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A family agriculture's livelihoods: a panel analysis in the southwest of Paraná

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Abstract

The study addresses the issue of livelihoods, taking family farmers in southwestern Paraná as an empirical universe. The study aims to identify and analyze the entitlements that make up the means of livelihood of family production units (UPF) through a temporal comparison in the agricultural years 2012-2013 and 2016-2017, featuring a panel research. For data collection, the same semi-structured questionnaire was applied in the UPFs in both years. Thus, it was found that livelihoods expanded from the 2012-2013 agricultural year to the 2016-2017 agricultural year, but that, among all the capitals that form livelihoods, physical and financial capital were more vulnerable than capital human, social and natural, because, comparatively, the values found are lower in both studied periods. With this, it can be seen that the average level of sustainability of the titles and, consequently, of the livelihoods of the UPFs increased over time, as the harmonic mean of each of the capitals also increased, despite having been found weaknesses in the titles of physical and financial capital.

Keywords: Entitlements. Capitals; Family production units.

Os meios de vida da agricultura familiar: uma análise em painel no sudoeste do Paraná

Resumo

O estudo aborda o tema dos meios de vida, tomando por universo empírico agricultores familiares do sudoeste do Paraná. O estudo tem por objetivo identificar e analisar os intitulentos que compõem os capitais dos meios de vida de unidades de produção

familiares (UPF) por meio da comparação temporal nos anos agrícolas 2012-2013 e 2016-2017, caracterizando uma pesquisa em painel. Para a coleta dos dados, foi aplicado o mesmo questionário semiestruturado nas UPFs em ambos os anos. Assim, constatou-se que os meios de vida expandiram do ano agrícola 2012-2013 para o ano agrícola 2016-2017, mas que, dentre todos os capitais que formam os meios de vida, os capitais físico e financeiro foram mais vulneráveis que os capitais humano, social e natural, pois, comparativamente, os valores encontrados são menores em ambos os períodos estudados. Com isso, pode-se perceber que o nível médio de sustentabilidade dos intitulentos e, conseqüentemente, dos meios de vida das UPFs aumentou com o passar do tempo, pois a média harmônica de cada um dos capitais também aumentou, apesar de terem sido encontradas fragilidades nos intitulentos dos capitais físicos e financeiros.

Palavras-chave: Intitulentos. Capitais. Unidade de produção familiar.

Los medios de vida de la agricultura familiar: un análisis de panel en el suroeste de Paraná Resumen

El estudio aborda la cuestión de los medios de vida, tomando como universo empírico a los agricultores familiares del suroeste de Paraná. El estudio tiene como objetivo identificar y analizar los derechos que componen los medios de vida de las Unidades de Producción Familiar (UPF) a través de una comparación temporal en los años agrícolas 2012-2013 y 2016-2017, presentando una investigación de panel. Para la recogida de datos se aplicó el mismo cuestionario semiestruturado en las UPF en ambos años. Así, se encontró que los medios de vida se expandieron del año agrícola 2012-2013 al año agrícola 2016-2017, pero que, entre todos los capitales que forman los medios de vida, el capital físico y financiero fueron más vulnerables que el capital humano, social y natural, porque, comparativamente, los valores encontrados son menores en ambos períodos estudiados. Con esto, se puede observar que el nivel medio de sostenibilidad de los títulos y, en consecuencia, de los medios de vida de las UPF aumentó en el tiempo, ya que también aumentó la media armónica de cada uno de los capitales, a pesar de haberse encontrado debilidades en los títulos. de capital físico y financiero.

Palabras clave: Titulaciones. Capitales. Unidad de producción familiar.

1 Livelihoods and entitlements

The theme of this research is situated within the broader context of studies on the processes, dynamics, and transformation of the rural world, and on the changes in social, economic, and environmental aspects of family farmers. The analysis of the study has a development perspective focused on the actors, which, according to Nierdele and Grisa (2008), reflects the emergence of more actor-oriented perspectives, marked in sociological debates by what has been called the return of subjects (Touraine, 1994) and human agency (Giddens, 1989), which had succumbed to the structuralisms that predominated until then in social theory.

