Spring onion (*Allium fistulosum* L.) farmer's system typologies of Maracaibo municipality, Zulia State, Venezuela

Tipología de productores de cebollín (*Allium fistulosum* L.) del municipio Maracaibo, Estado Zulia, Venezuela

Tipologias de produtores de cebolinha (*Allium fistulosum* L.) no município de Maracaibo, Estado de Zulia, Venezuela

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Abstract

In Venezuela, spring onions are the most widely consumed edible leafy vegetable. Their production is concentrated in small settlements where the interaction of farmers with social, technical, economic, environmental, and territorial factors gives rise to a different types of production systems. The study aimed to typify the spring onion production systems in the municipality of Maracaibo, Zulia state, Venezuela. A sample of 53 farmers was considered, to whom was applied a structured questionnaire with sociodemographic, labor, technology, territory, natural environment, and socioeconomic enviroment information. The groups were formed using multivariate techniques (Principal Components and K-Means Clustering) and were compared using Chi-square. The four groups were: 1. Mixed Family Production Systems (MFS = 36 % of the sample), centered on family labor, that combined agricultural crops with small-scale animal husbandry and the use of organic fertilizer. 2. Intensive technology systems (ITS = 23 %), where chemical fertilizers (nitrogen and phosphorus) were used intensively. 3. Family polyculture systems (SPF = 28 %) cultivated spring onion and other crops (cilantro, cassava, and plantain) for commercial sales. 4. Technified polyculture systems (SPT = 13 %), which were labor-intensive, planted large areas of spring onions and other crops (plantain and "topocho"), performed a more efficient use of inputs, and pests control. These findings help to understand specificities of each typology, that allow personalized implementation of agricultural development strategies, addressing specific factors for each group.

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Resumen

En Venezuela, el cebollín representa la hortaliza de hoja comestible de mayor consumo, su producción se concentra en pequeños asentamientos en los cuales la interacción del agricultor con factores sociales, técnicos, económicos, ambientales y territoriales, originan diferentes tipologías de sistemas de producción. El estudio tuvo como objetivo tipificar los sistemas de producción de cebollín del municipio Maracaibo, estado Zulia, Venezuela; se consideró una muestra de 53 agricultores a quienes se les aplicó un cuestionario estructurado con información sociodemográfica, fuerza laboral, tecnología, territorio, ambiente y entorno. Los grupos se conformaron por medio de técnicas multivariadas (Componentes Principales y Conglomerados por K-medias) y se compararon con Chi cuadrado. Los cuatro grupos fueron: 1.- Sistemas de Producción Mixta Familiar (SMF = 36 % de la muestra), centrada en la mano de obra familiar, combina cultivos agrícolas con cría de animales a pequeña escala y uso de fertilización orgánica. 2.- Sistemas de tecnología intensiva (STI = 23 %), donde se utilizan intensamente fertilizantes químicos (nitrogenados y fosforados). 3.- Sistemas de policultivos familiares (SPF= 28 %) cultivan cebollín y otros cultivos (cilantro, yuca y plátano) para la venta comercial. 4.- Sistemas de policultivos tecnificados (SPT = 13 %), con uso intensivo de mano de obra, siembran grandes extensiones de cebollín y de otros cultivos (plátano y topocho), utilizan más eficientemente los insumos y contrarrestan plagas. Estos hallazgos ayudan a comprender las particularidades de cada tipología permitiendo la implementación personalizada de estrategias de desarrollo agrícola, interviniendo en factores precisos para cada grupo.

Palabras claves: tipificación, agricultura familiar, hortalizas.

