Colegio de Postgraduados

Production and commercialization of flowers in the municipality of Texcoco, Estado de México

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ABSTRACT

Objective: To characterize the production and commercialization of flowers in the municipality of Texcoco, Estado de México.

Design/methodology/approach: A total of n=78 floriculturists from 11 different localities were interviewed and asked about general characteristics of the production unit, and for each person their level of innovation was also identified with the aim of constructing a typology of floriculturists.

Results: Four groups of floriculturists were found, which were differentiated ($P<0.10$) by their level of infrastructure, innovation, number of family members that work in the production unit and number of clients which they have, in addition to gender.

Limitations on study/implications: The type of sample used does not allow generalizing the results found. In addition, due to the diversity of flowers that are produced in the zone, it is difficult to homogenize the innovations and level of innovation, so an approach is presented.

Findings/conclusions: The production and commercialization of flowers in the municipality of Texcoco is carried out by traditional floriculturists. The groups identified mainly have infrastructure directed toward production, so the highest levels of innovation are found in technology, with the opportunity area of commercial and organizational innovations.

Keywords: cluster, local floriculture production, floriculture market, technological innovation.

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INTRODUCTION

Most of the ecosystems in the world can be found in Mexico, owing to its geographic location, complex topography and wide variety of soils [1]. There are agroclimatic conditions to produce a large variety of flowers, such as cempasúchil (*Tagetes erecta*), chrysanthemum (*Chrysanthemum* spp.), lilies (*Lilium* spp.) and daisies (*Bellis perennis*) [2]. For the years 2013-2022, chrysanthemum stood out in national production of grosses (14 dozens of floral stems), with an annual average of 10 million and a mean annual growth rate (MAGR) of 1.9%, with cultivation in the states of Mexico and Puebla standing out, by order of importance, with 99% of the grosses.

In the municipality of Texcoco, the climates that predominate

are sub-humid temperate with lower moisture rainfall and monthly temperature means between 18°-20°, and sub-humid temperate with summer rains of average moisture, with mean monthly temperatures of 12°-14° [3]. This contributes to the development of the floriculture activity in the region through protected horticulture in a peri-urban environment, near large market zones and research centers [4]. Few studies approach the profitability of the floriculture activity in the municipality of Texcoco. The investment project of the floriculture business in the locality of Santa Catarina del Monte, Texcoco, was analyzed in 2013, and it was found that the investment project for chrysanthemum cut flower is viable, both in a technical and financial way for small-scale and medium-scale producers [5]. However, in 2015, the studies pointed out that the floriculture potential from Texcoco has not been developed as it should have, and that there are aspects regarding its production and commercialization that are unknown [6]. Therefore, it became necessary to perform this study about the production and commercialization of flowers in the municipality of Texcoco, with the objective of analyzing, characterizing and proposing actions to improve flower production.

MATERIALS AND METHODS

The research was carried out in the municipality of Texcoco, Estado de México. Semi-structured interviews were conducted during the months of June and July 2023, with a total of 78 floriculturists from 11 different localities (Figure 1), selected from directed sampling based on a register of floriculturists provided by the Ministry of the Farmland in the municipality.

Variables were used such as age, education, gender, marital status, years in the activity, percentage of income that comes from the activity, surface and infrastructure for production, type of property, number of people and family members that work in the production unit (PU), main flowers produced, number of clients, client reach, and reasons for commercialization. For the infrastructure, a level was determined, considering what is presented in Table 1. In addition, floriculturists were consulted about whether they adopted a set of 18 specific innovations in production, which were categorized into three types: i) technological innovations, ii) commercial innovations, and iii) organizational innovations (Table 2). Both for the calculation of level of innovation and level of infrastructure, the formula for the Innovation Adoption Index was used [7]. The variables described were scaled to later perform a cluster analysis with the Ward method. Finally, Scheffé means

