

CHARACTERIZATION AND CLASSIFICATION OF THE PRODUCTION SYSTEMS OF THE FAMILY AGRICULTURAL PRODUCTION AT PENIPE CANTON CHIMBORAZO, ECUADOR

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Abstract

Background: This study was conducted in the Penipe canton, Chimborazo province, Ecuador, the Objective: is the characterizing and classifying the local family agriculture production systems. Methodology: The researchers worked with a total of 1,055 families, from which they extracted a sample (n=68) to conduct a study on geographical location, zoning, and survey interview, which included technical, socioeconomic, productive, and environmental aspects of the farms from a quantitative and qualitative standpoint. Results: express the characteristics of the production systems, allowing classifying and classifying the production systems of family agriculture in the canton. The conglomerated analysis using Ward's method and a 900-meter Euclidian distance divided the farms into three groups. Implications: Several aspects to be improved were identified, which limit the development of farms to be considered as sustainable systems, evaluating aspects of productivity, reliability in the productive system, resilience, adaptability, equity, and self-

management by local producers. Conclusions: Specialized Family Agriculture (SFA) is made up of 19 families, with an average age of 54 years, land ownership of 1.57 hectares, additional labor hired at a rate of two days per week, and monthly earnings of \$584 USD. Diversified Family Agriculture (DFF), composed of 34 families, with an average age of 53 years, land ownership of 6,99 ha, (95%) of families contracting additional labor to carry out agricultural activities, (8 daily wages/ campaign) and monthly earnings of \$792 USD. Subsistence Family Agriculture (SFA), composed of 15 families, with an average age of 48 years, and land ownership of 0.54 ha, this production system is distinguished by the fact that it does not hire additional labor to carry out agricultural activities, as the majority of its output is devoted to self-sufficiency and earnings of \$115 USD per month.

Keywords: Production system, family agriculture, characterization, classification.

Introduction

Family agriculture in Ecuador: according to the study carried out by the National Institute of Statistics and Censuses (INEC 2013), the total population of Ecuador is 16,358,000 inhabitants; with an area of 256,370 km². The economically active population currently represents 45.30% (7,410,174), with respect to the total population. Agriculture is one of the main sources of employment and income for the rural population and represents 30% (3,450,148) of the total population.

The Ministry of Agriculture, Livestock, Aquaculture and Fisheries (MAGAP 2016), mentions that 75% of the rural population (2'528.703) is dedicated to family agriculture, forming 842,901 productive units, which occupy a total production area of 4'500.000 ha. Although its economic importance has been relegated to the background as an economic sector, compared to other sectors considered more dynamic (oil, construction, commerce, services). It is still a strategic sector related both to employment, as well as to the production of food and export products, since it represents 7.33% of the Gross Domestic Product in the country (MAGAP 2016). At the national level, there is evidence of a slight increase in the percentage of households dedicated to family agriculture as of 1999 with 61.25% (553,621 households), 62.63% (681,188 households) in 2006 and 75% (842 901 households), in 2016. This means a relative increase that responds to the country's population growth.

The goal of this research is to contribute to the understanding of family agriculture production systems in Penipe Canton based on secondary sources of information and survey interviews. The analysis and understanding of the characteristics and relevance of family agriculture will contribute to the design and implementation of specific policies for this actor in the territory. Furthermore, the main characteristics of

family producers in the exploitation of cereals, tubers, vegetables, and fruit trees, accompanied by animal production, are explained, as are the processes that resulted in their composition, both quantitatively and qualitatively, such as Cieza, et al. recommend (2015).

In the analysis of agrarian systems, the biophysical aspect and geographic location is based on agricultural production within the production systems, in a specific geographic space, adapted to the biophysical and climatic conditions of the sector. The goal is to evaluate the interactions between agricultural system components at various levels, from general to specific (Torres y Lovois, 2009), in order to understand why certain phenomena, occur in the countryside and to develop models that explain how specific agricultural reality functions based on a specific real location. Dufumier (1995). In general, farmers work in a variety of environmental and socioeconomic conditions unique to their regions. The differences stem from access to and ownership of land, as well as other natural resources, information, public services, markets, credit, financial resources, acquired knowledge, and availability of labor (Torres and Lovois, 2009). These differences result in distinct evolutions, disparities in capitalization levels, and differences in decision-making and resource optimization criteria (Dufumier, 1995).

The use of geographic location systems constitutes a participatory method, with the direct participation of users (INEC 2013). Photographs of Earth's surface taken from space have numerous applications (cartography, cadastre, agriculture, geophysics, ecology, education, tourism, and so on), allowing users to view millions of geophysical data and services by navigating satellite images. Thus facilitating, a greater knowledge of our surroundings. The use of satellite images was put into practice with local residents, identifying changes or modifications that occurred over time in order to do an analysis of agricultural production systems (Van y Prain, 2002; Smith et al., 2009)

The characteristics of family agriculture (FA). The FA is made up of agricultural producers, livestock farmers, foresters, artisanal fishermen, and fish farmers with limited resources (FAO, 2014). At the same time built on a foundation that combines some aspects that govern within an agricultural family nucleus, such as:

- Limited access to land and capital resources, depending on their endowment.
- Use of family labor, with all family members actively participating in the production process, even when there may be a certain division of labor. The head of the family does not assume exclusive functions of manager but is one more worker of the family nucleus.
- Production of some agro-silvopasture-aquaculture-fishery goods, which represents their main source of income, which is complemented by other non-agricultural activities carried out inside or outside the family

unit. (Services related to rural tourism, environmental benefits, artisanal production, small agro-industries, sporadic employment, etc.)