Resumo

Na Venezuela, a cebolinha é o vegetal folhoso comestível mais consumido. Sua produção concentra-se em pequenos assentamentos onde a interação dos agricultores com fatores sociais, técnicos, econômicos, ambientais e territoriais dá origem a diferentes tipos de sistemas de produção. O estudo teve como objetivo tipificar os sistemas de produção de cebolinha no município de Maracaibo, estado de Zulia, Venezuela. Foi considerada uma amostra de 53 agricultores, aos quais foi aplicado um questionário estruturado com informações sociodemográficas, força de trabalho, tecnologia, território, meio ambiente e entorno. Os grupos foram formados usando técnicas multivariadas (Componentes Principais e Agrupamento K-Means) e comparados usando Qui-quadrado. Os quatro grupos foram: 1. Sistemas de Produção Familiar Mistos (MFS = 36 % da amostra), centrados na mão de obra familiar, combinando culturas agrícolas com criação de animais em pequena escala e uso de fertilizantes orgânicos. 2. Sistemas de tecnologia intensiva (ITS = 23 %), onde fertilizantes químicos (nitrogênio e fósforo) são usados intensivamente. 3. Sistemas de policultura familiar (SPF = 28 %) cultivam cebolinha e outras culturas (coentro, mandioca e banana-da-terra) para venda comercial. 4. Sistemas de policultura tecnologicamente avançados (SPT = 13 %), que exigem muita mão de obra, plantam grandes áreas de cebolinha e outras culturas (banana-da-terra e topocho), fazem uso mais eficiente de insumos e combatem pragas. Essas descobertas ajudam a compreender as especificidades de cada tipologia, permitindo a implementação personalizada de estratégias de desenvolvimento agrícola, abordando fatores específicos para cada grupo.

Palavras-chave: tipificação, agricultura familiar, hortaliças.

Introduction

The production of spring onions (*Allium fistulosum* L.) in the state of Zulia, Venezuela, is mainly carried out by family production systems; in which small-scale agriculture is practiced. This crop is alternated with other agricultural and animal products (Albornoz and Maldonado, 2022) where social, technological, economic, environmental, and territorial factors are combined and interrelated. In spite of the fact that most producers want to and try to improve their production levels, not all of them have the capacity to do so, because such capacity depends mainly on the way factors and resources are combined.

This gives rise to different types or modes of production that reveal the interactions that occur in the production units, considering factors related to both the natural environment and the territory, which can generate well-being for farmers and their families (Albornoz, 2024) as reflected in the economic and productive results of each type of production system, the identification and characterization of these types is essential for the implementation of effective and sustainable actions (Martínez *et al*., 2021). Furthermore, to the agricultural research community and institutions, it is an essential step for the success of extension and technology transfer programs for farmers (Stringer *et al*., 2020).

The understanding of the structure of different systems types ensures the effectiveness of agri-sector development actions (Ouédraogo and Tapsoba, 2022), besides classification allows to analyse agroecosystems diversity, agricultural producers characteristics, their production systems and the possible relationships that may arise (Goswami *et al*., 2014).

Hence, the importance of creating more or less homogeneous groups based on similar characteristics (Álvarez *et al.,* 2018). In this context, the study aimed to typify the agricultural systems in the main onion spring production region of Zulia state and thereby obtain information that allows the implementation of a more specialized approach to design agricultural development strategies (Tirado *et al.,* 2021), which effectively intervene in specific factors in each tipology and simplify options selection for planning strategies or processes implementation related to the production system competitiveness and sustainability of the territory (Zuluaga et al., 2023).

Materials and methods

The study was conducted in the Maracaibo municipality of Zulia state, Venezuela, located in the far northwest of the country, specifically in four parishes: San Isidro, Francisco Eugenio Bustamante, Venancio Pulgar, and Antonio Borjas Romero (Figure 1); between the coordinates 10°43’06.5”N 71°45’53.3”W and 10°35’53.8”N 71°43’41.9”W; territories where agricultural activity plays a significant role in the local and regional economy.

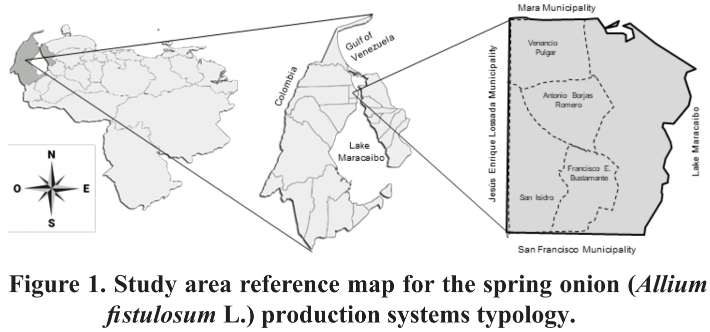


Figure 1. Study area reference map for the spring onion (*Allium fistulosum* L.) production systems typology.