Thus, the research problem is the gap between the perspective of specific concentration on economic wealth and a broader perspective on the life that people desire to lead. As Sen (2008) argues, the lack of resources not only limits the actual means available to individuals, but also constrains the goals and preferences that are formed throughout life. Material deprivations, manifested in terms of low incomes and consumption levels, lie at the heart of the problem and result in other aspects, such as poor nutrition and low-quality housing. Villwock (2015) contributes when he asserts that rural families adopt two basic paths for income generation, which are not

mutually exclusive and entail very diverse strategies: the increase of agricultural income and that of non-agricultural income. Thus, the focus of this study was on income generation and its relationship with livelihood assets, specifically, entitlements/assets, based on Ellis (2000) assertion that "more important than giving the poor food would be endowing them with resources that stimulate their capabilities, strengthening the means they have to carry out their activities".

These themes have been widely discussed in academic studies, through which it is possible to follow the constant and important transformations they have undergone. In this article, the result of Villwock (2018) doctoral thesis, the analyses were based on Amartya Sen's capabilities approach, which deals with development as improvements in people's living conditions, focusing on individuals and how they can create survival strategies based on their entitlements. Sen (2000) presents the concept of entitlements according to the Capabilities Approach, stating that they are part of the environment in which individuals are embedded, referring to the conditions they have to develop and achieve a particular goal (Sen, 2008; 2000). That is, entitlements consist of a set of resources and means - productive (e.g. availability of land and labor), exchange (e.g. income) or institutional factors (e.g. customs, traditions, laws, public policies) – available to individuals and that can influence their ways of life and destinies.

In other words, entitlements represent the set of combinations of goods or commodities that each person possesses or is able to possess, or the means to achieve certain ends, the conditions for making choices, established by legal, political, and economic arrangements (KAGEYAMA, 2008; WAQUIL et al., 2007). Entitlements are preconditions for individuals to achieve their capabilities (Sen, 2000; 2008). In Sen (2008) words:

The entitlement of a person is represented by the set of alternative bundles of goods that can be acquired through the use of various legal channels available to that person. [...] A person goes hungry when their entitlement does not include any bundle of goods that contains an adequate amount [or quality] of food within the set of assets that make up their livelihood (SEN, 2008, p. 57).

The concept of entitlement was founded within Frank Ellis' (2000) livelihood approach and encompasses the five capitals (environmental, physical, financial, human and social) that represent the means of livelihood and therefore, the assets that make up each capital. This approach considers that families develop their social reproduction strategies by establishing a link between the assets and the activities that the family group has to survive. According to the author, "a livelihood comprises the assets (natural, physical, human, financial and social), the activities and access to these (mediated by institutions and social relationships) that together determine the life acquired by the individual or family group" (ELLIS, 2000, p. 10).

Therefore, livelihoods are composed of a set of capitals made up of various assets, and the condition in which these assets are found influences how, for example, family farmers will access and mobilize them in their search for sustainability of their rural property and the autonomy of their family (SCOONES, 1998; ELLIS, 2000). Assets make up the base that gives life to alternatives for family maintenance and survival, allowing for social reproduction and acting on institutional

structures that establish a relationship with these individuals (NIEDERLE, GRISA, 2008).

In light of this, the similarity between assets and entitlements lies in the effectiveness of the means to achieve the desired end, so that for this work, assets and entitlements are the means to achieve the ends, and the availability of both allows individuals to expand or restrict their capabilities. Therefore, Sen's proposal is anchored in an idea in which individuals, through their entitlements, build conditions for achieving well-being. When these resources or means are under threat (risk), it can be said that their freedom of choice is limited, also distinguishing survival strategies. Thus, it can be said that Sen's approach to capabilities establishes a fruitful dialogue with the livelihoods perspective.

In this logic, it is emphasized that individuals and families have different forms of access to the different capitals, which attributes heterogeneity to their strategies for coping and adapting to various life situations (CHAMBERS, 2006). This difference in access and mobilization of assets is directly related to individual capacity and use of entitlements, differentiating them in their use and control (ELLIS, 2000; SEN, 2000; 2008; CHAMBERS, CONWAY, 1992). Thus, it becomes essential to understand which entitlements are available and how their use is carried out for each family unit, aiming, according to Schneider and Perondi (2012), to strengthen "livelihoods" to create work and income strategies.

In this context, there is a need to use tools to measure the different types of assets that limit or enhance the development of family production units. In this sense, the article aims to identify and analyze the entitlements that make up the livelihood capitals of family production units (UPF) in the Barra do Santana community, located in the municipality of Verê, in southwestern Paraná, through a temporal comparison in the agricultural years 2012-2013 and 2016-2017, characterizing a panel research.