These aspects define those households considered as “family” in order to differentiate from those that are not family members and that may be capitalist companies. As well as those households that, not being companies, do not produce agricultural or similar goods (FAO 2017). Given the existence of many modes of production, the small and medium-sized Family Agriculture (FA) is proposed as a sustainable foundation for rural and national development (Loewy, 2008). The key feature of this subset of low-wage producers is the coexistence of the productive and domestic units in a single unit of production and consumption; the impossibility of moving forward a sustained capital accumulation process and the importance of familiar handwork to the production process (Cieza et al., 2015)

Characterization consists in describing the property in accordance with the dimensions of agroecological, technical-productive, and socioeconomic analysis (Loewy, 2008). It involves determining a set of variables that distinguish one farm or unit of production from others; therefore, it is considered as a determining stage in agricultural systems research. The characterization process consists in determining the aspects that a farmer must bring together in order to be considered within the context of family agriculture, such as production and labor resources, output level, and market access. It is essential that these can be identified so that the criteria for registering farmers in a subsequent phase may be defined (FAO, 2017).

Interaction of the socioeconomic, environmental, and productive characteristics of the production system. Mazoyer y Roudart (2001), argue that a certain agriculture is the result of its history, as well as the past and present actions of the societies that participate in it. The diverse types of farmers differ in their socioeconomic circumstances, such as decision-making and agricultural practices. The evolution of each type of farmer and their production systems is defined by a complex set of environmental, technological, social, and economic factors, all of which are interconnected (Loewy 2008).

The analysis of the characteristic criteria in the production system provides important elements to establish the typology of farmers in familiar agricultural systems. The final result is the definition of different categories of farmers, each with its own dominant production systems. It is worth noting that there is no main category of farmers that will work in every situation. Likewise, there is no rigid border between each type of farmer since they are always evolving and can change their production systems. As well as in moving from one socioeconomic category to another, in the event of having a track record of capital accumulation or, conversely, of decapitalization (Silva y Basso, 2005).

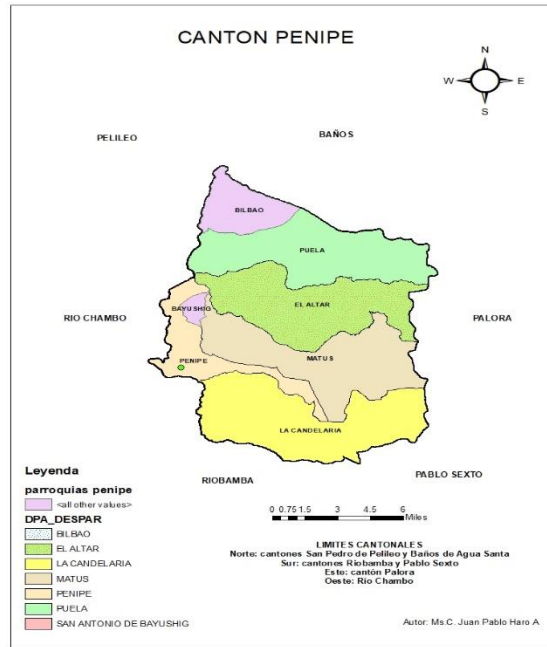
The classification of farms in Ecuador is determined based on a discriminatory criterion such as agricultural economic income and the hiring of occasional labor. Based on this, the typologies of Family Farming were determined as: Specialized Family Agriculture (EFA), results from households that have a predominant agricultural income (75% or more) and a greater requirement for provisional labor. While those households whose income from agricultural activities is not predominant (25% or less) as well as the average hiring of temporary labor, are considered Diversified Family Agriculture (DFA) (Martínez, 2013; Cieza et al. 2015).

Martinez (2013) asserts that because the typology's key criterion is familial income and temporary labor contracting, there may be households that do not recognize income or simply do not declare income. They also do not hire additional labor, which is included in the Self-Consumption Family Agriculture (SFA), whose income only allows them to subsist. This is due to a variety of factors, including the unwillingness to provide information on income, the presence of farms whose production is focused solely toward self-sufficiency, the presence of critical situations (plagues, diseases) that disrupt farming, and so on. The low proportion of rural family farms without income impedes the ability to further expand the typology, therefore only the two types of family agriculture are considered to be kept in the study.

Materials and methods.

Study area: The research was conducted in the Penipe canton (Figure 1), which is located northeast of the province of Chimborazo and includes seven parishes: La Matriz, El Altar, Puela, Matus, San Antonio de Bayushig, Candelaria, Bilbao. It has an area of: 370.95 km², whose geopolitical limits are north: San Pedro de Pelileo and Baños de Agua Santa cantons; South: Riobamba and Pablo Sexto cantons; East: Palora canton; West: Chambo River.

