How close are we to self-provisioning? A look at the livelihood strategies of rural households in the Southern Andean region of Colombia

Héctor Eduardo Hernández-Núñez (✉ heduardohn@gmail.com)

Universidad de la Amazonia <https://orcid.org/0000-0003-1408-456X>

Gustavo Adolfo Gutiérrez García

Universidad de la Amazonia

Isabel Gutiérrez-Montes

CATIE - Centro Agronómico Tropical de Investigación y Enseñanza, Turrialba 30501, Costa Rica

Juan Carlos Suárez Salazar

Universidad de la Amazonia

Hernán J. Andrade

Universidad del Tolima

Angie Paola Bernal Núñez

Universidad de la Amazonia

Fernando Casanoves

CATIE - Centro Agronómico Tropical de Investigación y Enseñanza, Turrialba 30501, Costa Rica

Cornelia Butler Flora

Iowa State University

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Abstract

Production for self-provisioning contributes to food security in rural territories; however, studies have indicated that this capacity is limited. We analyze the impact of livelihood strategies on self-provisioning conditions in 162 rural households in the department of Huila, Colombia. Different topics were examined: a. source of the food; b. composition of home gardens; c. push and pull factors towards self-provisioning; d. capacity of rural households to access food in the face of COVID-19. Results indicated that rural households are 75% dependent on grocery stores for access their food. Only 51% of households have a home garden, with limited species diversity. Capacity for self-provisioning varies according to the livelihood strategies and capital endowment of the household; those with a greater diversity of agricultural activities have better capacity to provide for self-provisioning. We conclude that resilience of rural households is minimal to face atypical events such as the pandemic generated by COVID-19.

1. Introduction

While the world is largely dependent on markets to meet its food needs, a significant number of rural households, mainly in developing countries, are highly dependent on their own food production (Aweke et al. 2020). This practice is referred to as self-provisioning (Álvarez et al. 2007; Sacco dos Anjos et al. 2010). Surpluses from this production generate income that allows households to purchase other foods (Dutra et al. 2018). Actions derived from self-provisioning make it possible to maintain the social relations that arise from the coexistence of individuals (Álvarez et al. 2007) and can occur through gifts and the reciprocal exchange of food between relatives and neighbors (Torres 2002). In addition, self-provisioning makes it possible to comply with the principles of food security, such as food diversity and the maintenance of eating habits (Grisa 2008).

Self-provisioning can be generated through different production processes, such as local processing, using harvest surpluses for home consumption (Torres 2002), and family agriculture (Van der Ploeg 2014). The latter favors the valuation of the social, environmental and cultural dimensions of rural households and offers direct access to food, which are characteristics of food security (Dutra et al. 2018). Family agriculture with an agroecological approach goes beyond the production of healthy and sufficient food (Rosset et al. 2011), and promotes the conservation of the natural base of diverse ecosystems, the empowerment of local actors (Altieri and Toledo 2011), and allows agricultural production to form part of the livelihood strategies of rural households (Anderzén et al. 2020; García et al. 2016b).

Diverse family farms produce, grains, vegetables, fruits, fodder and animal products simultaneously (Altieri et al. 2012). Historically, the production of these foods primarily for self-provisioning is traditionally developed in home gardens and agroforestry systems (Vaast and Somarriba 2014). Home gardens increase the intake of fresh and nutritious vegetables (Aworinde et al. 2013; Kortright and Wakefield 2011), particularly in more vulnerable households (Algert et al. 2016), supply of medicinal plants (Díaz et al. 2016), exchange of seeds and seedlings (Calvet et al. 2012) and decrease the acquisition of food in local markets (Altieri and Nicholls 2010). These production systems encourage the participation of all household members in food production and processing (Akhter et al. 2010; Calvet et al. 2011) and facilitates adaptation to social change in the community (Gray et al. 2014).

In the 1930s, the first studies of mixed gardens were carried out in Java, Indonesia (Hashini et al. 2013). Since then research has evolved both in definitions, which in English have addressed terms such as "*home garden*", "*backyard gardens*", "*dooryard gardens*", "*kitchen gardens*" and "*house gardens*" (Lope and Howard 2012), and in the inventory of species, functions, structural characteristics, composition, socio-economic and cultural relevance (Hashini et al. 2013). An agroforestry concept of home gardens refers to the orchard or plot of land as a space associated with the

house, in which trees, bushes and grasses grow, mixed with annual crops and raising of domestic animals (Cano 2016).

