketing system includes the existence of a highway or railway to the establishment and operation of purchasing power or the installation of an agro-industrial plant or a storage center. The authors also state that this aspect is of extraordinary importance and is often one of the main points for the expansion of production. According to Sabourin (... sd), in terms of the commercialization of agricultural products, peasants or their organizations have implemented various types of "interfaces," allowing cohabitation, an articulation between reciprocity practices and exchange practices. Some of these mechanisms are old and, in addition to the southern nations, also work in the countries of Europe. The author also stated that the first interface is direct selling which allows the meeting between producer and consumer, such as sales on the farm or in proximity markets, such as the markets of producers in France, Africa, or Brazil. There is a relationship of exchange, but the direct contact between producer and buyer allows us to redouble it with a relationship of binary reciprocity, face to face, which generates affective values: feeling of friendship, mutual recognition, or ethnic values of fidelity and respect.

4.4 TECHNICAL ASSISTANCE

The results of the interviews on the importance of technical assistance from the Ministry of Agriculture and Fisheries (MAP) through extensionists to farmers are presented in **Figure 11**. Respondents reported that technical assistance in the context of technology knowledge transfer is very important to increase farmers' knowledge of the technology absorption process to improve production quality.

Figure 11**.** The importance of technical assistance



Most respondents (Figure **11**) from the municipalities of Aileu and Covalima stated that the presence of extensionists is very important for them, but it is unfortunate because the frequency of extension visits is very rare. However, respondents from the municipality of Ainaro reported that they had never received technical assistance from extensionists, and only heard that extensionists only attended to those who worked in the groups of farmers formed by the Municipal MAP. The respondents reported that few receive or received technical assistance, but it was observed that producers who receive or received assistance, heard a significant increase in their production. Most producers are interested in receiving assistance, but many are discredited by someone technical for the lack of correct monitoring, or because they do not show confidence in what they say shows that there should be better training for them.

Technical assistance and rural extension services are essential for the sustainable development of family farming, especially for the insertion and feasibility of new agroecological practices. This promotion still emerges timidly in the daily life of family farming and needs a systemic scope adequate to this economic activity (Nunes et al., 2020). Sustainable agricultural techniques and technologies usually reach the farmer through technical assistance and rural extension, technical assistance alone is not a determining factor, unique and sovereign for the development or not of a settlement area or even a rural community, (Fatorelli & Mertens, 2010, p.406).

5 CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

According to the results of the research, concluding that the mean age of the interviewees was between 42.12 and 48.06 years, with experience as a producer from 15.65 to 24.18 years. The level of education varies among the three municipalities with the majority of respondents without schooling occurring in the municipality of Covalima.

Minimum total agricultural areas of 0.20 ha and maximum sums of 11 ha with a minimum total use area of 0.75 and a maximum of 1.98 ha, and abandoned areas between 0.81 and 1.97 ha per interviewee, respectively. The highest production of rice and corn occurs in the municipality of Covalima and the lowest production occurs in the municipality of Aileu. Concerning the financing of agricultural activities, the majority of farmers finance their activities on their own, and the family member who works in agricultural activities has about 3 to 6 people in each family.

The frequency of agricultural productivity varies between the three municipalities. In the municipality of Covalima there is twice the production per year (twice the production per year), but in the municipalities of Aileu and Ainaro occurs only once a year. Most interviewees use conventional agricultural production systems, mainly rice, and corn, and use extensive systems in animal production. The slightest interest of parents in encouraging young people to continue farming in the future, in this case, depends on the choice of children to define their future.

The regime for the sale of agricultural products varies in terms of market access and the buyer arriving at the place of production between the three municipalities. On technical assistance, most respondents stated it is very important in the context of introducing technological knowledge in rural areas.

5.2 RECOMMENDATION

Based on the conclusion of the study, the following questions are recommended:

1. Strengthen farmers with technical assistance, seeds, fertilizers, and other free resources to improve the productivity of agricultural factors in the context of rising production quality;
2. Provide low-interest loans to help farmers finance their productive activities;
3. Strengthening the market system and prices of agricultural products;
4. Implement a policy of bringing young graduates in agriculture back to their home villages to become modern producers with subsidized support for at least a year.

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DECLARATION OF CONFLICT OF INTEREST

We certify that there is no conflict of interest with any financial organization about the material discussed in this manuscript.

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