Figure 1. Political map of the Penipe canton, with its respective parishes.



The coordinates are 1° 26'00" and 1° 41'45" (793964.73; 9841403.66 UTM, WGS84, Zone 17 S) south latitude between 78° 21'30" and 78° 32'45" long (773052.42; 9812385.77 UTM, WGS84, Zone 17 S).

This research was exploratory, descriptive, correlational, analytical, and explanatory. For the characterization and classification of family agriculture production systems, the 6 parishes and cantonal capital were taken into account, with a total population of 7.032 inhabitants (PDyOT Penipe, 2015), made up of 1.055 family producers that are dedicated to family agriculture (MAGAP, 2016). A random, unrestricted sample of this population was obtained [n: 68] (Castellanos, 2011), in which the sampled population was concentrated in a set of agro-productive families.

In the first stage of this research, a geospatial analysis of the study area was carried out, based on the satellite navigation and location system. The ArcGis 10.4 software was downloaded, and thanks to the Ecuador 2012 satellite ortho photography, the district limits and their biophysical characteristics were defined. Also identifying the geographical location of the farms studied. This enabled the characterization, description, and analysis of the sociocultural, economic, productive, and environmental aspects of the family agriculture system in the canton, through the use of a questionnaire survey administered in person to each studied family.

Finally, the systematized information was analyzed, selecting 60 variables with high discriminant power ($CV > 50\%$) (Lores et al., 2008). The characterization information was systematized in Excel 2020 spreadsheets and analyzed with the statistical package (R_commander), using Multivariate Analysis, following the guidelines recommended by Escobar and Berdegué, (1990) and Coronel and Ortuño (2015). The coefficients of variation were calculated to rule out those variables that lack discriminatory power, and the analysis of principal components was carried out, which can be classified as variables in the cluster analysis, by the ward method. Also, as a measure of squared Euclidean distance, and plots on a dendrogram.

Results and Discussion.

Biophysical and geographic location

SIN (2017), states that the pedological composition of the Penipe canton corresponds to the suborders, AQUEPTS, ANDEPTS, PSAMMENTS, FLUVENTS, ORTHENTS and ANDEPTS; the latter correspond to 37.71% of the canton's surface, forming part of the group of inceptisols derived from volcanic parent materials. Characterized by their high fertility and suitability for agricultural and livestock activities. 36.70% of the cantonal territory presents steep slopes with danger of erosion. 11.98% of the territory has flat and undulating slopes, with good possibilities for agriculture and livestock. Meanwhile 19.03% is recommended for the implementation of soil conservation works; 32.29% have very steep slopes.

According to Holdridge (1982), the life zones of the Penipe canton are classified as Equatorial Cold Semi Humid High Mountain (29.51% of the territory). In the high areas of communities such as Pungal de Puela, Utuñag, Matus, Tarau, Candelaria and Releche. Then Equatorial Cold High Mountain (70.49% of the area of the canton) in the other communities of the canton. (SIN 2017).

According to PDyOT Penipe (2015), the areas in the Penipe canton have elevations ranging from 2160 msnm to 5319 msnm, with minimum precipitation ranging from 500 to 750 mm (western region) and maximum precipitation ranging from 2000 to 2500 mm/year (eastern region). The estimated average temperature in the canton is 12.5°C, with a maximum range that varies between 10°C – 12°C and a minimum of 2 to 4°C; relative humidity varies between 65 to 85%. It is a representative municipality, with the majority of its economic income coming from the agricultural sector.

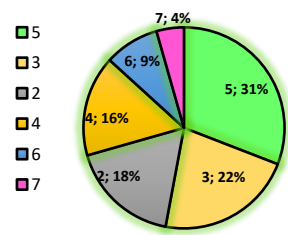
General characterization of family agriculture in the Penipe canton

The main economic activity is agriculture, followed by livestock and other relevant activities that generate income for the family production system.

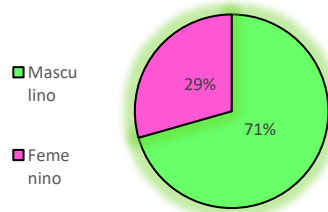
Tables 1, 2, and 3, and figures 3, 4, and 5 show the summary of results of the characterization of agroecosystems, in their sociocultural, economical, productive, and environmental dimensions, respectively.