Although the importance of home gardens in the food system is recognized (Ghosh 2014), each territory requires comprehensive and interdisciplinary research to explore its agrobiodiversity (Galluzzi et al. 2010) and the contribution to self-provisioning. Authors, such as Eroza et al. (2019), indicate that home gardens are a practice that has diminished over time and lost its cultural value, a situation that compromises the food security of rural communities. The expansion of monocultures in tropical landscapes, to the detriment of home gardens, threatens the agrobiodiversity that for years has consolidated peasant agriculture (Carney 2020). According to FAO, "*food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their daily energy needs and food preferences for an active and healthy life*" (FAO 2011). However, the lack of self-provisioning does not necessarily generate food insecurity, since food can be accessed through the market, requiring income from a variety of sources, including off-farm work (Aweke et al. 2020). Phenomena such as disasters and crises, caused by adverse weather conditions, natural hazards, economic crises, and conflicts can alter access to food.

The pandemic caused by the coronavirus disease COVID-19, in the year 2020, is the latest addition to the list of disasters and crises that have put food security at risk (Ahmed et al. 2020; Béné 2020; Devereux et al. 2020). This pandemic is a challenge to the food and nutritional security of vulnerable populations (Bhavani and Gopinath 2020; Devereux et al. 2020). Adaptation and mitigation measures are testing the resilience of each country's food systems (Ahmed et al. 2020).

This document analyzes the impact of livelihood strategies on the conditions of self-provisioning in rural households in the department of Huila, Colombia. It examines A. the source of food consumed in rural households, B. what rural households grow in their gardens, and C. the push and pull factors of self-provisioning in rural households. A critical analysis was made of the resilience of rural households' access to food in the face of limitations generated by the COVID-19. The study is designed so that the results can provide decision makers and public and international cooperation institutions with information to enable them to make efficient interventions and investments to increase rural food security, specifically enhance self-provisioning practices.

2. Materials And Methods

This study was conducted with 162 rural households in ten municipalities of the department of Huila, Colombia (Algeciras, Campoalegre, Íquira, Palermo, Rivera, Gigante, Tarqui, Hobo, Baraya and Tello) (Fig. 1). These municipalities have a presence of different climates: Warm semi-arid, Temperate semi-humid, Temperate semi-arid, Desert warm, Warm semi-humid, Cold humid, Cold semi-arid and Temperate humid (Climatic Classification Caldas-Lang) (IDEAM 2017).

Selected households correspond to seven types that were previously classified according to their livelihood strategies by Bernal et al. (unpublished data) (Table 1). Semi-structured surveys were carried out between 2018 and 2019 on each household to collect information on: a. access to food, b. composition and diversity of home gardens and c. factors that influence the characteristics of self-provisioning.

Table 1 Types of rural households according to livelihood strategies in Huila department, Colombia

Household type	Abbreviation	Characteristics
Cattlemen-Cocoa Farmers	CCF	Rural households whose farm area is larger than average (>30 ha). 68% of the area is pasture, 20% is cocoa and 10% is forest.
Coffee Farmers	CoF	30% of the coffee farmers have farms with areas between 8 and 16 ha and the rest do not exceed 8 ha. The main production is coffee (46% of the income), followed by cocoa (37% of the income) and in some cases they complement it with cattle raising as a form of saving (5% of the income).
Cocoa Farmers	CocF	They are economically dependent (95%) on cocoa. 85% of the farm's area is established in cocoa, the rest is conserved in secondary forest or stubble. 13% of cocoa farmers have farms with between 7 and 17 ha, the rest of the households have no more than 7 ha.
Diversified Farmers	DF	They have farms with areas averaging 5 ha. 30% of the area is in grapes, avocado, tangerine, banana; 70% of the area is established in cocoa. These activities contribute approximately 45 and 40% of the economic income, respectively, and 15% is complemented by the production of eggs and transitory crops.
Livestock-Cocoa Farmers	LiCF	The main economic activity is the production of minor species such as fish, pigs and chickens, which provides 46% of the income. In addition, they grow cocoa in 70% of the farm area, which on average is 8 ha. The income received from cocoa represents 44% of household income.
Employees-Cocoa Farmers	ECF	The main productive livelihoods are off-farm activities, including non-agricultural (i.e. pensions, public employment, own business) and agricultural activities such as sale of labour. These activities generate 50% of income. These households produce cocoa throughout the farm (3 ha) and complement the economy of these families by 40%.
Landlords-Cocoa Farmers	LaCF	They base their economy on two activities: the sale of cocoa, for which they allocate 20% of the farm area and the rest is used to be leased mainly for livestock use, which contributes 32% to the economy of these households.