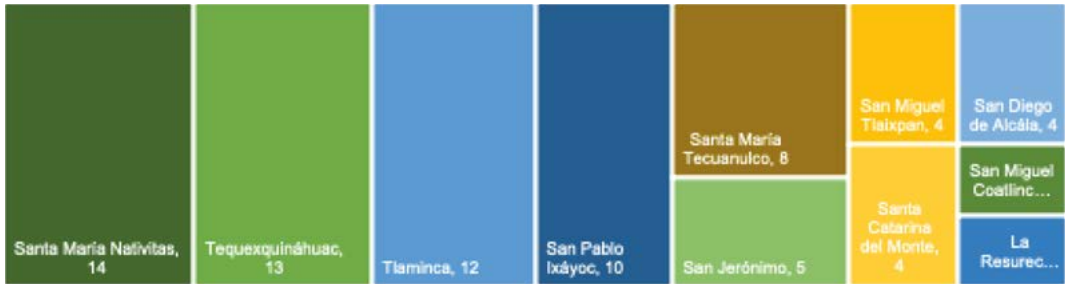

Figure 1. Universe of study. Source: Prepared by the authors with field information (2023).

Table 1. Infrastructure of the PU.

Infrastructure type
1. Water
2. Drain
3. Electricity
4. Internet at the Plot
5. Bank account
6. Cold storage rooms
7. Motorized cultivator
8. Own vehicle
9. Web sites
10. Online sales
11. Access to the bank by Internet
12. Electronic Invoice
13. Mother plant production area
14. Parihuela
15. Sprinkler pump

Table 2. Catalog of innovations.

Technology innovations
1. Soil analysis
2. Use of methyl bromide
3. Use of hydrogen peroxide
4. Padding
5. Fertirrigation
6. Crop rotations
7. Use of biological activators
8. Use of timer
9. Micronutrients
10. Composting
11. Soil improvers: agricultural lime and/or dolomitic lime and/or worm castings and/or liquid humus.
12. Mycorrhiza and azoospirilum
13. pH regulation for fertilization
Commercial innovations
14. Common purchases and/or sales
15. Sales by contract
Organizational innovations
16. Use of agricultural insurance
17. Use of credit
Technical-productive and administrative records

Source: Prepared by the authors.

difference tests were carried out for the quantitative variables analyzed in each group with a significance level of 10%. The analyses described were carried out through the use of the statistical package R.

RESULTS AND DISCUSSION

In general, 90% of the interview respondents are men and the rest women. Of them, 65% were married, 19% single, 8% living in civil union, and the rest are separated, widows or single mothers or fathers. They are on average 48 years old, with 11.8 years of education on average, and 20.8 years of experience in floriculture activity on average. In addition, 68% of them are owners of the land they farm, 26% rent it, and 6% of them work in a property on loan. The production of 19 different flower species was found, of which 29% of the floriculturists are devoted to the production of chrysanthemum, 14% to the production of sunflower (*Helianthus annuus*), 10% to the production of daisies, and 10% to the production of roses (*Rosa chinensis*), which as a whole represent 64%; the rest (36%) produces eleonora (*Chrysanthemum morifolium*), campana (*Moluccella laevis*), oriental (*Lilium candidum*), tulip (*Tulipa gesneriana*), geranium (*Geranium* spp.), African lily (*Agapanthus africanus*), aster matsumoto (*Callistephus chinensis*), among the most mentioned by floriculturists. On the other hand, of the total of interview respondents, for 46% of them, this activity represents economic income of 31 to 50%; for 22% it represents income between 51-70%; for 19% it represents more than 70% of their income; and only for 13% it represents between 0-30% of their economic income.

However, the characteristics of floriculturists and their production units (PUs) analyzed allowed grouping them into four groups (Figure 2).

Regarding the general characteristics of the PU and the floriculturist by groups, they are presented in Table 3, which shows the variables that present a significant statistical difference ($P<0.10$): number of family members who work, level of infrastructure, and number of clients of the PU.

Floriculturists from Group 1 represent 33% of the sample analyzed; 100% of them are men, the main flowers that they produce are chrysanthemum and daisies, and they are the ones that present the highest levels of infrastructure. Of them, 100% have the utilities of water and electricity, although the water used for production does not have adequate management, since 77% of them use the hose to irrigate; 86% have their own vehicle; 61% present production area of the mother plant; and 69% have rototiller, while 93% have dolly or aspersion pump. This allows inferring that due to the infrastructure they have, this fosters for the floriculturists to also be the ones that show the highest level of innovation (Table 3). Specifically, this infrastructure is a support to carry out the technological innovations, and in addition, this could also happen given that 69% of them are owners of their PUs. In reference to the number of family members who work in the PU, they are also the floriculturists that present a higher number of family members, the same as the number of clients. This group is characterized by its reach in the market, which is met with 23% of the floriculturists locally and regionally (Central de Abastos de Iztapalapa or Mercado de Jamaica), and the floriculturists refer as reasons for sale the fact that they value the quality of their product, offer a better price, or pay quickly and effectively.