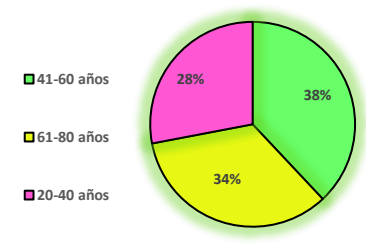
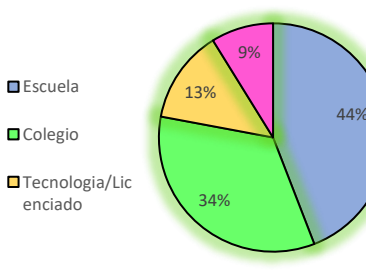
Table 1. Characterization results of family agriculture in the Penipe canton. Sociocultural dimension

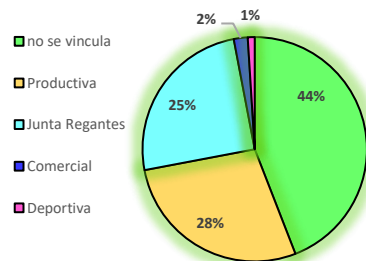
Indicators		Results
People who make up the family		They are mostly made up of 5 people (31%), 3 members (22%), 2 people (18%), 4 people (16%), 6 people (9%), 7 people (4%), according to the INEC census (2010) which shows that the family structure corresponds to an average of 5 people in the province of Chimborazo.



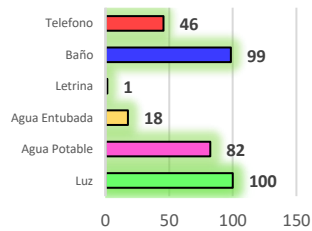
Family manager	Of the total, 71% is male, and 29% female, referring to the INEC population and housing census (2010), in which the driving force within the system is represented by men.
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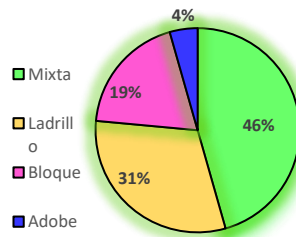
Age	Of the total number of respondents (38%) state that their age range is between 41-60 years, followed by a group whose age ranges between 61-80 years (28%) and is completed with farmers who are between 20- 40 years (28%).  <table border="1"><thead><tr><th>Age Range</th><th>Percentage</th></tr></thead><tbody><tr><td>41-60 años</td><td>38%</td></tr><tr><td>61-80 años</td><td>28%</td></tr><tr><td>20-40 años</td><td>28%</td></tr></tbody></table>	Age Range	Percentage	41-60 años	38%	61-80 años	28%	20-40 años	28%		
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Instruction	They express that (44%) of respondents have a primary education level, (34%) have a secondary education level, and (13%) have a technology or bachelor's degree, (9%) have a university degree.  <table border="1"><thead><tr><th>Education Level</th><th>Percentage</th></tr></thead><tbody><tr><td>Escuela</td><td>44%</td></tr><tr><td>Colegio</td><td>34%</td></tr><tr><td>Tecnologia/Licenciado</td><td>13%</td></tr><tr><td>Universidad</td><td>9%</td></tr></tbody></table>	Education Level	Percentage	Escuela	44%	Colegio	34%	Tecnologia/Licenciado	13%	Universidad	9%
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Bonding and social integration	44% are not linked to any group or association. Participates in some productive association (28%). It belongs to a group of irrigation board (25%). It is part of a commercial group (2%), religious (1%).										



Basic services (100%) of the families state that they have electricity in their homes, drinking water (82%), piped water (18%), have a bathroom (99%), a latrine (1%), and telephone service (46%).



Housing type They state that the construction is of the mixed type, brick, block (46%), followed by houses only made of brick (31%), block (19%), and adobe (4%).

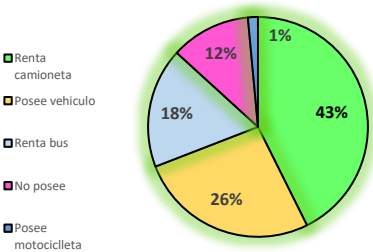


Health Access Health Center without equipment and trained personnel (71%), Health Center equipped and well-

trained personnel (13%), Health Center without equipment and without trained personnel (12%), Health Center equipped without personnel (3%), no health center, no care (1%).

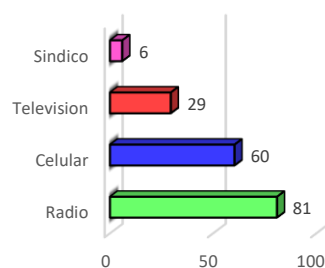
Transportation

A majority group of families, rent a van for their mobilization and transport of products (43%), have a vehicle to transport agricultural products from their farm (26%), have access to the bus (18%), have no access to the bus (12%), own a motorcycle only for his personal mobilization (1%)



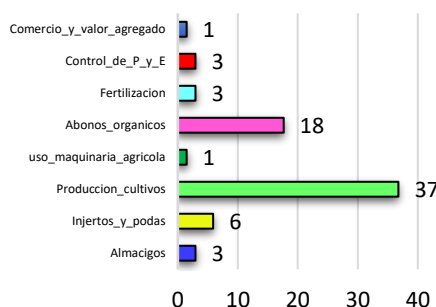
Communication

Producers use the radio (81%), cell phone (60%), television (29%) and through a parish or community trustee (6%), to find out about all the activities that take place in the parish and in the canton



Training

(56%) of family producers do not receive any type of training, (20%) express that through the shoulder-to-shoulder program with MAG technicians they have received training at least once in the locality. (14%) state that the Chimborazo Polytechnic University School has participated in training, (8%) of producers state that they have been trained by a commercial house of agricultural inputs, and (1%) state that they have been trained by the GADM



Penipe.