2 Methodological Procedures

For the empirical study of the research, interviews were conducted with the heads of 25 family production units in the community of Barra do Santana, located in the municipality of Verê/PR. It is important to note that it was necessary to carry out the field research in a community to ensure focus on the local context of the unit of analysis (family), which justifies the use of intentional – non-probabilistic sampling.

The study presents the family or household as the unit of analysis, which, according to Ellis (2000), is the most appropriate unit of analysis in the approach to livelihoods, since it is in the family that intense interdependent social and economic relationships occur. The family is not only formed by consanguineous relationships, but is defined as the social group that lives in the same place, shares meals and makes joint decisions about the "future of the family," whether they are decisions about the use of resources and/or, in the case of farming families, about the organization of the property. Therefore, analyzing the family allows for an understanding of the various livelihood strategies adopted not only by the family "head," but by all those who make it up. Thus, the unit of analysis was called the Family Production Unit (UPF).

The research was carried out over a period of four years, with characteristics of a "panel study," which is a methodology that uses longitudinal data. In the study, data collection was carried out at two moments: the 2012/2013 agricultural year and

the 2016/2017 agricultural year, with the aid of a questionnaire¹, including the time variable, which is essential in the analysis of livelihoods. This choice was primarily based on two factors: (1) it allows for the comparison of the same subjects over time; (2) and allows for the observation of a growing availability of alternative portfolios of assets and activities over time.

Livelihoods were assessed by measuring the Livelihoods Index (IMV) for each interviewed family, based on studies originally developed by Carney (1998) and which underwent changes over time. Some examples of studies carried out in Brazil include Perondi (2007), Waquil (2007), Schneider and Perondi (2012), Villwock (2012), and Freitas (2015). The livelihood index was composed of the five capitals, and it can be used directly or indirectly, generating the means of survival for families.

Natural capital comprises the land, water, and biological resources that are used by people to generate ways of survival. Such resources may be located in spaces of greater diversity gradients (mountain regions) or not (plains) and may be distinct between renewable or non-renewable. Physical capital comprises what has been created by the economic production process subject to depreciation, such as improvements and machines. Such resources, when used as a family residence, for example, would be considered unproductive, however, they become productive if the house provides rooms for rent. Human capital is the available domestic work, influenced by variables such as education, skills, and health. It is a capital that grows as one invests in education and training, as well as acquiring skills in one or more productive occupations. Financial capital comprises the liquidity that the household group has available to carry out its strategies. This is a capital that can be enhanced by accessing a subsidized credit line or even a non-refundable fund. Social capital, finally, is a term that captures the links of the individual and household group with the community, in its broader social sense, and the possibility of belonging to a virtual social group with varied capacity for social inclusion (ELLIS, 2000, our translation).

To compose the capitals and then form the IMV, it was necessary to delimit the entitlements (Sen, 2000) or assets (Ellis, 2000), which is the central point of this study. According to Ellis (2000), these assets/entitlements would characterize the means of life as a set of assets, activities, forms of access and use that determine the way of living of an individual or family, that is, it is the assets/entitlements that form each capital that composes the livelihoods of the UPF.

The delimitation of entitlements/assets was based on works focused on the elaboration of entitlements/assets in the southern region of the country, such as Perondi (2007), Waquil (2007), Zotti (2010), Schneider (2012), Villwock (2012), Matte (2013), and Freitas (2015). It should be noted that, for this study, according to Table 1, the entitlements/assets of physical capital refer to the possession of machines and equipment, improvements and the amount of land available for productive activities; those of financial capital are related to the different incomes that result in the total

¹ Questionnaire validated by Perondi (2007) and adapted by the research project of the Brazilian Agricultural Research Corporation (EMBRAPA) entitled Small farms under family management and the institutional strategy of Embrapa: social diversity, productive dynamics and technological development, of 2013.

income of the farm household and the available labor force; natural capital refers to the base of available natural resources, related to the conservation of natural goods, divided between: water conservation, soil and forest conservation; human capital is related to individual attributes, such as education level, access to information, communication, available family labor, as well as access to transportation, consumer goods and necessary infrastructure; and finally, social capital refers to the daily relationships that families establish both within their nucleus and with the external environment, that is, the community, institutions, etc.

