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Exploring the attitudes and strategies of peri-urban vegetable growers in the Santiago Metropolitan Region of Chile

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ABSTRACT: Vegetable production is common in peri-urban agriculture where produce is sold in nearby towns, and the Santiago Metropolitan Region (SMR) in Chile is no exception. The objective of this article is to explore the productive, commercial and management strategies of small-scale vegetable growers at the SMR, their attitudes towards their activity, and to identify different profiles. We surveyed in person 170 farmers. The data was analyzed using descriptive and multivariate techniques. Results suggest that different characteristics and strategies are concomitant to certain attitudes that vegetable growers hold towards key aspects such as innovation or willingness to associate.

Explorando las actitudes y estrategias de los horticultores periurbanos en la Región Metropolitana de Santiago

RESUMEN: La horticultura es común en la agricultura periurbana, en la cual los productos pueden ser vendidos en urbes próximas, como el caso de la Región Metropolitana de Santiago (RMS). Esta investigación tiene por objeto explorar las estrategias productivas, comerciales y de gestión, así como las actitudes, de los pequeños horticultores en la RMS e identificar perfiles. Se encuestó en persona a 170 agricultores. Los datos fueron analizados mediante técnicas descriptivas y multivariantes. Los resultados sugieren que las diferentes características y estrategias son concomitantes a las actitudes de los horticultores respecto a aspectos como la innovación o la voluntad de asociarse.

KEYWORDS / *PALABRAS CLAVE*: Vegetable growing, peri-urban farming, Metropolitan Region, Chile / *Horticultura, agricultura periurbana, Región Metropolitana, Chile.*

JEL classification / *Clasificación JEL*: Q13, Q18, R12.

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1. Introduction

Vegetable production has high potential to generate income and employment per hectare, as well as nutritious foods (Schreinemachers *et al.,* 2018). Vegetable growing is also part of the multi-cropping systems characteristic of small-scale and family farming (FAO, 2018). Public policies worldwide have been sluggish in responding to the increasing demand for vegetables, stunting farmers' ability to capitalize on this trend (Pingali, 2015). Vegetable growing worldwide presents challenges such as safety, productivity, and market access that need to be addressed (Schreinemachers *et al.,* 2018).

According to the FAO (1999), vegetable growing is characteristic of peri-urban agriculture (PUA). The FAO defined PUA as farm units close to towns with full or semi-commercial operations. The FAO says that PUA has the potential to increase the availability of fresh foods in cities, but usually competes for land, water, energy, and labor, which limits its development.

To design appropriate policies to support peri-urban vegetable production, information must be gathered about the farmers. According to the FAO (2015), support policies should address farmers' objective situations and pay special attention to their attitudes, which allows for more effective interventions. In this article we will use the ABC Model as a framework for understanding attitudes, which proposes that they are a reaction to an object based on affect, behavior, and cognition (Haddock & Maio, 2008). Considering the classical concept of "habitus" in Bourdieu (1984), attitudes might be deeply related to the social, economic, and cultural context. Therefore, it is likely that as a group that shares a similar context, it will share similar attitudes.

This article is a contribution to address the following questions: What are the main sociodemographic characteristics, as well as productive, commercial and management strategies of peri-urban vegetable growers? What are their attitudes toward their activity, and which factors underlie those attitudes? Which attitude profiles are evident? What recommendations can be suggested to policy makers, extension agents and organizations based on these findings?

For this, we will focus on the Santiago Metropolitan Region (SMR) of Chile. The SMR accounts for 40 % of the population of Chile and generates 45 % of national Gross Domestic Product, 0.8 % of which (SMR GDP) is agriculture (BCN, 2020). It is divided into 52 districts, 34 of which form the biggest urban center in Chile, known as *Gran Santiago*. Encircling these is a belt of 18 peri-urban districts with lower population density, although this is changing due to significant real estate development in the last ten years (Cáceres, 2015). Vegetable production is concentrated in the southern part of that belt. The SMR is the most important vegetable producing region in Chile, encompassing 31.4 % of the national cultivated area, most of which is in hands of small-scale farmers (INE, 2018). Previous research has shown that although SMR small-scale farmers have low access to technology and formal markets and a high average age (Boza *et al.,* 2016; 2018), they provide essential fresh products to SMR markets (Espacio & Fomento, 2016). Vegetable growing in the SMR is therefore a clear example of peri-urban farming.