Source: (Bernal et al. unpublished data)

2.1 Access to food in rural households

The source of food consumed was identified within the different types of households: Grocery stores, neighbors, farmers' markets, and self-provisioning. The "grocery stores" category includes chain stores, supermarkets, mini-markets, local shops, and marketplaces. Some of these places are in rural areas (rural population centers), where families make provisional purchases. Most grocery stores are in urban areas. Usually members of rural households travel on Saturdays or Sundays to buy the foods in grocery stores in urban areas. Foods were classified as vegetables, fruits, grains, dairy products, and cereals, for which a binary indicator variable was generated (presence=1, absence=0). Food access in the seven types of rural households was characterized by: a. reduced food quantity (RFQ), b. limited food variety (LFV), and c. going to bed without dinner because of lack of food (NHEF). Using the food classification, a cluster analysis was performed using Ward's method and Gower's similarity (Balzarini et al. 2008). Four groups were classified according to the level of self-provisioning: null, low, medium, and high. The correspondence between household types, level of self-provisioning and the capacity to access food was estimated using a contingency table analysis (Balzarini et al. 2008).

2.2 Composition and diversity of home gardens in rural households

The food-use species founded in the existing home gardens in each rural household were characterized. Following variables were used: a. richness (number of plant species cultivated), b. abundance (total number of plants) and c. diversity with the Shannon-Weaver index (Corzo and Schwartz 2016; Monroy et al. 2016). Species grown in the home gardens were classified into eight categories: aromatic, bulb, cereal, fruit, grass, bulb vegetable, legume and tuber. An analysis of variance using general and mixed models (Di Rienzo et al. 2011) was carried out to estimate the differences in the characteristics of the home gardens according to the households' livelihood strategies. The analysis was made using InfoStat version 2019 (Di Rienzo et al. 2019).

2.3 Push and pull factors towards self-provisioning in rural households

In each rural household, the community capitals endowment was characterized, using the seven capitals proposed by Flora et al. (2004): human (HC), natural (NC), cultural (CC), built (BC), social (SC), political (PC) and financial (FC) using 44 variables selected from those recommended by different authors (Cepeda et al. 2008; Gutiérrez-Montes 2005; Gutiérrez-Montes et al. 2009). We identified the capital variables that function as push or pull factors with the conditions of self-provisioning in rural households through a Spearman correlation analysis. Significant ($p<0.05$) positive correlations were considered as push factors, whilst negative correlations were pull factors.

3. Results

3.1 Food sources and access in rural households

The source of the food consumed in each household presented significant differences ($p<0.0001$) between household types, where 75, 9, 8 and 3% of these products are acquired in grocery stores, own crops, farmers' markets and barter with neighbors', respectively. Fruits are the foods that are acquired in greater proportion in own crops (agroforestry systems including home gardens); while grains and cereals are acquired mostly in the markets (92 and 89%, respectively). Although most vegetables come from grocery stores (71%), 13 and 9% of them come from farmer's markets and the farm (self-provisioning), respectively (Table 2).

Table 2 Source of food access in rural households in the department of Huila, Colombia

Variable	Grocery stores	Self-provisioning	Farmers Markets	Neighbours
	%			
Grains	92.35±1.35a	0.86±1.35b	3.7±1.35b	0.62±1.35b
Fruits	57.49±2.44a	26.68±2.44b	9.81±2.44c	2.28±2.44d
Cereals	90.43±1.34a	0.31±1.34b	3.09±1.34b	0±1.34b
Dairy products	70.34±2.49a	12.25±2.49b	3.09±2.49bc	8.4±2.49c
Vegetables	70.86±2.2a	9.38±2.2b	13.46±2.2b	1.82±2.2c

Values represent the mean $\pm$ standard error. Averages with an equal letter do not differ statistically ($p>0.05$) for each place of source.