This research was framed under the empirical-inductive approach; mainly descriptive type, with an ex post facto, non-experimental, cross-sectional anf field design; (Hernández *et al.*, 1997; Padrón, 2007). To estimate the study population, Google Earth for Windows (License: Freemium, version 10.75.03, March 2025) was used to visualize, identify, and georeference agricultural production units using satellite images showing the area planted with chives. Guided tours were conducted with key stakeholders from each area. Thus, 145 production units were identified in the four parishes. The sample population was calculated using the formula proposed by Martínez (2005), which states:

$$n=\frac{N*p*q*Z^2}{e^2(N-1)+p*q*Z^2}$$

Where:
N = Population size (145)
p = Probability of success (50 %)
q = Probability of failure (50 %)
Z = Standard distribution or 90 % confidence level
e = Population mean error (9 %)

A sample of 53 agricultural production units (PU) was defined, using the stratified random sampling technique by proportional allocation, which distributed the sample according to the relative weight (size) of each stratum. The criteria for selecting the units were: 1) Production units in which chives (spring onion) were the main production item; 2) units in which more than 40 % of the cultivated area was chives. To collect the data, a questionnaire was applied to farmers wich was made up by 30 items, distributed in six dimensions (Table 1).

The typologies of production systems were obtained after applying a factorial extraction analysis by principal components (PCA), both widely used in studies of agricultural production systems (Barnes and Toma, 2012).

Several matrices were structured which began with the total of the available variables, but those that showed a factorial weight below 0.5 were removed from the analysis. Bartlett's test of sphericity (Zimpel *et al*., 2017), the determinant coefficient, and the KMO test were also used to select the final matrix for the PCA analysis. To select the number of components, the Kaiser criterion (Silva *et al*., 2020) was used, and according to this, variables with eigenvalues greater than 1.0 were retained; the criterion of minimum cumulative variance of 60 % was also applied.

K-means cluster analysis was performed using the new factors extracted from the PCA; Four clusters were obtained using the non-hierarchical algorithm (K-means), since this number showed a solid classification by optimizing the distribution of the systems among the groups and by minimizing each observation sum of distances with respect to the center of its group. The characteristics of each typology resulting from the structure of each one were expressed in frequencies; the Chi-square test (X^2) was also used for group comparisons. IBM SPSS Statistics version 23.0 was used for all statistical analyses.

Results and discussion

General characteristics of producers and production systems

Spring onion (chive) production in Zulia state was performed in small production units which size ranged from 1 to 5 hectares, 66 % of the analyzed sample showed a total area of 2 hectares or less. These production units constitute the household of the farmer and his family (80 %), families were made up of 5 ± 2.38 members on average; results that were consistent with reports from horticultural systems in Chile, Peru, Colombia, and Ecuador (Boza *et al*., 2019; Rocha *et al*., 2016; Tirado *et al*., 2021; Verdezoto & Viera , 2018) .

Male farmers (90 %) showed a mean age of 48 ± 12.68 years, with a 50-year difference between the youngest farmer (24) and the oldest. Despite this difference, 72 % of the farmers were under 55 years of age, they are still in working age and economically active. These results are quite coincident with the ages of small farmers in Chile, who ranged from 15 to 65 years (Vera & Moreira, 2009).

Regarding the educational level of producers, 51 % managed to complete primary education and 43 % secondary education, wich is reflected in the empirical technologies they use, since there is evidence that establishes a positive relationship between the level of education and the adoption of new technologies (Bidogeza *et al*., 2009), in addition, educated people perform jobs and functions more efficiently, important in decision-making at home. In general terms, it can be said that they were small family production systems that constitute the farmer's household, with the man acting as head of the family and as the laborer of the production unit.

Explanatory factors selection for structuring farmer's system typologies

Those variables whose explanatory power was greatest were selected from the 38 variables considered in the study. Pearson's correlation analysis of the selected variables matrix yielded a

Table 1. Dimensions and variables considered to classify spring onion production systems.