2. Materials and methods

The data analyzed in this article was obtained from a survey conducted in person by a team of nine agricultural engineers in September of 2019 with 170 small-scale vegetable growers located in 13 districts of the southern area of the Santiago Metropolitan Region. Those districts were selected due to the higher concentration of vegetables production. The data was validated and coded once it was collected. The sample size was determined by non-probability sampling, mainly because we did not have a sampling frame available to randomize the selection of respondents, as Chile does not have any sort of "vegetable growers registry." In fact, small-scale farming is characterized in Chile by high informality (Boza *et al.,* 2019). Non-probability sampling is appropriate when randomization is not viable, the population is too large, and the objective is an explorative analysis that is not unquestionably generalizable (Etikan *et al.,* 2016). In this, sample randomness reduces biases for inference. When the population is homogenous, for instance, if they share the same occupation and location as they do in this case, reliability of generalization without sample randomness increases, especially if the goal is not causal inference (Kohler, 2019; Jager *et al.,* 2017). To recruit the respondents, we applied the snowball technique, i.e., a reduced number of initial subjects were identified, and after being interviewed by the survey team, they were asked to identify other small-scale vegetable farmers located at their same district, who were then visited and interviewed as well. This process was repeated until 170 valid surveys were scheduled.

The survey was composed of the following sections: i) sociodemographic characteristics, ii) technical and production strategies, iii) access to ICT, innovations, and certifications, iv) farm management and commercialization, v) access to financial support and association membership and vi) statements regarding attitudes. Multiple choice, closed questions were used for the items from i to v. The answers to the last category were formed in accordance with a 7-level Likert scale (from 1: "completely disagree" to 7: "completely agree").

The information obtained from the survey was first analyzed using descriptive statistics. This was followed by multivariate analysis techniques applied to the results on farmers' attitudes. Principal components factor analysis was employed, which helps reduce the volume of information derived from a large set of variables. Prior to applying factor analysis, Bartlett's sphericity test and the Kaiser-Meyer-Olkin (KMO) index were estimated to determine sample adequacy (Malhotra *et al.,* 2008).

After being identified, the factors were interpreted once the variance percentages explained by the variables of each of them were determined. The internal consistency of factors was measured using Cronbach's coefficient. When factors were established and characterized, an analysis of non-hierarchical conglomerates (k-means) was applied to define clusters. This was accompanied by an ANOVA ($\alpha < 0.05$) to differentiate attitudes between groups. Finally, each group was characterized by a descriptive analysis.

3. Results

3.1. Descriptive analysis of the sample

They were surveyed 47 women (28 %) and 123 men (72 %). The average age was 53. Only 15 % of the farmers were under 40 years old, while 30 % were over 60 years old. Of the respondents, 40 % have only completed primary education, 37 % secondary education, 10 % technical education and 8 % university education, while 5 % have not completed any formal education. The average farm size is 13.7 hectares, with an average of 10.8 hectares in production. There is a large range for this variable, however. Of the farmers, 72.6 % have 10 hectares or less, and 56 % have 5 or less, 41 % rent their land, and 43 % own it. Most of the farmers produce outdoors, and only 21 % use greenhouses. Only 12 % of the farmers declared that they use organic techniques. Furrow (37 %) and sprinkler (33 %) are the most common irrigation systems. On mechanization, 92 % of farmers use machinery, the majority of which is borrowed or leased. Only 8 % of respondents have access to a processing plant. Of the farmers 64 % use family labor. On innovation, 39 % of farmers incorporated new species or varieties into their production within the last year, and 41 % have adopted new management techniques. Most of the farmers (86 %) do not have any type of certification. Of those who do, Good Agricultural Practices was mentioned most.