The source of food presented differences among types of rural households; the largest percentage of food is purchased in local grocery stores (Fig. 2). Diversified Farmers and Livestock-Cocoa Farmer households had the highest production of food for self-provisioning, as opposed to employees-Cocoa Farmers and Landlords-Cocoa Farmers, who depend on grocery stores for these goods. Cocoa Farmers households are the largest purchasers of food in farmer's markets (Fig. 2).

Rural households in the department of Huila have not secured access to food, since more than 50% of the amount and variety of food consumed daily by them in the study area have tended to decrease, with varying levels of frequency. Only less than 25% of the households reported that none of their members has ever had to go to bed without dinner because they do not have food (traditional dinner in the area: rice, meat, ripe plantain, grain -lentils or beans- and hot sugar cane drink) (Fig. 3).

Diversified Farmers' households have never had to decrease the amount of food they eat, and they are also the ones who produce the most food on their households (Fig. 4). Coffee Farmers have had a decrease in the amount of food for consumption more frequently and, at the same time, are those who have almost no food production on their households (Fig. 4). Cocoa Farmers, Employees-Cocoa Farmers and Landlords-Cocoa Farmers had a low food production on their households and frequently must limit food consumption at household (Fig. 4).

3.2 Composition and botanical diversity of home gardens

Only 51% of households have home gardens with between 4 and 13 species of food crops. Livestock-Cocoa Farmers households had the most home gardens, followed by Landlords-Cocoa Farmers and Coffee Farmers, which contrasts with Employees-Cocoa Farmers and Cocoa Farmers, which had the fewest home gardens (Table 3). The home gardens were commonly located in areas close to the dwelling, specifically near the kitchen in the vicinity of the clay oven and stove, as observed in the rural home "Los Naranjos" (Fig. 5). This family states that: *"the home garden is a blessing, everything is fresh and without those chemicals that are thrown on the crops, and the savings are always a lot"* (interviewed producer, 2019).

Table 3 Food goods produced in home gardens in different types of rural households in Huila, Colombia.

Variable		LaCF	ECF	CocF	CoF	DF	CCF	LiCF
		%						
Presence of family garden in the household	Yes	66.8	37.5	36.1	66.7	45	38.1	84.2
	No	33.3	62.5	63.9	33.3	55	61.9	15.8
Foods grown in home garden	Aromatics	17.6	14.3	17.8	18.7	18.7	6.7	18.2
	Bulb	11.8	4.8	22.2	15.6	18.7	0	9.1
	Cereal	0	0	4.4	1.6	0	0	1.8
	Fruit	35.3	62	28.9	39.1	34.3	60	32.7
	Graminea	5.9	0	0	0	0	0	0
	Bulb Vegetable	11.8	4.8	8.9	14	15.6	6.7	18.2
	Legume	5.9	4.8	15.6	4.7	6.2	13.3	10.9
	Tuber	11.8	9.5	2.2	6.2	6.2	13.3	9.1

Cattlemen-Cocoa Farmers (CCF), Coffee Farmers (CoF), Cocoa Farmers (CocF), Diversified Farmers (DF), Livestock-Cocoa Farmers (LiCF), Employees-Cocoa Farmers (ECF), Landlords-Cocoa Farmers (LaCF). The grass category is made up of the species *Saccharum officinarum* L.

The proportion of foods grown in home gardens by household types differ statistically ($p < 0.05$). The largest proportion of foods were fruit species, followed by aromatics and bulb species. Bulb species were not grown in home gardens of Cattlemen-Cocoa Farmers. In addition, these households had the lowest proportion of aromatic species, but the highest proportion of fruit species latter the Employees-Cocoa Farmers (Table 3).

The diversity of food species grown in home gardens showed significant differences ($p < 0.05$) between types of rural households. Livestock-Cocoa Farmers and Cocoa Farmers households had the greatest Shannon-Weaver index and richness of food species in home gardens; in contrast, Employees-Cocoa Farmers and Cattlemen-Cocoa Farmers households whose home gardens had the least diversity of food species (Table 4).

Table 4 Diversity of food species produced in home gardens in rural households in the department of Huila, Colombia.