Table 1. Description of the titles/assets that make up each capital

Capitals	Intitulations/actives
Physical	machinery and equipment; improvements; amount of land
Financial	incomes; labor
Natural	water, soil and forest conservation
Human	Schooling; access to information; communication; available family work; access to transportation; consumer goods and infrastructure
Social	Relations with the community and institutions

Source: Prepared by the author.

To measure the manpower, were used the contributions of Lima et al (1995), indicating that a Human Work Unit (UTH) represents 300 days of work, eight hours per day of an adult person between the ages of 18 and 59. Since the presence of active people outside this age bracket is common in rural areas, we consider: children between 7 and 13 years of age = 0.5 UTH; young people between 14 and 17 = 0.65 UTH; adults between 18 and 59 = 1 UTH; and seniors over 60 years of age = 0.75 UTH.

The monetary values for the 2012/2013 crop year were corrected using the General Market Price Index (IGP-M) from the Getúlio Vargas Foundation (FGV), available on the Central Bank website for the 2016/2017 period, which was 1.244.

The income sources were classified, according to Lima et al (1995), as:

- A) Agricultural Income (RA): it is what remains from the gross product after deducting all property expenses. In other words, it is the portion of the gross product that remains with the farmer to remunerate family labor and increase assets;
- B) Social Transfers (RTS): pensions, government aids, and other social transfers are classified as assistance, not strictly as income;
- C) Other Labor Income (ORT): agricultural activities outside the UPF;
- D) Income from Other Sources (ROF): income from land leases, rent, savings, donations, and investments. These are incomes not derived from work;
- E) Non-Agricultural Income (RNA): income from non-agricultural activities;
- F) Total Income (R): it is what remains from the gross product (PB) after deducting all property expenses. In other words, it is the portion of the PB that remains with the farmer to remunerate family labor and increase assets. Total income is also the sum of other incomes, as exemplified in the formula: $R = RA + RTS + ORT + ROF + RNA$.

The calculation of the IMV is represented by the area of a pentagon and takes into account, for each capital, the harmonic mean, with results ranging from 0 to 10. Moreover, it should be noted that the area of the pentagon is sensitive to the order

of the capitals considered in the radar chart, hence the sequence of capitals in the configuration of the pentagon is the same used by Carney (1998), Perondi (2007), Villwock (2012), and Freitas (2015). The systematization of the responses into indices was carried out with the aid of two computer programs: Microsoft Office Excel and SPSS (Statistical Package for Social Science) software.

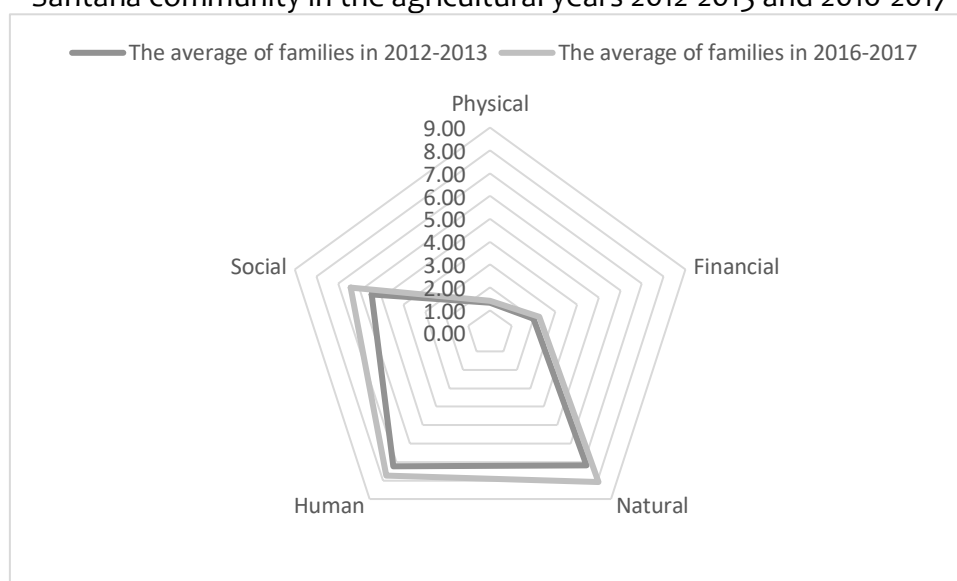
According to Ellis (2000), the capitals are more than just the elements that make up the vertices of the IMV pentagon. The geometric figure itself is also useful, as the pentagon can be used to graphically demonstrate the variation of access of certain groups to these resources. The central point of the pentagon, where the lines intersect, represents zero access to resources, while the outer perimeter represents maximum access to resources. From this basis, different pentagon shapes can be drawn for different communities or groups within a community, where each capital was analyzed individually and also as a dynamic cycle. Representing the results through radar-type graphs or biograms allows for better visualization of the values obtained, as well as the existing imbalances.