Of the respondents, 29 % declared that their farm produces a monthly income averaging 250,000 CLP ($305.65 USD, 04-03-2020) and 33 % did not answer this question. In fact, 54 % did not keep financial records for their farms, and 49 % did not keep production records either. The main vegetables cultivated in terms of the number of farmers growing them are lettuce, tomatoes, and onions. The main crops in terms of hectares are beans, broccoli, cabbage, and lettuce. Intermediaries and wholesalers are the principal distribution channels for more than half of the respondents, followed by on farm sales and farmers' markets. Of the farmers, 42 % say they are incorporated to the formal economy, meaning their activity is registered at the *Servicio de Impuestos Internos* (Internal Revenue Service) and they pay taxes. The *Instituto de Desarrollo Agropecuario*, INDAP (National Institute of Agricultural Development), an organization under the Ministry of Agriculture, is the primary source of financing for farmers, followed by *Banco Estado* (the State Bank of Chile). Of the farmers, 86 % have never been the beneficiary of a public institution other than INDAP.

Only 43 % of farmers had bank accounts, 25 % use a computer, 33 % use email, 22 % use social networks to promote their products, 9 % use e-commerce, 31 % perform procedures such as bill payments online, and 81 % use a cell phone. The results also show low willingness or capacity to join or form farmer's associations, as 84 % of the respondents do not belong to any technical-productive, commercial, or trade association.

TABLE 1

Description of the vegetable growers surveyed

Variable	Categories	%	
Gender	Male	72	
	Female	28	
Age	21-40 years old	15	
	41-60 years old	55	
	61-80 years old	30	
Education	None	5	
	Primary	40	
	Secondary	37	
	Technical	10	
	University	8	
Farm size (total/in production)	Less than 1 ha	29	40
	1.1-10 has	43	38
	10.1-20 has	11	11
	20.1-30 has	6	3
	More than 30.1 has	11	8
Land tenure regime	Owner	43	
	Rent	41	
	Usufruct	8	
	Others	16	
Type of production	Outdoors	79	
	Greenhouse	21	
Production system	Conventional	82	
	Organic	12	
	Hydroponic	4	
	Other	2	
Irrigation system	Furrow	37	
	Sprinkler	33	
	Line	15	
	Drip	10	
	Other	5	

TABLE 1 (Cont.)

Description of the vegetable growers surveyed

Variable	Categories	%	
Technology, innovation, and certifications (yes/no)	Machinery	92	8
	Processing plant	8	92
	New species last year	39	61
	Family labor	64	36
	Certifications	14	86
Farm income (month average)	Less than 250,000 CLP	29	
	250,000-500,000 CLP	18	
	500,000-1,000,000 CLP	12	
	More than 1,000,000 CLP	9	
	No answer	33	
Distribution channel	Wholesalers	32	
	Intermediaries	24	
	On farm sales	22	
	Farmers' market	12	
	Retailers	6	
	Others	4	
Management strategies (yes/no)	New management techniques last year	41	59
	Financial records	46	54
	Productive records	51	49
	Incorporation to the formal economy	42	58
	Bank account	43	57
	Membership in associations	16	84
Institutions from which received credit	INDAP	44	
	Banco Estado	33	
	Other banks	13	
	Other institutions	10	
Information and communication technologies (ICT) use (yes/no)	Computer	25	75
	Cell phone	81	19
	Email	33	67
	Social media to promote products	22	78
	E-commerce	9	91
	Business procedures	31	69

Source: Own elaboration.

3.2. Assessment of attitude statements

The evaluation statements showed that farmers were convinced that they are selling products that are not risky to consumers: "I think my vegetables are safe" (6.6). This positive self-perception is also shown by their agreement with: "I implement Good Agricultural Practices" (6.0). There is a high level of agreement regarding the statement: "I need investment to increase my production" (6.4). Farmers show indecision inclining toward disagreement with the statement: "I consider that I have the appropriate infrastructure to develop my business" (3.9). Farmers see the benefits of investing in renewable energies as an opportunity to improve the sustainability of their farms.

On commercialization there are differing attitudes. There is clear agreement with the statements: "The sale of my vegetables is made at an appropriate time" (6.3) and "I like the payment method I receive for the sale of my products" (5.9). The statement "I am always looking for new clients" (5.1) showed a certain consensus, however, they strongly disagree with "I actively promote my products" (2.3) and "I think the use of social networks allows me to present my products" (2.1). The farmers show indecision related to the statement: "The sale price of my vegetables is good" (4.4). These answers are coherent with a market that has a high presence of intermediaries, wholesalers, and on-farm sales, to which farmers sell undifferentiated and non-processed products. Farmers are uncertain about the importance of intermediaries for their commercialization.