Variable	LaCF	ECF	CocF	CoF	DF	CCF	LiCF
Shannon Weaver	0.5±0.23abc	0.3±0.09bc	0.4±0.1bc	0.5±0.11ab	0.5±0.15abc	0.2±0.08c	0.9±0.15a
Species Richness	2.9±1.27ab	1.3±0.39c	1.7±0.46c	2.9±0.55a	1.9±0.58bc	1.2±0.38c	4.2±0.86a
Food Categories Richness	1.9±0.7abc	0.9±0.26d	1.2±0.32cd	1.9±0.34ab	1.6±0.46bc	0.7±0.24d	2.9±0.49a

Cattlemen-Cocoa Farmers (CCF), Coffee Farmers (CoF), Cocoa Farmers (CocF), Diversified Farmers (DF), Livestock-Cocoa Farmers (LiCF), Employees-Cocoa Farmers (ECF), Landlords-Cocoa Farmers (LaCF). Food Categories: aromatic, bulb, cereal, fruit, grass, bulb vegetable, legume and tuber. Values represent the mean $\pm$ standard error. Averages with an equal letter do not differ statistically ($p>0.05$) for each place of source.

The most abundant species in the home gardens were: fruit trees (mandarin -*Citrus reticulata* L., mango -*Mangifera indica* L., avocado -*Persea americana* Mill., orange -*Citrus sinensis* L. Osbeck-), fruits (tomato -*Solanum lycopersicum* L., banana -*Musa acuminata* L.), leafy vegetables (lettuce -*Lactuca sativa* L., chard -*Beta vulgaris* L.), legumes (Common bean -*Phaseolus vulgaris* L.), aromatic plants (cilantro -*Coriandrum sativum* L.), tubers (cassava -*Manihot esculenta* Crantz-) and bulb (onion -*Allium cepa* L.) (Fig. 6). We found species that established specifically in certain types of rural households. The households with the highest number of species were CocF, with five species, being (ruta -*Ruta graveolens* L. strong smelling rue-, rosemary -*Rosmarinus officinalis* L., araza - *Eugenia stipitata* Mc Vaught-, lippia alba - *Lippia alba* (Mill.)-, spearmint - *Mentha spicata*-) the most common and LaCF and CCF, with three species each.

Fig. 6 Species grown in home gardens by type of rural household in the department of Huila, Colombia. Red circles represent the types of rural households. Blue circles represent plant species found in rural households. The size of the blue circles represents the number of households that reported each species (larger size equals more households). Cattlemen-Cocoa Farmers (CCF), Coffee Farmers (CoF), Cocoa Farmers (CocF), Diversified Farmers (DF), Livestock-Cocoa Farmers (LiCF), Employees-Cocoa Farmers (ECF), Landlords-Cocoa Farmers (LaCF).

3.3 Push and pull factors towards self-provisioning in rural households

A significant correlation ($p<0.05$) was found between variables from four community capitals and the conditions of access to food produced on the farm (Agroforestry Systems and home gardens) and diversity of food grown in home gardens (Table 5). The greater richness and diversity of species grown in the gardens was related to a greater number of women in the household and a higher level of education among young people and heads of household (human capital), as well as a higher level of technology (tools) (built capital). However, the diversity of species grown in home gardens showed a negative correlation, according to the Spearman coefficient, with farm area (natural capital) and household income (financial capital), particularly with total and external income. The percentage of fruit trees for

consumption produced on the farm was positively correlated with the educational level (human capital) and with the households' associations (social capital) (Table 5). Dairy production (milk and cheese) showed a positive correlation with variables of productive financial and built capital (Table 5).

Table 5 Correlations between variables that make up capital endowment and variables of self-provisioning of food and diversity of home gardens in rural households in the department of Huila.

	On-Farm Cultivation (Self-provisioning)					Characteristics of the home garden		
	Vegetables	Grains	Fruits	Cereals	Dairy products	Species Richness	Group Richness	Shannon Weanner
Human capital	-	-	-	-	-	-	-	-
<i>Number of Women in the Household</i>	-	-	-	-	0.19	0.19	-	0.18
<i>Years of Education Head of Household</i>	-	-	0.3	-	-	-	-	-
<i>Years of Youth Home Education</i>	0.2	-	0.21	-	-	-	-	-
Social capital	-	-	-	-	-	-	-	-
<i>Participation in Associations</i>	-	-	0.21	-	-	-	-	-
<i>Interaction with Training Institutions</i>	0.29	-	0.22	-	-	-	-	-
<i>Number of trainings received</i>	-	-	0.19	-	-	-0.29	-	-
Natural capital								
<i>Area of the farm</i>	-0.28	-	-	-	0.29	-0.18	-0.23	-0.22
Built capital	-	-	-	-	-	-	-	-
<i>Access to Irrigation System</i>	-	0.21	-	-	-	-	-	-
<i>Technological level of the farm</i>	-	-	-	-	0.19	0.21	0.22	0.24
Financial capital	-	-	-	-	-	-	-	-
<i>Income Households</i>	-0.25	-	-	-	0.44	-0.21	-0.23	-0.2
<i>External Income</i>	-	-	-	-	-	-	-0.25	-0.26
<i>Livestock Income</i>	-	-	-	-	0.4	-	-	-
<i>Crop Income</i>	-0.2	-	-	-	0.26	-0.19	-	-
<i>Diversity of Agricultural Activities</i>	0.3	-	-	0.19	0.2	-	-	-

