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Original article

Structural typology of farms in usufruct in Báguanos, Holguín, Cuba

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ABSTRACT

The research was carried out with the objective of building the structural typology of farms in usufruct of the municipality of Báguanos, as a guideline to be used in the reinforcement of agricultural extension work towards these farmers. The sample was 82 farms, information was collected through semi-structured interviews and the SPSS – 22 program was used for data processing. The typification evidenced three groups of farms: in type I, livestock predominates with dimensions ranging from seven to 67 ha, with full dedication of the usufructuary and family and contracted labor force. In type II with several cultivations (vegetables, grains, banana, roots, tubers and corms) predominate, the dimensions from 0.25 ha to 6 ha, usufructuaries with total dedication and have water. The type III are farms for several cultivations (vegetables, grains, banana, roots, tubers and corms) and fruit with dimensions between 0.25 ha up to 13.42 ha, pluriactive usufructuaries and they not hire workforce. The greatest demand of farmers is for technical advice and the limitations are the limited availability of water, varieties and labor force.

Key words: classification, farmers, extension, agroecosystems

INTRODUCTION

The structural typology is a way of summarizing the great heterogeneity of production systems [(1)], based on the identification of groups. The classification contributes to decision-making within agrarian extension processes regarding intervention actions of value for farmers [(2)].

At the international level, farm typologies are used, which can be verified by reviewing several scientific publications. For example, explain the importance of creating groups based on characteristics of local agriculture [(1)]. In addition, it groups farms in rural areas of Colombia [(3)], it characterizes cattle farms in Canada [(4)], it groups family farming systems in the face of climatic risks [(5)] and it characterizes vine-producing farms in Peru [(6)].

In the Cuban environment, there were few reports of investigations that evidence groupings of farms. Only two publications were found: that characterized cattle farms in a peasant community [(2)] and that classified dairy farms according to dimensions of productive intensification [(7)]. However, in Cuba there is a lack of increasing theoretical research with an analytical vision because traditionally they have been limited due to the urgency of supporting the rapid obtaining of food [(8)]. It is proven that current challenges are not solved by focusing only on productivity because they require new and complex approaches [(9)]. The above reveals the usefulness of the typologies because they are applicable to agricultural production systems in different forms of ownership. For this reason, the classification of farms in usufruct is pertinent because they are insufficiently characterized [(10)] and the productive increase is not significant, due to inconsistencies in agricultural policies and because not all farmers have experience in the work [(11-13)].

Holguín province has more than 18,000 usufructuaries distributed in the 14 municipalities of its geography and in the municipality of Báguanos there are 3,100 beneficiaries, which makes it worthwhile to conduct investigations. Therefore, this work aimed to build the structural typology of farms in usufruct of the municipality of Báguanos, as a guideline to be used in the reinforcement of the agrarian extension work towards these farmers.

MATERIALS AND METHODS

The research was carried out in Báguanos municipality located in the center of the Holguín province, Cuba. The sample was made up of 82 farms belonging to usufructuary farmers (owners of a farm for a specified time and established prior agreement with the state that is the owner of the property). To collect the information, semi-structured interviews were carried out that contained variables [(13)] to collect elements of the history, resources, the production system and the socioeconomics of the farms. The information was with the IBM - SPSS program, Statistics version 22 tabulated and analyzed [(14)]. The statistical methods used were: descriptive

(statistics of central tendency and frequency distributions) and multivariate inferential (factor, correlational and cluster analysis).

For the analysis of factors with Varimax orthogonal rotation, the main components were extracted. To determine the minimum number of necessary factors, it was considered to select those with eigenvalues greater than one [15] and it was ensured that the accumulated proportion of variance explained by the extracted factors was greater than 70 %. A correlation analysis of variables was carried out, which allowed us to identify those with the greatest impact on each of the factors (Table 1). Based on the five determining variables, a factor analysis was performed with the Bartlett test for significance of ($P < 0.05$) and the Kaiser-Meyer-Olkin index ($KMO > 0.5$), which confirmed that the data meet the test conditions [15].