Dimensión	Variables
Sociodemographic data of the farmer and his family	Sex, age, education, producer experience, marital status, composition of the family nucleus, permanence (lives in the PU), land ownership
Production unit and workforce data	Land size and uses, productive área or number of "muros"*. Number of agricultural items produced. Type and quantity of labor
Local Tecnology	Soil preparation, seeding, irrigation, fertilization Pest control, weed control, and harvesting
Territory	Strengths or Weaknesses Quality of soils, quality of roads, proximity to the city, personal security
Natural environment	Water source. Biodiversity. Biotic resources. Waste management .
Socioeconomic environment	Marketing. Policies. Agricultural support and agricultural services.

*Each "muro" measures on average 50 m long, 1,20 m wide and 0,30 m high determinant coefficient of 0.255, the Kaiser-Meyer-Olkin index showed a value of 0.552 (> 0.5), and the Bartlett test of sphericity reported a significance of P = 0.000, indicating a sufficient relationship between the variables and suitability for conducting PCA.

The results of the analysis showed the selection of thirteen variables (Table 2) with the greatest explanatory power that is indicated by the communalities, which refer to the total amount of variance that each variable retains in the factors and that can be explained by the factorial model obtained. The highest values of the variables number of produced items and biodiversity index indicate that the model is able to reproduce 93.7 % and 93.5 % of the original variability of each one, likewise, it can be observed that it also explains more than 75 % of each of the rest of the variables; however, the lowest value that corresponded to the variable fertilization frequency is still considered acceptable to include in the analysis since it indicates that the model is able to reproduce 56.3 %.

Likewise, the PCA results shown in Table 2 indicate that these five selected components or factors (CPs) showed eigenvalues greater than 1 and retained 79.9 % of the total variance of the 53 spring onion production systems. The variables that explain or describe each component are shown in the rotated factor matrix (Varimax) of independent variables with the weight factor for each variable.

The first component (CP1) is most strongly correlated with the planting of other crops, the number of items in production, agricultural diversification, and income from other items or non-agricultural activities; and less strongly correlated with the proportion of labor and the location of the UP far from the city. The second component (CP2) is strongly correlated with the importance of living close to the city and intensive fertilization technology, but negatively correlated with the lack of quality land.

The third component (CP3) it is described by the security that territory provides contrasting with land routes in poor condition; the fourth component (CP4) is strongly related to larger areas (number of “muros”) planted with spring onions and a to a high proportion of labor; and finally, the fifth component (CP5) represents chive production experience associated with animal husbandry. These components indicate the existence of groups of production units with specific characteristics.

Farmers typologies formation

Four clusters were identified (Figure 2), each one corresponding to a type of farmer; cluster 1 represents 36 % of the production systems; cluster 2 is made up by 23 % of the systems analyzed; cluster 3 is formed by 28 % and the fourth represents 13 % of all.

It could be noticed that cluster one represents production systems whose typology is mostly described by CP3 and CP5 since the security provided by the territory is very important to these farmers; also, their chives growing experience stands out, which they have associated with animal prodution. To this group of farmers, the size of the planting area, the number of labor and the technology are not very relevant, however, they do carry out organic fertilization, so they can be classified as producers with mixed family systems (MFS).”

Regarding cluster 2, it was observed that CP2 which is referred to the city near location most describes this group, these farmers attach great importance to the fact that the production units are near to the cities, and also to a intensive fertilization, hence they were classified as producers with intensive technology spring onion production systems (ITS).”

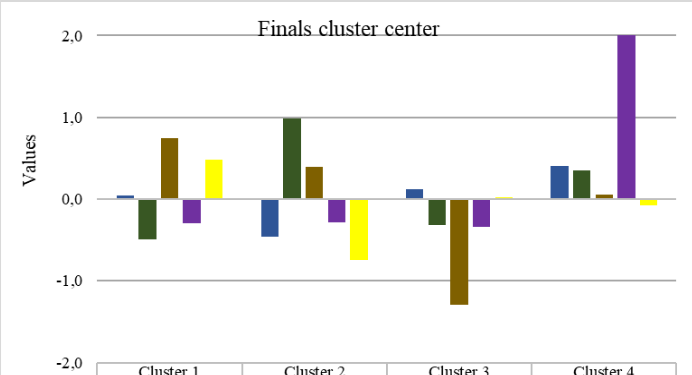
On the other hand, cluster 3 is mainly related to the variables that described CP1, which are associated to production systems where farmers plant other crops in addition to spring onion, they gave great importance to the number of agricultural production items, thus diversifying agriculture and income with other production items and also with non-agricultural activities, therefore, they were classified as producers with family polyculture chive production systems (SPF).