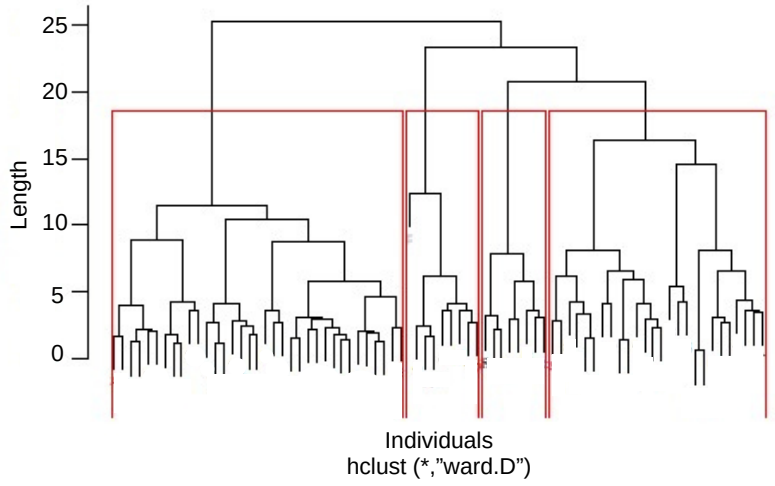

Figure 2. Resulting groups from the analysis.
Source: Prepared by authors with field information (2023).

Table 3. General characteristics of the PU and the floriculturist by groups.

Variable (units)	Group				
	1	2	3	4	Total
	n=26	n=35	n=9	n=8	N=78
Farmer age (years)	46.4[a]	49.7 [a]	47.9 [a]	44.1 [a]	47.8
Farmer educatin (years)	12 [a]	10.8 [a]	15 [a]	11.8 [a]	11.8
Activity experience (years)	20.3 [a]	21.6 [a]	24.1 [a]	15.8 [a]	20.8
Number of people permanently working on the plot	4.6 [a]	2.7 [a]	2.1 [a]	2.1 [a]	3
Number of family members working on the plot	3.04 [a]	1.23 [b]	1.44 [ab]	1.38 [b]	2
Area (m^2)	2098.5 [a]	4118.4 [a]	2288.9 [a]	1706.4 [a]	2986.6
Infrastructure level (%)	48.2 [a]	32.4 [b]	35.3 [ab]	28.7 [b]	37.6
Number of customers	1.69 [a]	1.06 [b]	1.11 [b]	1.13 [b]	1.28

*Values with different letter in the same line are statistically different (P<0.10).
Source: Prepared by the authors.

Group 2 of floriculturists covers the highest percentage of the sample studied (44%), and 100% of them are men. They produce mainly sunflower, cempasúchil, campana and chrysanthemum. This group presents the second best level of infrastructure in their production unit; 89% have access to water and 77% to electricity, and also 66% have their own vehicle. Of the floriculturists, 40% have a production area of mother plant, 63% have a dolly or spraying pump. However, although they have the basic infrastructure for production, they are the ones that presented the lowest level of innovation, which is probably because in this group it is more common for the type of property to be rented or loaned.

Group 3 involves 12% of the sample, 100% of the floriculturists are men and they produce mainly chrysanthemum and daisy. Regarding their level of infrastructure, 100% have water service, 89% electricity, 78% vehicle, 56% have a production area for mother plant, 89% have a spraying pump or dolly, and for 66% the PU is their property while for the rest it is rented.

Group 4 covers 10% of the sample, and this group is characterized by being made up solely by women who produce mainly roses, aster matsumoto and African lily. Of them, 100% have water, 63% electricity, only 38% have a vehicle of their own, and 50% have dolly or spraying pump; 75% of them own the PU. From this group, it should be highlighted that although there was no statistical difference, they are the ones that have least activity in floriculture, since they present 8.3 years of experience less than the floriculturists from Group 3, who were the ones that presented the most experience on average (Table 3). It should also be highlighted that they are the ones that have least infrastructure to carry out the activity, and that no statistically significant difference was found; however, they present a higher level of innovation than floriculturists from Group 3, and even from the organizational point of view, and statistically, they have a higher level of innovation than floriculturists from Group 2 (Table 4).