Table 1. Factor score

Variables	Factor 1	Factor 2	Factor 3
Total area	**0.716499**	0.411816	-0.11739
Fundamental dedication	**0.807974**	0.149383	-0.137913
It has water	-0.105043	0.194467	**-0.953324**
Exclusive linking	**0.746055**	0.23307	0.195944
Work force	-0.374427	**0.898469**	0.232246

Source: SPSS, 2019

To build the typology, the hierarchical cluster analysis was performed with Ward's grouping by the squared Eucledian distance. With the cut-off line (chaining) the definition of the clusters was facilitated and a discriminant analysis was carried out to see the certainty in the location of each farm for each cluster. The groupings with a value of 93.8 % of correctly located originals were confirmed. Descriptive statistics were used for the characterization of the clusters.

RESULTS AND DISCUSSION

The cluster analysis showed three groups of farms in usufruct condition in Báguanos, the groups formed below the cut-off line (40 %) located at number 10 of the re-scaled distance as can be seen in Figure 1.

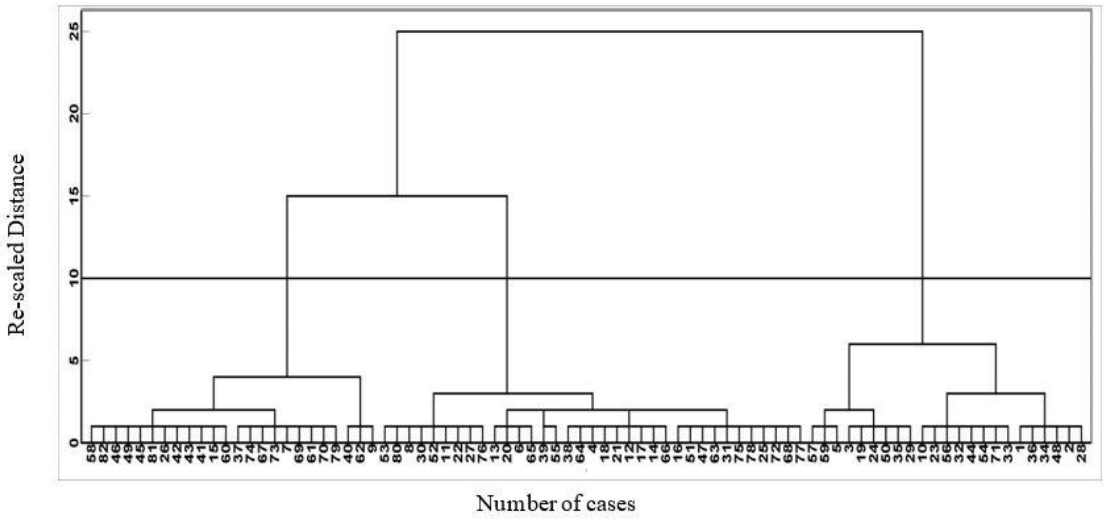

Figure 1. Grouping of farms in usufruct in Báguanos

The types of farms are:

Type I: with 24 farms dedicated to livestock with variable dimensions (from seven to 67 ha), with total dedication time of the usufructuary and family and contracted workforce.

Type II: with 35 farms devoted mainly to various crops (vegetables, grains, bananas, roots, tubers and corms) with dimensions between 0.25 ha and 6 ha, with a predominance of full-time dedicated usufructuaries and availability of water.

Type III: with 23 farms dedicated mainly to various crops (vegetables, grains, bananas, roots, tubers and corms) and fruit trees with dimensions between 0.25 ha and 13.42 ha, multi-active usufructuaries and do not hire labor force.

Dedication and areas of the farms

Dedication is related to the availability of the workforce, the time devoted to agricultural work and the area available. The variability of the size of the farms is due to the limits of hectares established by the Decree Laws (259, 300 and 358) and Resolutions (24 and 356) of the Ministry of Agriculture that have protected the usufruct in Báguanos.