They also manifest interest in commercialization as part of their activity, as they disagree with the statement: "I am only interested in producing, not trading" (3.4), and the importance for them to establish formal relations: "I think that billing in purchases and sales is important" (5.5).

Statements related to innovation are valued with indifference or clear disagreement, especially in non-productive innovations related to packaging (2.1), management (2.2) and commercialization (2.4). Innovations on technical-productive aspects are valued more.

Farmers are uncertain about the usefulness of the public support instruments and have a clear dislike of private support. They express significant disagreement on their ability to obtain private financing. Although few farmers participate in associations, they value the advantages they could obtain through them: "I believe that associations (technical or commercial) are beneficial for their participants" (5.6).

Speaking generally about their activity, our results suggest an uncertainty regarding the future, as the statement "I have a positive vision about the future of my productive activity" had a modest score (4.9), and the statement "I believe that the younger generations are interested in vegetable farming" had one of the lowest scores (2.2). In contrast, farmers approve of the time they currently dedicate to their production: "I consider that the time I work on my farm is adequate" (5.3).

TABLE 2

Farmers' valuation of the proposed assertions towards their activity

	Av.	S.D.
I think my vegetables are safe	6.6	0.9
I need investment to increase my production	6.4	1.4
The sale of my vegetables is made at an appropriate time	6.3	1.2
I implement Good Agricultural Practices	6.0	1.6
More investment in renewable energy would contribute to my activity	6.0	1.7
I like the payment method I receive for the sale of my products	5.9	1.8
I believe that associations (technical or commercial) are beneficial for their participants	5.6	2.0
I think that billing in purchases and sales is important	5.5	2.3
I consider that the time I work on my farm is adequate	5.3	2.0
I am always looking for new clients	5.1	2.5
I have a positive vision about the future of my productive activity	4.9	2.3
The sale price of my vegetables is good	4.4	2.0
The innovations in my productive system have been beneficial for my activity	4.4	3.0
The public support I have received has been useful for my activity	4.4	3.1
I consider that I have the appropriate infrastructure to develop my business	3.9	2.1
I consider that the role of intermediaries is essential to sell my products	3.6	2.7
I am only interested in producing; not trading	3.4	2.3
There are enough public financing options for the sector	3.2	2.5
Innovation in commercialization has been beneficial for my business	2.4	2.9
I actively promote my products	2.3	2.6
The private support instruments I have received have been useful for my activity	2.3	3.0
I finance my productive activity mainly through private banks	2.2	2.5
Innovation in farm management has been beneficial for my business	2.2	2.8
I believe that the younger generations are interested in vegetable farming	2.2	1.8
I have incorporated new packaging techniques in the last 5 years	2.1	2.7
I think the use of social networks allows me to present my products	2.1	2.8

Note: 7-level Likert scale; from 1: "completely disagree" to 7: "completely agree".

Source: Own elaboration.

3.3. Factor and cluster analysis

The principal component analysis based on answers to the statements showed that farmers' attitudes variance could be explained in a 67.5 % for the following four factors: "positive expectations" (21 %), "associativity and investment" (18.1 %), "farm innovative practices" (15 %) and "formalization and private support" (13.4 %). The first is associated with an optimistic vision of the future of their farms and a willingness to improve their situation. The second is related to the importance of associations and the need for resources to invest. The third is related to the relevance of technical innovation. The last factor is related to the importance of formal relations and access to financing.

Four homogenous groups were identified in terms of their attitudes. The first cluster comprised 13.7 % of the respondents. They are characterized by an all-round negative attitude toward every factor except "associativity and investment." Of the farmers in this cluster, 85 % are male and the average age is 55 years old. Likewise, 60 % have only primary education, and the average farm size is 8 hectares with 6 under production.