Significant correlations ($p < 0.05$) are presented using Spearman's method.

4. Discussion

4.1 Food sources and access in rural households

The national agricultural census in Colombia indicates that 56% of rural properties present at least one home garden for self-provisioning, whereas only 27% of Huila households had home gardens (DANE 2016). However, we found contrary results because 51% of the farms identified in the ten sampled municipalities of department of Huila had home gardens. These findings also disagree with findings of Salcedo (2016), who mentions that in this department the practice of producing food for self-provisioning is not common in rural households. According to Andrade (2013), state policies and the promotion of business agents have consolidated an economic model focused on mining, hydrocarbons and agro-industry in Huila, which could move rural households away from these traditional practices. The latter, with characteristics similar to those promoted in the Brazilian Amazon, where changes in agricultural practices for the mass production of acai (*Euterpe precatoria* Mart.) fruit, have deteriorated agrobiodiversity (Steward 2013).

The combination of policies that promote agro-industry as an alternative model for the growth of agriculture has degraded the diversification of practices aimed at self-provisioning, which explains why 75% of the products come from direct purchases in grocery stores. Levels of self-provisioning in rural families in the department of Huila are critical; only 8.6% of food is produced on the farm, which generates a high dependency on external food purchases (Aweke et al. 2020). This behavior is consistent with the findings of Álvarez et al. (2007), who indicate that a significant proportion of peasants in Colombia do not cultivate their own land.

The high dependence on external access to food affects the food security of households in cases of atypical events such as social protests that prevent food mobility (Archila et al. 2014) or, as the current case of the COVID-19 pandemic, which substantially reduce human mobility and household purchasing power, especially the most vulnerable households (Siche 2020). For example, mitigation measures in Colombia have generated social confinement that include mobility restrictions, temporary closure of most workplaces and social distancing (Decreto_N°847 2020). In the case of rural households with low levels of self-provisioning, these measures generated limitations in access to food, due to 1) closure of informal food markets related to COVID-19 to achieve greater social distancing (Devereux et al. 2020), 2) restrictions on movement to urban areas where markets are located and 3) a reduction in the purchasing power of families due to increased unemployment and limitations on the marketing of agricultural products. However, external impacts do not generate homogeneous effects in rural communities. Hanazaki et al. (2012) state that vulnerability to food insecurity depends on the diversity of household livelihoods. For example, households with a greater diversity of livelihoods, which in our study are the Diversified Farmers, produce a greater quantity and diversity of food than they use for self-consumption. This is a condition that generates less external dependence on access to food, which places them at an advantage in situations of risk such as those generated by COVID-19.

4.2 Composition and diversity of home gardens

One in two households reported home gardens on their property; however, the number of species grown is lower than other studies conducted in the same area of our study (department of Huila). Between 4 and 13 species of food use identified per home garden contrasts with a similar study in the department of Cauca, southern Andean region of Colombia, where a total of 142 plant species were found, of which 22% are food crops (Montenegro et al. 2017). A total of 52 species were identified in the home gardens, a lower value than that reported by Villa and García (2017) in the municipality of San Pablo, Magdalena Medio in Colombia, where a total of 75 species were recorded, with an average interval of 17 species (6 to 33 species) per home garden. These statistics are even more critical when

compared to the agrobiodiversity of other countries in Latin America; for example, a study in 24 municipalities in the State of Mexico reported 134 tree and shrub species and 54 herbaceous and vegetable species in home gardens (García et al. 2016a). This situation is consistent with Dutra et al. (2018), who indicate that, although there is a great diversity of foods, fewer plant species and varieties are being consumed.