The surveyed population states that they have received training in the following topics: crop production (37%), production of organic fertilizers (18%), grafting and pruning of fruit trees (6%), control of pests and diseases (3%), fertilization (3%), elaboration of seedlings (3%), use of agricultural machinery (1%), commerce and added value (1%). The topics that most interest the producers are: production and management of organic fertilizers (87%), production of priority crops in the area (82%), trade and added value (57%), control and management of pests and diseases (46%), fertilization (38%), seedlings (19%), grafts and pruning (15%), use of agricultural machinery (9%).

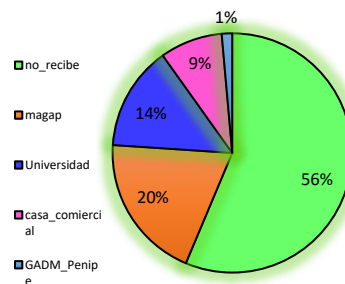
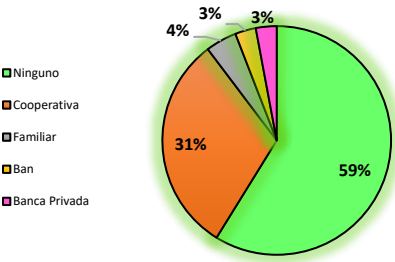


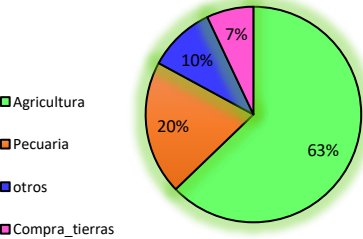
Table 2. Characterization results of family farming in the Penipe canton. Productive economic dimension.

Indicators	Results																
Farm Income	Mostly between 387-700 USD (53%), (22%) earn between 0 - 386 USD, this level of income does not even have the basic unified remuneration in Ecuador which is 386 USD per month. This amount is far from the value of the vital family basket, which is greater than 498.40 USD (Inec, 2017), (21%) have 701-1000 USD, only a small group of families have incomes greater than 1001 USD per month. (4%). <table border="1"> <thead> <tr> <th>Income Level</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>387-700</td> <td>53%</td> </tr> <tr> <td>0-386</td> <td>22%</td> </tr> <tr> <td>701-1000</td> <td>21%</td> </tr> <tr> <td>>1001</td> <td>4%</td> </tr> </tbody> </table>	Income Level	Percentage	387-700	53%	0-386	22%	701-1000	21%	>1001	4%						
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Income from other activity	Additional activities that generate income for the family, such as daily activity (36%), public servant or retiree (18%), informal trade (16%), livestock activity (15%), private sector employee (7%), carriers (7%), gastronomy (1%). <table border="1"> <thead> <tr> <th>Activity</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Jornal</td> <td>36%</td> </tr> <tr> <td>Servidor_Publico/Jubilado</td> <td>18%</td> </tr> <tr> <td>Comercial_(licores, ventas)</td> <td>16%</td> </tr> <tr> <td>Pecuaria</td> <td>15%</td> </tr> <tr> <td>Servidor_privado</td> <td>7%</td> </tr> <tr> <td>Transporte</td> <td>7%</td> </tr> <tr> <td>Other</td> <td>1%</td> </tr> </tbody> </table>	Activity	Percentage	Jornal	36%	Servidor_Publico/Jubilado	18%	Comercial_(licores, ventas)	16%	Pecuaria	15%	Servidor_privado	7%	Transporte	7%	Other	1%
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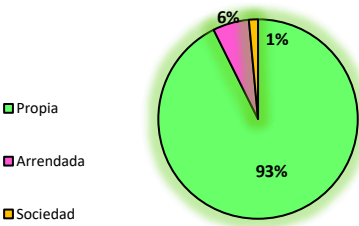
Access to credit	59% do not have access to any loan or economic credit, due to the lack of knowledge of the procedures to Access them, 31% choose to make the credit in a local cooperative, 4% do it through a family loan, 3% do it through BAN Ecuador, taking advantage of the productive credits established by the government, and 3% through private banking.
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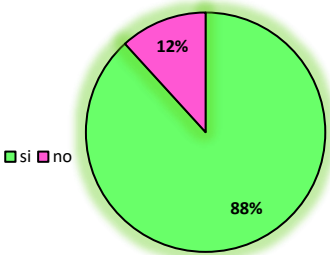
Credit Destination	63% is intended for use in agriculture, purchase of seeds, agricultural supplies and supplies for marketing. 20% to promote the livestock sector, 20% with the purchase of vitamins, dewormers, seasonal food. Another destination constituted in equipping grocery stores, repairing vehicles, family household expenses (10%) and purchase of land for production (7%)
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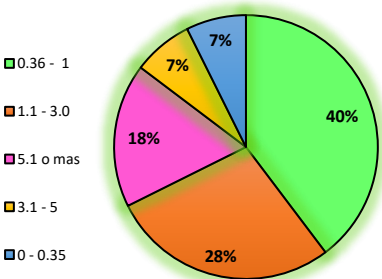
Propiedad de la tierra	distributed as follows: owned land (93%), leased (6%), partnership (1%),
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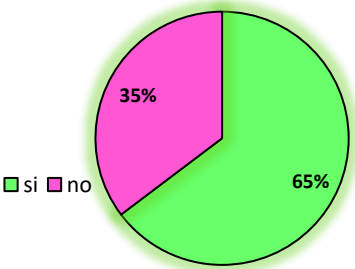
Property title 88% have a property title, and 12% do not have a property title for their properties in the locality.