TABLE 3

Composition of factors that explain farmers' attitudes

Factor	% Variance	Weight	Factor variable
Positive expectations	21	0.835	I have a positive vision about the future of my productive activity
		0.780	The sale price of my vegetables is good
		0.529	I am always looking for new clients
Associativity and investment	18.1	0.788	I believe that associations (technical or commercial) are beneficial for their participants
		0.719	I need investment to increase my production
Farm innovative practices	15	0.802	More investment in renewable energy would contribute to my activity
		0.798	I implement Good Agricultural Practices
Formalization and private support	13.4	0.871	The private support instruments I have received have been useful for my activity
		0.609	I think that billing in purchases and sales is important

Note: Bartlett's sphericity test P = 0.00. Kaiser-Meyer-Olkin index (KMO) = 0.55. Total explained variance = 67.5 %.

Source: Own elaboration.

The second cluster is the largest, comprising 45.2 % of the respondents. They have a positive attitude toward all factors except "formalization and private support." Of the individuals in this cluster, 72 % are men and the average age is 54 years old. Unlike the first cluster, these farmers have a higher level of education, including some farmers with technical and University education. The average farm size of 10 hectares, with 8 under production.

TABLE 4

Farmers' clusters in terms of attitudes towards their activity

Factors	Clusters			
	C1 (13.7 %)	C2 (45.2 %)	C3 (10.3 %)	C4 (30.8 %)
Positive expectations (p = 0.01)	-0.64052	0.06915	-0.07634	0.20870
Associativity and investment (p = 0.00)	0.36229	0.42012	-2.09951	-0.07737
Farm innovative practices (p = 0.00)	-1.86325	0.41483	0.30172	0.11912
Formalization and private support (p = 0.00)	-0.42081	-0.49627	-0.87942	1.20803

Note: 24 cases could not be considered for the cluster analysis because of lack of complete information.

Source: Own elaboration.

TABLE 5

General description of farmers' clusters

Variable	Cathegories	C1	C2	C3	C4
Gender (%)	Male	85	72	47	87
	Female	15	28	53	13
Education (%)	None	10	4.5	13.3	0
	Primary	60	40.9	33.3	35.6
	Secondary	20	37.9	53.3	37.8
	Technical	5	10.6	0	11.1
	University	5	6.1	0	15.6
Age (Average)		55	54	58	50
Farm size (Average has.)		8	10	15	21

Source: Own elaboration.

The third cluster comprises 10.3 % of the respondents. They have negative attitudes about all factors except "farm practices innovation." This is the oldest group, with an average age of 58 years old, and the highest representation of women (53 %). Of these farmers, 53 % have finished secondary education, and their average farm size is 15 hectares, with 14 under production.

The fourth cluster is the second largest, comprising 30.8 % of the cases. In direct opposition with the first cluster, they are characterized by an all-round positive attitude toward every factor except "associativity and investment." Of these farmers, 87 % are men. This is the youngest cluster, with an average age of 50 years old. This group stands out for having a higher level of education: 27 % of the farmers have technical or university education. They have the largest farm size, averaging of 21 hectares with 15 under production.

4. Discussion

The SMR vegetable growers surveyed have a high average age and a generally low level of education. The rural-urban migration of young people can explain the aging of farmers. According to the World Bank, the rural population in Chile has decreased by 0.8 % annually during the last two decades, while the urban population has increased by 1.5 %. The education level is considerably lower than the national average in the CASEN 2017 survey of the Ministry of Social Development (2018), but this makes sense considering the average age of the rural population. The vegetable growers surveyed run small-scale farms with little use of technology, especially ICT, except for cell phones. Throughout Latin America, technological advancement in agriculture has not included small-scale farmers (Trigo & Elverdin, 2019).

In the specific case of ICT, the lack of training and an unfavorable attitude have been shown to reduce their use in Chilean small-scale farming (Mora *et. al.,* 2012). Most farmers surveyed do not keep economic or productive records, which might decrease their ability to plan and insert themselves in formal markets. Supermarkets and exports are not commercial options for them. This results in lower revenues than they would get in shorter supply chains (Aguiar *et al.,* 2018), but farmers appreciate that intermediaries are able to buy high volumes all at once, and thus contribute to income stability (Rimisp, 2015). Farmers surveyed have little knowledge of government support programs beyond the *Programa de Desarrollo Local*, PRODESAL (Local Development Program) from INDAP and have limited options to obtain financing and a low rate of participation in associations. These characteristics might be related. The main programs from INDAP, such as PRODESAL, are focused on individual solutions, which, accompanied by farmers' cultural background, discourages association (Nagel & Martínez, 2015).