In the department of Huila, apart from the agro-industrial model promoted by the state, predominant crops such as coffee have low species diversity, given the elimination of associated crops such as corn, because it reduces the growth of coffee (Salcedo 2016). According to Cerdán et al. (2012), the richness of species and intensity in the management of coffee cultivation is influenced by farmers' knowledge. The industrialization of agriculture and the spread of standardized technology packages has lowered the level of traditional knowledge of farmers (Šūmane et al. 2018). The absence of home gardens, as an indispensable practice in family farming, exposes a high degree of vulnerability to the loss of agrobiodiversity of food species, as well as traditional knowledge that threatens food security (Montenegro et al. 2017).

4.3 Push and pull factors towards self-provisioning in rural households

The richness and diversity of cultivated species was associated with a greater number of women in the family and a higher level of education. In the case of the role of women, it coincides with that proposed by Galluzzi et al. (2010), who identify women as seed custodians. A study in the southern Andean region of Colombia shows that women are leaders in the production and management of mixed gardens at the local level (Guapucal et al. 2019). These results show the importance of women's participation in home garden management, not only for socio-economic well-being, but also for the importance of their practices in sustaining the livelihoods of their communities and preserving agrobiodiversity (Akhter et al. 2010). In addition, Gutiérrez-Montes et al. (2012) state that when women carry out home gardening activities, natural resource conservation actions increase. The importance of the level of education is consistent with studies, which have demonstrated the positive influence of the education of heads of household on dietary outcomes or family nutrition (Mango et al. 2014; Vaitla et al. 2019). For example, Aweke et al. (2020) found that household head literacy correlated positively with levels of self-provisioning.

In Colombia, 54% of the dispersed rural population has basic primary education, 10% has secondary education and 2.7% has tertiary education (DANE 2016), which reflects the limited opportunities for access to economic and social integration of the rural population (MEN 2018). Among the sampled households, the higher the educational level, the greater the richness and diversity of the home gardens. This marks a close relationship between the level of education and knowledge in the management of agricultural practices. Snoeck et al. (2016) state that the deficiency in knowledge of sustainable management practices contributes to environmental degradation processes and a reduction in the productive capacity of crops. A basic knowledge of soil management practices is an important factor in maintaining the agricultural viability of the soil and the productivity of rural households (Dawoe et al. 2012). However, it is essential to integrate the scientific knowledge produced by academic learning with the local knowledge of farmers (Šūmane et al. 2018).

The present study found a negative relationship between the farm area and economic income with self-provisioning, a behavior different from that affirmed by Lopéz et al. (2019) who indicate that Mexican households with greater access to land guarantee the provision of food through production in home gardens. This condition can be explained by the effect generated by the high production of agricultural monocultures and extensive cattle raising, common agricultural production techniques in rural households in the department of Huila. Consistent with this, Aweke et al.

(2020) found a close correlation between livestock and reduced self-provisioning, noting that livestock are not maintained primarily as a source of food for the household, but as a source of cash income. However, the same authors indicate that livestock farming leads to a higher consumption of milk and its derivatives and, in addition, the income obtained from the sale of livestock or livestock products is used to buy food. The low level of self-provisioning in Coffee Farmers' households is probably because most of the farm's productive area is devoted to coffee cultivation (Salcedo 2016). But coffee and cocoa have been established crops under agroforestry systems that allow for increased diversity of food species (Vaast and Somarriba 2014), mostly fruits (Cerdeña et al. 2020; Cerdeña et al. 2014). Crops in agroforestry systems and fruit trees grown in the home garden explain the higher percentage of self-provisioning food in the seven types of rural households. However, Álvarez et al. (2007) found that although fruits were present in greater variety, as in the case of this study, the amount available was not sufficient for household members to consume the number of servings proposed in the Colombian food guidelines.

Conclusions

We found rural households in the department of Huila are highly dependent on grocery stores for access to food, so they depend on cash income for their purchases; income that is mainly derived from agricultural activities, only, in the cases of the Employees-Cocoa Farmers and Landlords-Cocoa Farmers households, the income comes mainly from activities outside the rural household (agricultural and non-agricultural). Agricultural production for self-provisioning is minimal and varies according to livelihood strategy, where households with greater diversity of agricultural activities have greater capacity for self-provisioning. In the case of households with higher levels of self-provisioning, fruit and dairy products predominate, with a high external dependence on all types of grains, vegetables, and cereals.