In type I cattle farming predominates (62 %) for meat and milk productions. There are limitations regarding the availability of food for the animals in periods of drought, which makes it significant that these breeders are not far-sighted. Existing crops (corn, beans, plantain, and cassava) are in dry land grown and yields are low. However, the diversity of drought-tolerant varieties and species that could help overcome these restrictions is scarce.

In type II, various crops predominate, with the presence of corn, beans, plantains, cassava and hardly any vegetables. The average yield of the grains is 1 t ha, favored by the intense fertilization with cachaça that in addition to providing nutrients contributes to moisture retention, because they are dry-land farms. It was found that without the application of organic

matter, yields do not exceed 0.5 t ha. The limitations of the crops are access to quality seeds and inputs. The animals present are oxen for tilling the soil, pigs and birds.

In type III, various crops (corn, donkey plantain, cassava, beans) and fruit trees (avocado and guava) predominate, as the main limitation is the scarce availability of water and the low yields of food. What can affect the general management and prioritization of grains sold at high prices. The number of animals present (pigs and poultry) is low; they are intended for self-consumption and occasional sale.

Work force

The average age of all types is over 48 years, the schooling of ninth grade for types I and II and eleventh for group III. The aging of the usufructuaries and the scarce presence of young people on the farms, in addition to the limited agricultural technical knowledge to manage their agroecosystems, is considered worrying for the future [11]. As can be seen in Figure 2, the family workforce predominates, which is a potential for social sustainability [9].

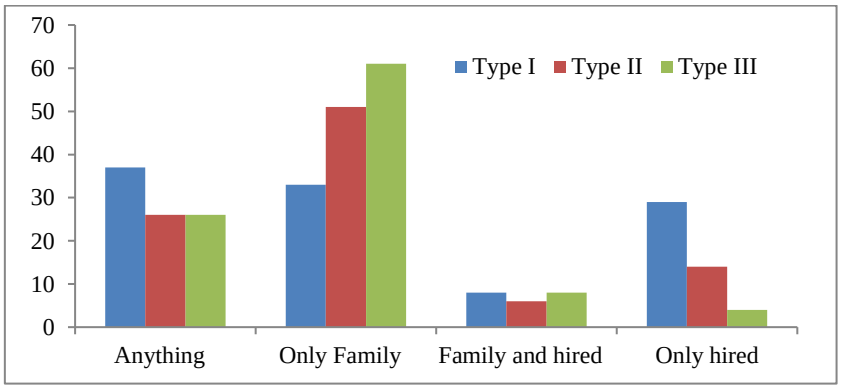

Figure 2. Workforce on farms

All type I beneficial owners dedicate themselves exclusively to work on their farms with an average of 70 hours a week, family help predominates and 30 % hire a workforce. In type II, the exclusive dedication to the farm predominates (70 %) with an average of 50 hours a week, the family workforce and occasional hired workers predominate. In type III, all the usufructuaries are multi-active because they carry out trades outside the farms, they only dedicate an average of 20 hours per week and they only have family workforce. Pluriactivity can be an economic strength [16] but for the farms in usufruct object of analysis, the low behavior of the yields shows insufficient management of the crops, which it assumes is related to the few hours dedicated by the moonlighting owner.

Natural resources soil and water

The farms in usufruct are located on soils with agro-productive category III and IV, fundamentally which affects the low crop yields. Type II farms have water all year round. Types I and III present serious difficulties in times of intense droughts because the volume of supply sources significantly decreases, with external dependence on water in critical months.

Diversity of crops and animals

The diversity of the crops (Figure 3) is limited with the presence of monocultures in all agricultural lines with a predominance of corn.