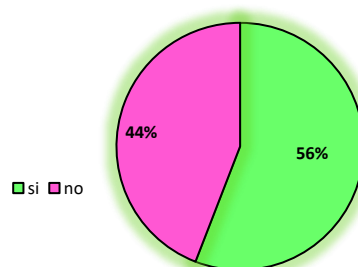
Land occupation area 40% of the area is represented from 0.36 – 1 ha, followed by 28% with 1.1-3 ha. 18% with more than 5.1 ha. A minority of 7% with 3.1-5 ha, and 7% with less than 0.35 ha.



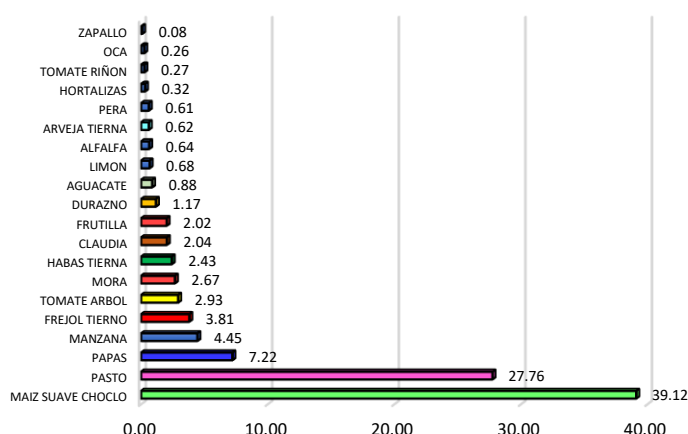
Irrigation The (65%) of lands have moderately technified irrigation, and (35%) do not have irrigation, which makes intensive production difficult.



Additional labor	(56%) hire additional labor because they require support to carry out pre-cultural, cultural and crop harvesting work, and (44%) do not hire labor, since productive work is carried out only with family labor.
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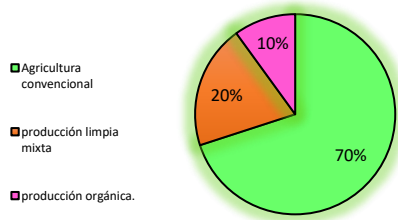


Crop certificate	Of the total area studied, (194.49 ha) is made up of the following crops: soft corn 76.09 ha (39.1%), grass 54ha (27.7%), intended for use in minor species, cattle, pigs, goats, and horses. Potato cultivation 14.04 ha, corresponding to (7.2%), apple 8.66 ha (4.4%), beans 7.41 ha (3.81%), tree tomato with 5.70 ha (2.9%), blackberry 5.2 ha (2.6%), broad beans 4.72 ha (2.4%), claudia 3.97 ha (2.04%), strawberry 3.93 ha (2.02%), peach 2.28ha (1.17%), avocado 1.70 ha (0.88%), lemon 1.31 ha (0.68%) peas 1.2 ha (0.62 %), alfalfa 1.25 ha (0.64%), pear 1.19 ha (0.61%), vegetables 0.615 ha (0.32%), globe tomato 0.516 ha (0.27%), oca 0.5 ha (0.26%), and pumpkin 0.16 ha (0.08%).
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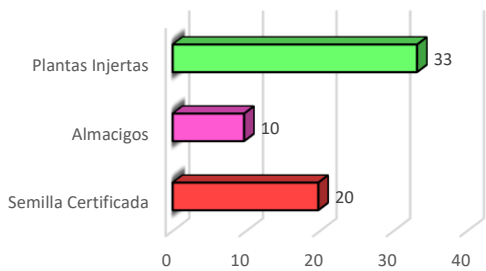


Productive management	70% have a conventional agriculture management system, 20% have a mixed clean production management, and 10%
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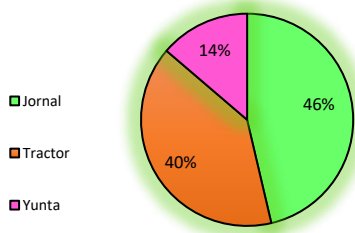
system have an organic production system.