Only half of rural households have home gardens and those have limited species diversity, so actions are needed to increase agricultural activities that promote self-provisioning through home gardens and agroforestry systems, encouraging food production, especially vegetables, legumes and grains.

The type of livelihood strategy and the community capitals endowment, especially human, social, built and financial, have an impact on the conditions of self-provisioning and on the diversity of food in the garden. The wealth and diversity of species grown in the gardens is associated with a greater number of women in the family, a better educational level among young people and heads of household, and a higher technological level. In addition, the larger the farm area and financial income, the greater the external dependence on food, a behavior that predominates in households where livestock activity is more important.

The actions for the mitigation by COVID-19 disease generated the following consequences: 1) At the beginning of the pandemic, transit for the purchase of food was restricted, and during the following two months people were only allowed to go out once a week, 2) Many of the local markets were closed, including marketplaces that were the preferred place for rural households to buy food, and 3) Purchasing power was lower due to the decrease in employment and in the commercialization of agricultural products, on which most of the rural households studied depend. These scenarios, combined with the low levels of self-provisioning in rural households, lead to the conclusion that the resilience of food systems in the Andean Region of Colombia is minimal in response to events such as the pandemic generated by COVID-19 disease. The challenge is to generate actions that allow the fulfillment of the principles not only of food security, but also, of food sovereignty.

It is important that institutions related to food security and rurality generate actions that promote production for self-provisioning. Actions should be promoted through agro-ecological approaches, which will make it possible to comply

with the principles of food security, ensuring access, availability, utilization, and stability. This will also make it possible to improve the social and cultural capital of rural households.

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Figures

Figure 1

Area of study and selected municipalities in the department of Huila, Colombia.

Figure 2

Sources of food access in rural households in Huila, Colombia. Cattlemen-Cocoa Farmers (CCF), Coffee Farmers (CoF), Cocoa Farmers (CocF), Diversified Farmers (DF), Livestock-Cocoa Farmers (LiCF), Employees-Cocoa Farmers (ECF), Landlords-Cocoa Farmers (LaCF). The bars represent the mean values, while error bars are standard error.

Figure 3

Food access capacity of rural households in Huila department, Colombia. P-value was obtained by contingency tables (Statistical Chi²) for the equality of proportions hypothesis. Reducing food quantity (RFQ), (b) limiting food variety (LFV) and (c) going to bed without dinner for not having enough food (GBH), Cattlemen-Cocoa Farmers (CCF), Coffee Farmers (CoF), Cocoa Farmers (CocF), Diversified Farmers (DF), Livestock-Cocoa Farmers (LiCF), Employees-Cocoa Farmers (ECF), Landlords-Cocoa Farmers (LaCF).

Figure 4

Biplot obtained from a multiple correspondence analysis between household types (white triangle), food access capacity (gray square) and level of self-provisioning (black circle). Department of Huila, Colombia. Cattlemen-Cocoa Farmers (CCF), Coffee Farmers (CoF), Cocoa Farmers (CocF), Diversified Farmers (DF), Livestock-Cocoa Farmers (LiCF), Employees-Cocoa Farmers (ECF), Landlords-Cocoa Farmers (LaCF).

Figure 5

Home gardens in Diversified Farmers' rural household in the department of Huila, Colombia. Orange -*Citrus sinensis* L. Osbeck-, Mandarin -*Citrus reticulata* L., Mango -*Mangifera indica* L., Camito -*Pouteria caimito* (R.&P.) Radlk-, Papaya -*Carica papaya* L., Corn -*Zea mays* L., Tomato -*Solanum lycopersicum* L., Cilantro -*Coriandrum sativum* L., Mamey sapote -*Pouteria sapota* (Jacq.) H.E. Moore & Stearn-. Photography from Héctor Eduardo.

Figure 6

Species grown in home gardens by type of rural household in the department of Huila, Colombia. Red circles represent the types of rural households. Blue circles represent plant species found in rural households. The size of the blue circles represents the number of households that reported each species (larger size equals more households). Cattlemen-Cocoa Farmers (CCF), Coffee Farmers (CoF), Cocoa Farmers (CocF), Diversified Farmers (DF), Livestock-Cocoa Farmers (LiCF), Employees-Cocoa Farmers (ECF), Landlords-Cocoa Farmers (LaCF).