3 Identification and analysis of the livelihoods and entitlements of family farmers

The results come from a general analysis of the harmonic means of the five capitals, verifying which ones expand and which ones restrict the living conditions of these families. Consequently, among the expanding sets, the "expander" entitlements were explained; and among the sets understood as limiting, the most "vulnerable" entitlements were analyzed.

Chart 1 shows each capital on its axes: Physical, Financial, Natural, Human, and Social. According to Ellis (2000) and Sen (2000), it is important that the distribution of capitals is uniform and harmonic, because the more harmonic the expansion of the set of capitals, the better their living conditions will be, justifying the idea of a multidimensional theory. However, the biogram shows that, both in the 2012-2013 and 2016-2017 agricultural years, there is no harmonic distribution among the capitals. What occurs is a harmonic distribution only among the natural, human, and social capital, not the same for the physical and financial capital.

Chart 1 - Biogram of the Livelihoods of family production units in the Barra do Santana community in the agricultural years 2012-2013 and 2016-2017



Source: Elaborated by the author based on field research (2013) (2017).

It is worth noting that data from all 25 family production units (UPFs) in the Barra do Santana community were analyzed for the 2012-2013 and 2016-2017 agricultural years in order to understand all income and livelihood strategies of the UPFs, without leaving any of them out, even though outliers were found in relation to income and physical capital in the analysis, which justifies, to some extent, why the financial and physical capitals of the community are lower than the others.

The Livelihoods Index (IMV) of the family production units considered in the research, represented by the pentagon area, had average values of 65.17 and 88.25 in the agricultural years 2012-2013 and 2016-2017, respectively. Therefore, it can be inferred that the average level of sustainability of the entitlements, and consequently, of the livelihoods of the family production units², increased over time, as the harmonic mean of each of the capitals also increased, as explained in the paragraph below.

On a scale of 0 to 10, the families obtained a harmonic average score of 1.18 for the availability of physical capital, 1.81 for financial capital, 6.83 for care of their natural capital, 7.05 for availability of human capital, and 4.72 for social capital in the agricultural year 2012-2013. In the agricultural year 2016-2017, five years after the first analyzed milestone, all values that make up the pentagon increased, with scores of 1.26 for the availability of physical capital, 2.35 for financial capital, 7.86 for care of their natural capital, 7.26 for availability of human capital, and 5.65 for social capital.

These values suggest that there was a slight increase in the average values of the capitals over time, and despite the uneven distribution of the capitals within the pentagon, it is necessary to analyze which entitlements allowed for the expansion of

² Outliers are data that differ drastically from all the others; they are points outside the curve. It is an observation that presents a great distance from the others in the series.

livelihoods and how this occurred over the years. Therefore, the following will analyze the changes that occurred in each entitlement that comprises each capital and the causes of this unequal distribution of "gains" resulting from this process of modernization in the rural environment.