Finally, cluster four is most closely related to CP4 in terms of the size of planted área or number of “muros” and to the number of hired labor; it is also related to a lesser degree to CP1 and CP2, so it is a group that represents production systems with larger planted areas and with high use of labor, high fertilization, high biodiversity, crop association and non-agricultural income. These factors allow them to be classified as producers with thechnified polyculture spring onion production systems (TPS).

Table 2. Rotated component matrix results of principal components analysis with the evaluated variables.

Rotated component matrix						
Variables	CP1	CP2	CP3	CP4	CP5	**Comunalidades**
EXPERIENCE	-0,129	0,291	-0,207	0,139	0,783	0,776
OTHERINCOM	0,740	-0,083	0,188	-0,077	0,400	0,756
OTHERCROP	0,857	0,101	-0,022	0,041	-0,295	0,834
ANIMPRODUC	0,403	-0,205	0,108	-0,441	0,612	0,785
NUMPRODUTC	0,939	0,104	-0,200	0,058	0,037	0,937
NUMBMUROS	0,079	-0,090	0,131	0,871	-0,001	0,790
FERTFREC	0,105	0,599	0,370	-0,066	-0,228	0,563
WORKFORCE	0,027	-0,003	0,016	0,921	0,011	0,849
GOODSOIL	-0,148	-0,865	0,097	-0,026	-0,146	0,801
INSECURITY	-0,108	-0,031	0,872	0,130	-0,044	0,792
NEARCITY	-0,024	0,865	-0,118	-0,059	0,111	0,779
QUALIROADS	0,108	0,030	-0,883	-0,018	0,042	0,794
BIODINDEX	0,937	0,104	-0,201	0,060	0,040	0,935

EXPERIENCE: farmer years experience; OTHERINCOM: another income source; OTHERCROP: other produced crops; ANIMPRODUC: animal production; NUMPRODUTC: number of produced items; NUMBMUROS: chives production number of “muros” ; FRECFERT: fertilization frecuency; WORKFORCE: number of labor; GOODSOIL: It is a strength to have good soil; INSECURITY: Insecurity is a weakness; NEARCITY: Located near to the city is a strength; QUALIROADS: The bad quality of the roads is a weakness. BIODINDEX: biodiversity index. (Source: Output from IBM SPSS version 23.0 software with own data)



	Cluster 1	Cluster 2	Cluster 3	Cluster 4
CP 1	,04924	-,46429	,11937	,40647
CP 2	-,49688	,98560	-,32189	,34883
CP 3	,74883	,39775	-1,29298	,05627
CP 4	-,29076	-,28644	-,33770	2,00388
CP 5	,48323	-,74745	,02086	-,07499

Figure 2. Clusters graphical representation according to the weight of each component within group.

Differentiating factors of the spring onion farmer's system typologies

The Chi-square analysis showed that variables: animal production ($p \leq 0.00$), number of "muros" ($p \leq 0.00$), fertilization frequency ($p \leq 0.00$), labor ($p \leq 0.00$), security in the territory ($p \leq 0.00$), proximity to the city ($p \leq 0.02$) and road conditions ($p \leq 0.00$), were associated to the typologies; in other words, each of these variables had a different behavior in each typology, the values of the variable categories allowed to characterized the groups particularities (Table 3).

Farmers with mixed family systems (MFS)

These producers focus on combining agricultural activities of crops and small-scale animal husbandry, mainly sheep and poultry, which they produce for sale, self-consumption or for the exchange of goods whith others farmers in the area, thus they compensate family income. In this type of group, labor was limited to one or two people (89 %), represented primarily by the farmer and his or her direct descendants, whether son or daughter, in this regard, Kuivanen *et al*. (2016) consider that they are the traditional backbone of the rural workforce, carrying out the different tasks of the crop (Guillen, 2020), which may be related to the number of production chive "muros"; 47 % of the MFS farmers cultivate between 36 and 70 chive "muros", equivalent to an area between 0.5 and 1 hectare of production. These farmers and their families have more than 15 years of experience (42 %) in agricultural activity. The main objective of the farmer is to provide family food by producing self-consumption items.