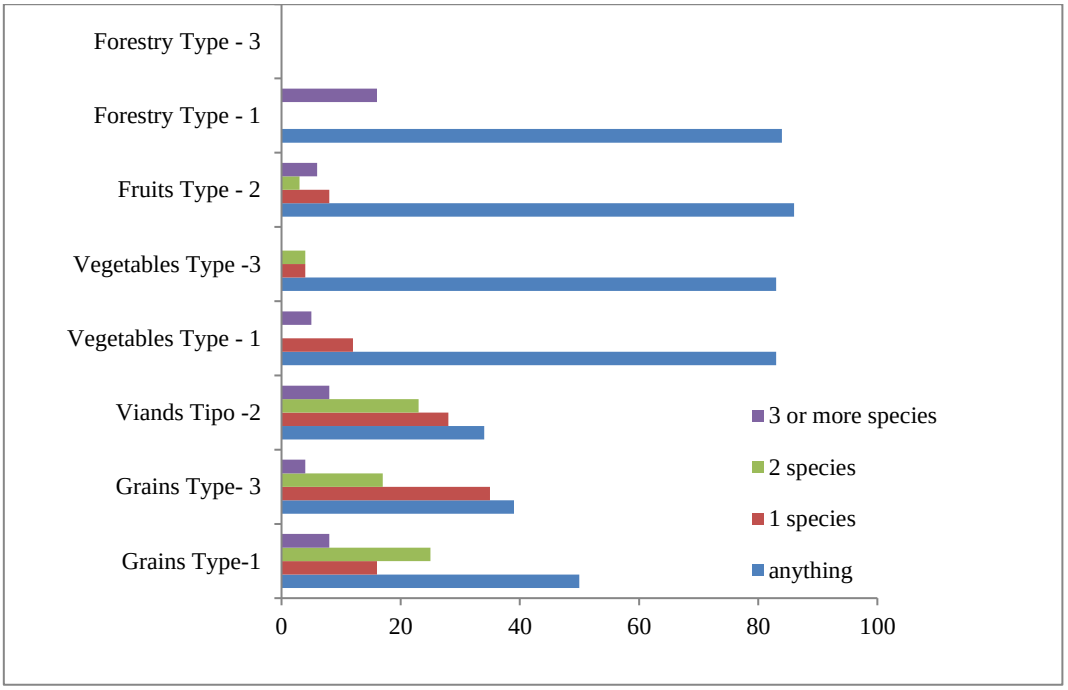

Figure 3. Crop species by type of farm

There is an average presence of three species per row, which is considered disadvantageous for the sustainability of the farms because the diversity of crops could contribute to greater food security for the usufructuaries because they would have less external dependence on food and beneficial effects for the agroecosystems [(9)]. Type I presents the greatest diversity of animal species, which is related to fundamental dedication. In types II and III, pig farmers have an advantage and other animal species are not representative.

Income and marketing

In Figure 4 the origin of the income can be observed. The income is related to the fundamental dedication and only type I usufructuaries (21 %) have accessed bank credit, which is explained by the investments in the purchase of animals. Greater access to credit to increase productivity would be beneficial [(12)].