Capital Natural

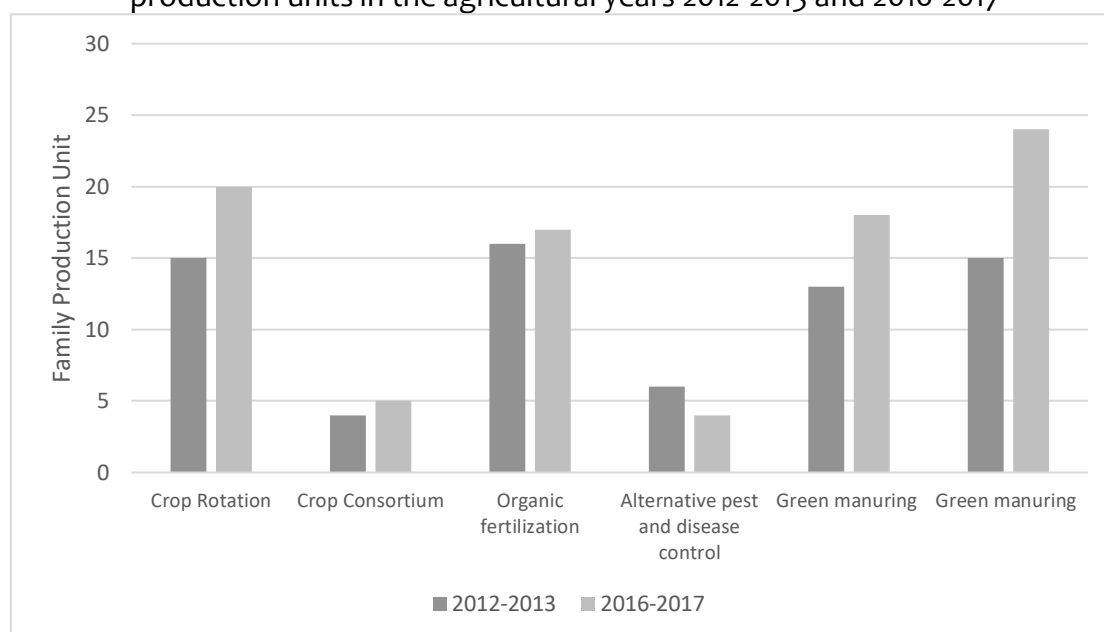
Although Sen (2000; 2008) does not provide a clear definition of natural resources as an instrumental freedom, his works emphasize the importance of this dimension as a means of livelihood. In relation to the rural environment, the connection between farmers and the environment is indispensable for rural development, since according to Freitas (2014), the asset of land (essential for human survival and productivity in agriculture) depends heavily on the preservation of streams, springs, rivers, native forests, soils, among others. Thus, the natural capital of this study refers to the base of available natural resources, related to the conservation of natural assets, divided into: water conservation, soil conservation, and forest conservation.

Regarding water conservation, two assets were analyzed: the source of water on the property and the destination of human waste, as Sabei and Bassett (2013) state that the final destination of waste can influence the quality of water for rural communities. From the agricultural year of 2012-2013 to 2016-2017, there was no change in the source of water, which was accessed through individual artesian wells or from the community itself for all interviewed families in the Barra do Santana community. Regarding the destination of human waste, in 2012-2013, there were 23 families whose destination was a simple septic tank, and only two families whose destination was direct discharge into the soil; in 2016-2017, all families had a septic tank as the final destination for human waste.

Regarding soil conservation, the practices that comprise this asset are crop rotation, intercropping, organic fertilization, alternative pest and disease control, green manure, and no-till planting. In Figure 2, it can be observed that from the agricultural year of 2012-2013 to 2016-2017, there was an increase in the number of families that began to perform all soil conservation activities, except for the practice of alternative pest and disease control, as there were six families who performed this practice in 2012, and in 2017, only four families did.

In this sense, it can be inferred that the decrease in the practice of alternative pest and disease control may be linked to the process of input use in farming, that is, to the increased use of agricultural inputs (materials originating from outside the property), mainly pesticides, in the crops of families in the Barra do Santana community. Moreover, it is worth noting that the increase in the number of families that perform soil conservation practices over the years contributes to the expansion of natural capital, becoming a potential enhancer of a process of creating better living conditions.

Chart 2 - Soil conservation practices that make up the natural capital of family production units in the agricultural years 2012-2013 and 2016-2017



Source: Elaborated by the author based on field research (2013) (2017).

In addition to the soil conservation practices mentioned in the above chart, the erosion process of the soils of the interviewed establishments was also analyzed and classified into (1) those without erosion problems, (2) those with erosion problems but adopting the no-till practice, and (3) those with erosion problems and not practicing no-till. In the 2012-2013 agricultural year, 20 families did not face soil erosion problems in their family production units. Of the five that had problems, three used no-till and two did not. In the 2016-2017 agricultural year, 24 families did not have soil erosion problems in their establishments, and only one did, but employed the no-till practice.