These producers consider that geographic location close to the city denotes a strength for the system, it was expressed by 67 % of farmers; in addition, 74 % of these producers also consider a strength the good quality soil available for chives production. Finally, this group consider that personal insecurity is not a problem in their territory, thanks to the community efforts that leaders in the area carry out to maintain safety of all.

Farmers with intensive technology systems (ITS)

The production systems of this group represent 23 % of the sample, and their most significant characteristic is the intensive use of chemical fertilizers. 83 % of farmers in this group apply these fertilizers three times per crop cycle, a frequency that differs from the rest of the groups and suggests that this is a fundamental production practice. According to Bouteska *et al*. (2024), this activity plays a crucial role in increasing crop yield.

This typology is more oriented toward vegetable production; 67 % of these farmers grew other crops such as plantains, "topocho" (another musaceae), and cassava in addition to spring onion, which require fertilizers. Another reason for fertilizers use is that 75 % of farmers think that soil is not good enought for growing spring onion. This group includes producers with less experience growing chives; 42 % have less than five years of experience, representing the new generation that makes agriculture their way of life. Regarding the territory, they considered that near location to the city is beneficial (67 %), especially because they have more opportunities to access agricultural and household inputs, even though the conditions of agricultural roads are a factor that hinders the system (75 %). Finally, this cluster showed a medium to low biodiversity index, that is a consequence of the limited diversification they performed, since most of the land is dedicated to chive cultivation.

Farmers with family polyculture systems (FPS)

This third group represents 28 % of the sample, farmers produced other crops commercially in 73 % of the production units (PUs), unlike the MFS type, where production was for self-consumption. In this case, 80 % of producers grew three or more crops in addition to spring onion, generally associated with cilantro, cassava, "topocho", and plantain, as the most representative crops. Consequently, this group exhibited medium to high agricultural biodiversity (47 % and 33 % respectively) and the smallest areas planted with chives (fewer than 35 "muros"). Thus, farmers in this group obtained additional income from other crops sale (53 %).

Regarding agricultural experience, it could be seen that farmers have been growing spring onion for more than 15 years (47 %). In these production systems, labor was minimal due to the small planted areas for each crop, that is why in 67 % of PUs labor is limited to one person that played de role of the farmer and the head of the household. This is an indicative that other family members find themselves in need of other income sources to meet household requirements. When considering farmers' appreciation of soil quality, opinions are divided and unlike the others, it is striking that this group considers insecurity to be an element that negatively affects the productive system.

Farmers with technified polyculture systems (TPS)

This last group represents producers with primarily plant-based agricultural production systems and accounts for 13 % of the sample. They rely on larger-scale crop combinations, by optimizing pollination, nutrient uptake, and pest control. This group was characterized by their intensive use of labor; the producers in this group were the only ones who hired personnel in order to attend seasonal activities, primarily planting and harvesting. 43 % employ three people, while 57 % employ four or more.

In these systems there were large extensions of spring onion cultivated land since 83 % of farmers mantained more than 100 "muros" in production, equivalent to more than 2 hectares, in addition 71 % of them grow other crops, both commercially and for self-consumption. The main crop combinations were chives - plantain - cassava (43 %); chives - cilantro - plantain and cassava (43 %), while the chives - plantain combination was in lesser proportion (20 %), by considering previously exposed, biodiversity index for this group ranged from médium to high values; this diversification is an opportunity to generate alternative income, contribute to the economy improvement and mitigate critical situations that sometimes arise in this productive activities, in turn, agricultural biodiversity reinforces food security (Aquino *et al*., 2018)

Table 3. Frequency distribution of the study variables by farmer's system typologies.