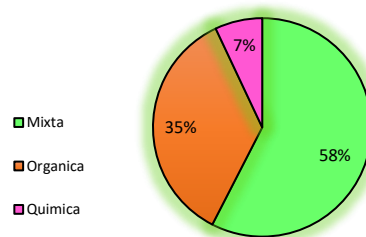
Certified seed and use of Seedbeds The certified seed is especially used in potato, pea, and vegetable crops with a (20%) and Seedbeds for the reproduction of fruit species (10%)



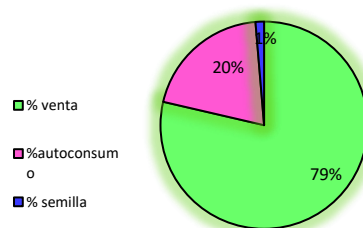
Mechanization Process Used in agricultural work, it is represented by the use of unqualified labor called day labor (46%), tillage with a tractor and implements (40%), and the use of oxen to sow (14%),



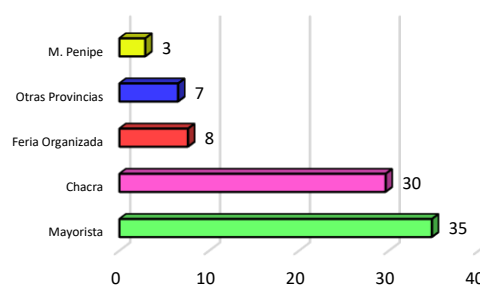
Fertilization It is constituted by, mixed fertilization, whose result is the mixture of fertilizer from minor species, cattle, pigs, goats, and horses as well as fertilizer processed as compost. With the presence of chemical mixtures (58%), purely organic fertilization (35%), and chemical fertilization (7%),



Production destination	The destination of the production is made up, for sale (79%), self-consumption of the products (20%), and for seeds (1%),
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Trading places	The places are diverse for products from family farming, because there is not a high degree of associativity to be able to search for markets with fair prices. These are mainly sold in the Riobamba wholesale market (35%), in the Chacra directly to merchants (30%), through fairs organized by the provincial council (8%), other provinces (7%), and (3%) in the market of the Penipe canton
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Quality	The quality of the products is defined by the producers based on the size of the products (51%), their presentation (49.2%) and their shape (0.1%).
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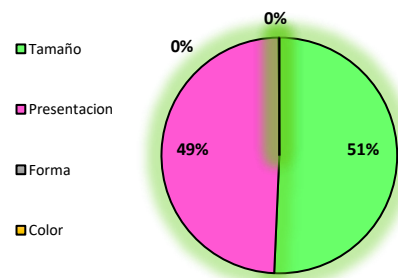
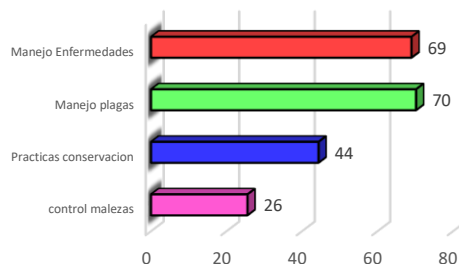


Table 3. Characterization results of family agriculture in the Penipe canton. Environmental dimension.

Indicators	Results										
Land occupation	Destined to agriculture (90%), livestock activity (8%), and in a minority for forestry activity (1%), and fallow (1%), this due to the lack of labor and economic resources to produce.										
	<table border="1"><thead><tr><th>Indicator</th><th>Percentage</th></tr></thead><tbody><tr><td>Agricultura</td><td>90%</td></tr><tr><td>Pecuaria</td><td>8%</td></tr><tr><td>Barbecho</td><td>1%</td></tr><tr><td>Forestal</td><td>1%</td></tr></tbody></table>	Indicator	Percentage	Agricultura	90%	Pecuaria	8%	Barbecho	1%	Forestal	1%
Indicator	Percentage										
Agricultura	90%										
Pecuaria	8%										
Barbecho	1%										
Forestal	1%										
Crop stubble and environmental conservation practices	Crop stubble is put into the soil as organic fertilizer (63%), used for animal consumption (21%), for composting (9%), and burned or not used at all (7%) due to ignorance of the use of this plant material. Environmental conservation practices constitute windbreaks with forest species such as lupine (<i>Lupinus albus L.</i>), alder (<i>Alnus glutinosa L.</i>), "Yagual" (<i>Polylepis incana</i> sn) and the making of level furrows (44%), (INEC , 201										
	<table border="1"><thead><tr><th>Indicator</th><th>Percentage</th></tr></thead><tbody><tr><td>Lo incorpora al suelo</td><td>63%</td></tr><tr><td>Lo utiliza para el consumo de sus animales</td><td>21%</td></tr><tr><td>Compostaje</td><td>9%</td></tr><tr><td>Ninguno o lo quema</td><td>7%</td></tr></tbody></table>	Indicator	Percentage	Lo incorpora al suelo	63%	Lo utiliza para el consumo de sus animales	21%	Compostaje	9%	Ninguno o lo quema	7%
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Management of weeds, pests and diseases Management occurs through the application of selective, pre-emergent, and post-emergent herbicides (26%). Pest management, through the application of pesticides, insecticides, and contact (70%). With the application of systemic, translaminar, and contact fungicides (69%)



Classification of the family agriculture production system

In each of the 68 surveys carried out on producers, 60 variables were used to carry out the classification, while keeping in mind that the coefficient of variation was greater than 50%.