Regarding forest conservation, two practices were analyzed: whether the establishment had reforested degraded areas and whether it had natural forest. The data showed that in the 2012-2013 agricultural year, seven establishments out of 25 researched reforested degraded areas, and in 2016-2017, only five families practiced this. With respect to the number of establishments that had natural forest or woodland, it was observed that this remained unchanged (21 establishments) in both years of analysis. However, over the years, the total area of natural forest or woodland of all families decreased from 98 hectares in the 2012-2013 agricultural year to 75 hectares in the 2016-2017 agricultural year. In this sense, it is worth noting that this decrease in the area of natural forest and woodland can be relativized with the decrease in the total area of the establishments, since in 2012, the total area of the establishments of the 25 interviewed families was 687 hectares, and in 2017, it became 523 hectares.

Consequently, it can be inferred that, according to the data, there was a 14% decrease in the total area of the establishments from the 2012-2013 agricultural year to the 2016-2017 agricultural year, and this same percentage also occurred for the decrease in the area of natural forest and woodland, since in the 2012-2013 agricultural year, the UPFs leased land from third parties to use them in their agricultural practices, thus increasing the total area of their establishments. In the

2016-2017 agricultural year, the properties decreased the leasing of land or stopped doing so, decreasing the total area of their establishments and, consequently, the natural forests and woodlands, a situation that increased pressure on natural resources.

Therefore, according to the natural capital and the analyzed entitlements, it can be inferred that among the families, there was an increase in the sense of sustainable production and conservation of natural resources in their establishments over time, which are essential to good living conditions, fundamentally in the rural environment, where the survival and maintenance of the family also occurs through the exploitation of these natural resources. Additionally, according to the field diary, there is a propensity for families to create strategies to expand environmental conditions as they understand that environmental preservation has become necessary for agriculture and the maintenance of families in the rural context.

Human Capital

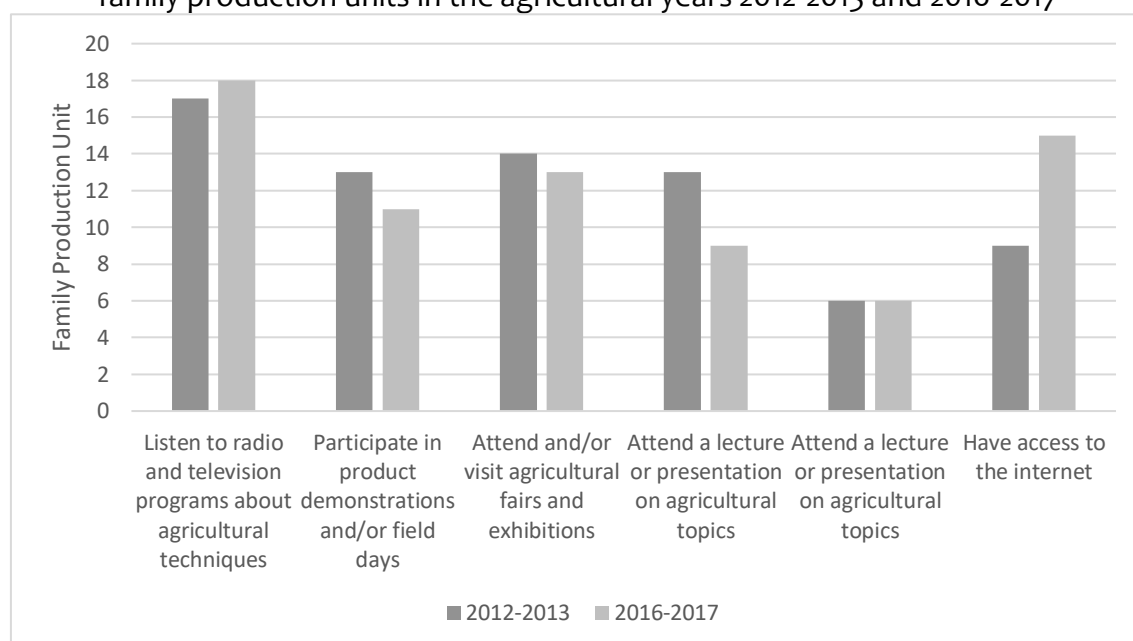
According to Sen's approach (2008), the set of human entitlements is essential in understanding the possibilities of making changes in people's living conditions. For the author, entitlements such as education, health, and information are minimum aspects in individuals' lives for them to overcome certain contexts of risks and uncertainties. Furthermore, having basic consumer goods and infrastructure to survive makes individuals not worry about their basic survival needs and be able to promote empowerment, directly implying an improvement in living conditions.