Regarding the commercialization channels of Groups 2, 3 and 4, most of them satisfy the local market; that is, whether they sell directly in the street markets of their locality, in flower shops or in established markets in Texcoco such as the San Antonio Market or Texcoflor Market. They carry out these sales mainly because the clients purchase wholesale, or simply due to family tradition. The market that these groups of producers are focused on could be attributable to the low level of adoption of commercial and organizational innovations, which is related to the infrastructure that they have for this purpose (Figure 3). This applies even for floriculturists from Group 4 who were the ones with highest levels of adoption (Table 4).

This allows inferring that the production units analyzed are of traditional type; that is, although there are differences between them, they are devoted to the production of seasonal products, and for most of these, this type of production is not priority since they obtain income from other activities, and in addition their products are considered a commodity for there is not really anything that differentiates them from their competition, so the price they are paid is the one present in the market [4].

Table 4. Adoption of innovations among groups (%).

Innovation Adoption Index	Group				
	1	2	3	4	Total
Technology	42.3 [a]	21.5 [b]	29.1 [ab]	31.7 [ab]	30.4
Commercial	21.2 [a]	11.4 [a]	33.3 [a]	25.0 [a]	18.6
Organizational	6.4 [a]	1.9 [a]	0 [a]	8.3 [a]	3.8
General	34.0 [a]	17.1 [b]	24.7 [ab]	27.1 [ab]	24.6

***** Values with different letter in the same line are statistically different ($P<0.10$).
Source: Prepared by the authors.

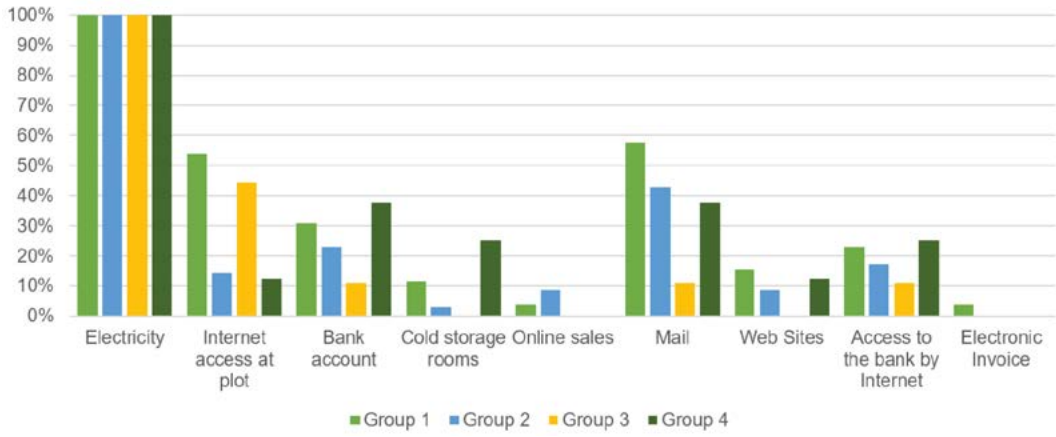

Figure 3. Infrastructure related to commercial and organizational innovations or to improve the commercialization channels.
Source: Prepared by the authors.

CONCLUSIONS

Four groups of floriculturists were found, which were statistically differentiated due to their level of infrastructure, the number of family members who work in the PU, and the number of clients they have. The levels of adoption are generally low; that is, they are adopting between 3 and 6 innovations out of 18 possible, depending on the group. Technological innovations are the group of innovations most frequently adopted, then the commercial and finally the organizational. It was found that there is a relationship between the level of infrastructure and the level of innovation. The level of infrastructure that the floriculturists have is focused on production, water, electricity, a vehicle of their own, and a dolly, among others. However, they do not have infrastructure that allows them to improve their commercialization and their organization; that is, access to internet, invoice emission, bank account, webpage, or email. Therefore, this study evidences that infrastructure is required in order to innovate. With the aforementioned, the groups found are characterized by being traditional businesses.

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