Indicator	Categories	Farmer's system typologies			
		1 MFS n=19	2 ITS n=12	3 FPS n=15	4 TPS n=7
Farmer years experience	≤ 5 años	21 %	**42 %**	27 %	29 %
	(6-10 años)	**26 %**	17 %	13 %	14 %
	(11-15 años)	11 %	17 %	13 %	14 %
	> 15 años	42 %	25 %	**47 %**	43 %
Another income source	Others crops	**68 %**	25 %	53 %	**71 %**
	Subsidies and/or non-agricultural activities	26 %	**33 %**	**27 %**	14 %
	None	5 %	42 %	20 %	14 %
Other produced crops	yes	58 %	67 %	**73 %**	**86 %**
	No	42 %	33 %	27 %	14 %
**Animal production	yes	**74 %**	8 %	47 %	0 %
	No	26 %	92 %	53 %	100 %
Number of produced items	Four or more	21 %	0 %	33 %	**43 %**
	Three	42 %	**58 %**	47 %	43 %
	Two	**37 %**	42 %	20 %	14 %
** Spring onion production (number of "muros")	≤ 35	11 %	33 %	**40 %**	0 %
	36 a 70	**47 %**	42 %	27 %	0 %
	71 a 100	**21 %**	17 %	20 %	14 %
	> de 100	21 %	8 %	13 %	**86 %**
**Fertilization frecuency	One	21 %	0 %	**53 %**	14 %
	Two	47 %	17 %	33 %	**57 %**
	Three	32 %	**83 %**	13 %	29 %
** Number of labor	One	**63 %**	50 %	67 %	0 %
	Two	26 %	**50 %**	27 %	0 %
	Three	11 %	0 %	7 %	**43 %**
	Four or more	0 %	0 %	0 %	57 %
It is a strength to have good soil	Si	**74 %**	25 %	60 %	29 %
** Insecurity is a weakness	Si	0 %	8 %	**80 %**	14 %
** Being close to the city is a strength	Si	5 %	**67 %**	27 %	43 %
The quality of the roads is a weakness	Si	**89 %**	75 %	**0 %**	57 %
Biodiversity index	0,75 (Alta)	21 %	0 %	33 %	**43 %**
	0,50 (Media)	42 %	**58 %**	47 %	43 %
	0,25 (Baja)	37 %	**42 %**	20 %	14 %

MFS: Farmers with mixed family systems, ITS: intensive technology systems, FPS: farmers with family polyculture systems, TPS: farmers with technified polyculture systems. ** Significativo a p≤ 0,01. Source: Own data. Output from SPSS software version 23.0

Farmers of this type showed more than 15 years of experience (43 %), who consider the soil to be of poor quality (71 %). Due to these systems have the largest land areas, the focus is on safety; 86 % of farmers do not have such problems, as crops are generally monitored at night during the harvest season.

Conclusions

Sprin onion farmers from Maracaibo municipality, Zulia state, were classified into four types of production systems, The distinctive factors were animal husbandry, planting area, fertilization frequency, labor type and number, and the strengths and weaknesses of the territory. In general terms, the predominance of family labor indicates that these are characteristic family farming systems.

In this regard, it could be affirm that two of the typologies were characterized by an exclusive role of the farmer and his family to agricultural tasks, one of them were dedicated to produce spring onion and also animal husbandry (Mixed Family System) and the other combine spring onion production with other crops (Family Polyculture System).

The other two typologies were distiguished by technology and labor, in one hand was the intensive application of technological resources, such as chemical fertilizer (Intensive Technology System) and in the other hand was the intensive use of hired labor in order to meet high level production and crops diversity (Technified Polyculture System).

Regarding the territory, insecurity is a factor of concern to those groups dedicated to polyculture (FPS and TPS), since intercropping is attractive to those near lawbreakers, given the peri-urban location of these systems.

These findings help to understand the particularities of each typology by allowing the personalized implementation of agricultural development strategies, which intervene in precise factors for each group. They can also promote training programs to improve agricultural practices, when recommending biological diversity as a strategy to generate alternative income, improve environmental sustainability and enhance food security by addressing the weaker qualities within each typology.

Finally, it is important to encourage participatory action research among farmers as an alternative for supporting studies with experimental trials that address key problems and contribute to generate research for academies and institutions that are financially limited to conduct studies.

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