When applying the Ward method and squared Euclidean distance, comparing with what was expressed by (Martínez, 2013), 3 groups of systems were formed, as shown in figure N. 6. Of which the first corresponds to the segment of producers of the diversified family agriculture production system (AFD) with (50%) Cluster 2 corresponds to specialized family agriculture production systems (AFE) (20%). Finally, the third group puts together the least part of producers, making up subsistence or self-consumption family agriculture (AFS) (22%).

The coding is shown in table 4

Figure 2. Dendrogram-cluster analysis and classification of FA production systems.

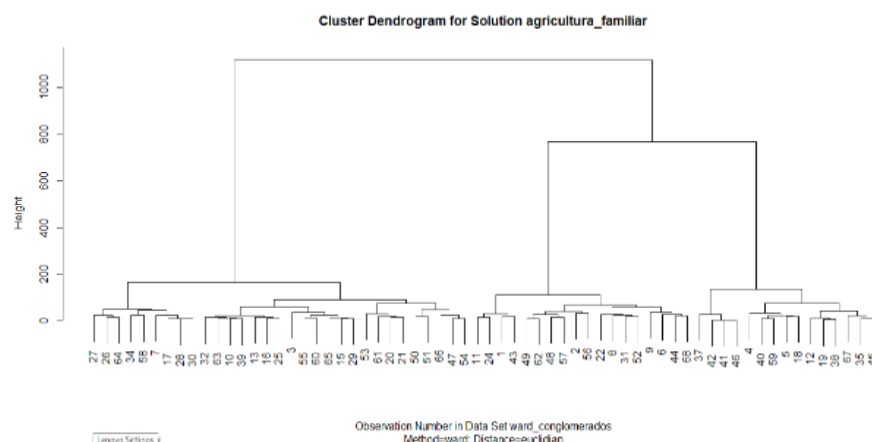


Table 4. Family coding makes up the 3 types of family agriculture production systems

DIVERSIFIED F.A	AF003, AF007, AF010, AF013, AF014, AF015, AF016, AF017, AF020, AF021, AF023, AF025, AF028, AF032, AF034, AF039, AF047, AF050, AF051, AF053, AF054, AF055, AF058
SPECIALIZED F.A	AF001, AF002, AF006, AF008, AF009, AF011, AF022, AF024, AF031, AF036, AF043, AF044
SUBSISTENCE F.A	AF004, AF005, AF012, AF018, AF109, AF035, AF037, AF038, AF040, AF041, AF042, AF045.

Description of production systems:

Specialized family agriculture production system (AFE): This type of production system is made up of 19 families (table 4), the same ones whose farms are located in the parishes of La Matriz, El Altar, Matus, Puela, Bayushig, Candelaria, with an average age of 54 years, land ownership average area of 1.57 ha. 59% of families hire additional labor to carry out their agricultural activities, with an average of 2 days per campaign, and with an average income of 584 USD per month.

Diversified family agriculture production system (AFD): This type of production system is made up of 34 families (table 4), the same ones whose farms are located in the parishes of La Matriz, El Altar, Matus, Puela, Bayushig, Bilbao, with an average age of 53 years, and land ownership average area of 6.99 ha. (95%) of families, hire additional labor to carry out their agricultural activities for 8 days per campaign, with an average income of 792 USD per month.

Subsistence family farming production system (AFS): This type of production system is made up of 15 families (table 4), the same ones whose farms are located in the parishes of El Altar, Matus, and Bayushig, with an average age of 48 years, average land ownership of 0.54 ha. This production system is characterized by not hiring additional labor to carry out its agricultural activities, since its production, for the most part, is dedicated to self-consumption; his income amounts to 115 US dollars per month.

Conclusions

- The geographical location and biophysical aspects of the 68 properties that are part of the family farming study in the Penipe canton were determined. Finding farms that are dedicated to this production system in the seven parishes of the canton, Matriz, Puela, Bilbao, Candelaria, Matus, El Altar and Bayushig.

- The characteristics of the production system and the corresponding classification were determined, by finding three family agricultural production systems. These are represented in three conglomerates classified as diversified family agriculture (AFD) which has 34 farms and represents (50%) of the total number of families surveyed. Cluster 2 corresponds to specialized family agriculture production systems (AFE) with 19 farms, representing (20%) And the third, which brings together the smallest part of producers, conforming family agriculture for subsistence or self-consumption (AFS) with 15 family farms (22%).

Acknowledgment

To the Higher Polytechnic School of Chimborazo and the Morona Santiago Technology Innovation Research Group, La Molina National Agrarian University and the Higher Polytechnic School of Chimborazo for allowing this research to be carried out.

Funding. This work did not receive funding.

Conflict of interests. Nothing to declare.

Compliance with ethical standards. Do not apply.

Data availability. References and data set are available at: <https://repositorio.lamolina.edu.pe/handle/20.500.12996/5179>. Further information can be obtained upon reasonable request with the corresponding author email: juanpablo.haro@epoch.edu.ec

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