The farmers surveyed evaluated their productive practices and the food safety of their products very positively. This view contrasts with expert reports which show that improving safety is one of the main challenges for small-scale vegetable farming in Chile (Pertuzé *et al.,* 2019), suggesting that farmers might not fully understand the concepts of food safety, Good Agricultural Practices, and their implications. On the

commercialization side, they like their ability to sell in a timely manner, but not the price they receive. Their attitudes also suggest a willingness to explore new commercialization avenues for their produce.

Farmers think that they do not receive enough government support, but their contact with the private sector is almost non-existent. They have a low willingness to innovate, especially on aspects not related to production, even though they do perceive commercialization as their obligation. This could be because farmers are more familiar with innovation in production techniques. They are insecure about the future of their farms and are convinced that to grow they need more resources to invest. Access to funding is critical to increase productivity. However, in Chile, von Cramon-Taubadel & Saldías (2014) showed differing impacts of access to credit due to the type of production.

The factors underlying farmers' attitudes were related to expectations, willingness to join associations, investment, innovation, formalization, and private support. They allowed us to cluster the farmers into four groups by both their attitudes and their objective characteristics. These results are coherent with previous research in Chile. These investigations have shown that, even among small-scale farmers, there are differing views on their activity, especially about changes, and concomitant with their descriptive characteristics (Boza *et al.,* 2018; 2019; Mora *et al.,* 2012, 2013). Considering Boza *et al.* (2018), both articles study the same population of small-scale vegetable growers at the SMR, however this research has more updated data and identifies factors underlying farmers' attitudes and clusters.

The clusters we identified suggest that vegetable growers with smaller farms are less willing to innovate and formalize. They have a negative perspective about the future of their farms. They see farmers' associations as a beneficial option, and they feel the growth of their farms is limited by the lack of investment resources. In contrast, younger vegetable growers with higher levels of educational and larger farms disagree entirely. Farmers in the largest cluster believe strongly in the importance of farmer's associations, are equally willing to innovate in technical aspects, and agree that they are limited by a lack of investment. They are not interested, however, in formalization or access to private loans.

5. Conclusions

This research has clear implications for policymaker who are designing and executing interventions, as well as for farmers' organizations and extension agents. Our results show different aspects for which innovation is needed. We will divide them into product, process, marketing, and organizational innovation, following the last edition of the Oslo Manual by the OECD & Eurostat (2018). For products, there is space for differentiation by adding value through transformation (e.g., IV and V Range) and in food safety and quality certifications. In process innovation, we suggest improving safety through Good Agricultural Practices by following official regulations and standards, promoting technological change to achieve higher yields and postharvest durability, and upgrading irrigation systems for a more efficient water

use. In marketing, we recommend searching for alternative distribution channels that don't depend on the traditional intermediaries. We also suggest strengthening alliances with other farmers to raise and stabilize marketable volumes. In organizational innovations, we suggest promoting formalization among farmers to increase their access to markets on better terms. We also recommend reinforcing the use of both technical and economic records and introducing planning practices.

To address these aspects, our research suggests that policy makers, extension agents and organizations must deal with vegetable growers' general strengths and limitations, but should also adapt to their different specific objective and subjective profiles. Our results indicate that farm size, along with other socio-economic characteristics such as age and educational level, might influence the attitudes of peri-urban vegetable growers toward innovation, formalization, willingness to associate and even optimism about the future of their activity. Younger farmers with bigger farms and a higher level of education seem to have higher expectations for themselves and their businesses. That might encourage them to improve, innovate, formalize, and approach the private sector for loans. However, they are quite individualistic, and are not interested in associations. Therefore, some farmers should be approached with individual interventions, while others need to be approached collectively and more progressively, convincing them slowly, as they are more reluctant to change.

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