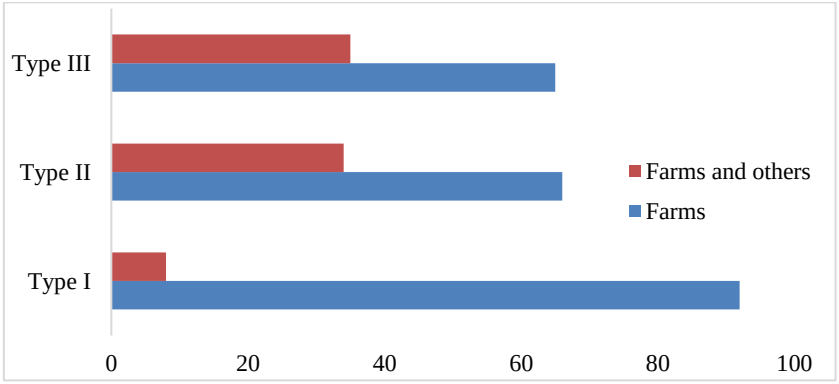

Figure 4. Origin of farm income by type

The main market channels for agricultural products are: collection, markets, points of sale of cooperatives and select fruit companies. However, the usufructuaries commercialize most of their productions with stockpiling because it is a regulation established by the Ministry of Agriculture. The National Storage Company has transportation for the transfer of products and purchases at lower prices compared to other available channels. In addition, the number of usufructuaries who have transportation to transport the crops is almost nil, which slows down sales to other marketing channels. The limited diversity of channels constitutes a limitation for the sustainability of the farms in usufruct because it exposes them to the risks of losing money and products [17], if the collectors do not arrive at the right time.

Production for family self-consumption

In self-consumption production with respect to the total by type there is a predominance of consumption of volumes below 20 % for types I and II. In type III, half of the usufructuaries consume productions that can reach 50 %, which could be related to the multiple activity that leads to insufficiently exploited farms whose production is destined for the family.

Agricultural update of the usufructuaries

Information access paths are important for updating. Figure 5 shows that only type II accesses the specialist advice channel. Therefore, agrarian extension could contribute much to the management of farms in usufruct with the use of educational methods to increase production, income and the well-being of farmers [10,11,13,14]. In addition, extension agents must assume new roles as promoters of learning to contribute to sustainability.

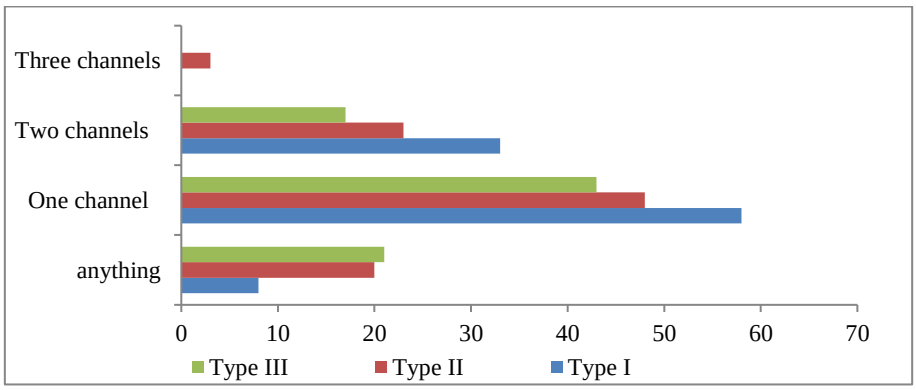

Figure 5. Channels used for agricultural updating by types of farms

Suggestions for projecting agrarian extension work with usufructuaries:

- Influence the management of rainfed crops with proposals for improvement, adoption, implementation and participatory validation of solutions.
- Promote agroecology starting with the practices of association and crop rotation, to optimize areas and move towards monocultures.
- Establish criteria for investment in technological changes appropriate to the existing conditions in the production systems in usufruct of the territory.
- Collaborate in the increase of agrobiodiversity through the strengthening of interactions between research centers and farms of usufructuaries.
- Promote animal feeding alternatives for the dry season with reserves of forage areas and the insertion of trees to increase welfare.
- Promote the insertion of young family members in careers related to agriculture, through vocational training and links with educational centers.
- Disseminate information on options with credit and the commercialization of products with added value in local and foreign markets, as means of entry for supplies and investments.
- Promote the articulation of institutions and experimental farmers for technical assistance, taking advantage of the existing spaces (assemblies, radio), the accompaniment and the establishment of days of agricultural consultation by areas of residence.

CONCLUSIONS

- The classification showed the existence of three groups of farms with different characteristics.
- Among the limitations found are significant: the availability of water, the scarce plant diversity and the channels for updating the usufructuaries.
- It was found that there are risks for the sustainability of agroecosystems in usufruct given the behavior of agro-productive, economic and social indicators, which leads to a

perspective of future extension work in various dimensions (technical, social, economic and agro-ecological).

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