In this study, the entitlements/assets that make up human capital are related to individual attributes, such as the level of education, information, communication, available family labor, as well as access to transportation, consumer goods, and minimum infrastructure related to housing.

Regarding the level of education of the interviewed families, the results show that, in the period considered, the average education level of the families in the Barra do Santana community was not altered. Both in the agricultural year 2012-2013 and 2016-2017, the average education level of families was the 6th grade. This average may be related to possible difficulties in accessing education during the corresponding period of childhood and adolescence of the interviewees, as well as the migration of children outside the property to study and work, so that even those who studied did not add levels of schooling to the analyzed establishments. This low level of education of the interviewees may cause difficulties in exercising their freedoms, especially in relation to seeking subsidies for technical production decision-making (SEN, 2008).

Regarding access to information, the interviewees were asked if any family member employed a practice that allowed them to access information. In this sense, Chart 3 shows that the number of participation in demonstrations of new products and/or field days, participation and/or visit to fairs, livestock exhibitions, and/or listening to lectures or presentations on agricultural themes decreased from the agricultural year 2012-2013 to the agricultural year 2016-2017. However, the practice of listening to radio and TV programs about agricultural techniques increased from 17 to 18 in the UPFs from the first to the second agricultural year under analysis.

Chart 3 - Practices of access to information that compose the human capital of family production units in the agricultural years 2012-2013 and 2016-2017



Source: Elaborated by the author based on field research (2013) (2017).

It can be observed that during the period under analysis, internal information activities within the property increased, but external activities decreased. That is, the habit of listening to the radio and accessing the internet increased, but going out of the property to attend a course, a lecture, a field day, or to learn about new products decreased. In this perspective, what may justify the decrease in the members of production units going out to seek information is the increase in the intensity of productive activities from the 2012-2013 agricultural year to the 2016-2017 agricultural year, mainly related to the production of grains and milk, as well as access to information through digital search platforms.

It should be emphasized that, according to the field research notebook, listening to radio and TV programs about agricultural techniques is part of the farmers' daily routine and does not require exclusive time for this (unlike other information access practices), since farmers do this while having breakfast or in the afternoon, as well as when they are in the barn milking cows, as in the case of some milk-producing properties.

It is understood that, in this way, there is difficulty for families to participate in courses, meetings, and public calls, both due to lack of knowledge (and even fear of the consequences of such participation) and due to the ease of seeking knowledge via the internet. It should be noted that access to information is an essential asset for families when seeking to establish strategies to improve a life condition, or even to maintain a situation presented as favorable to the individual or family group, being essential to access the greatest number of accurate information. In view of this, it is believed that the greater the possibilities of obtaining information, both for agriculture and for other daily activities, the greater the range of communication channels that families establish to articulate strategies for improving the quality of life and social reproduction.

In addition to the aforementioned practices, Chart 3 shows that internet access in UPF households increased from nine to 15 between the 2012-2013 and 2016-2017 agricultural years. According to the interviewees, this increase in internet access was due to a decrease in the costs of installing internet signal reception antennas in the community. Additionally, the interviewees stated that they "do not want to be left out of the world," referring to the expansion of social networks and access to information technologies.

Furthermore, according to the interviews, the main use of the internet is to maintain communication with family and access weather forecasts to plan agricultural activities, which depend on meteorology to plan the execution of agricultural activities. Overall, it can be said that families have access to both agricultural and non-agricultural information mechanisms, but this resource is not always utilized as a potential enhancer of living conditions.

In the 2012-2013 agricultural year, 13 families had computers on their property, a number that remained unchanged five years later in the 2016-2017 agricultural year. However, regarding the use of cell phones, 22 out of the 25 UPFs surveyed had cell phones in the first year of analysis, and in the second year analyzed, all 25 UPFs had mobile telephony. Thus, it is evident that the number of families that had access to the internet in 2016-2017 was greater than the number of computers present on the property, and the increased access to cell phones led to an increase in access to information and communication through the internet in the UPFs surveyed.

In addition to the conditions of information for the development of activity, other measures of interest to family members should be considered, as the deprivation of access to basic freedoms represents significant limitations in the freedom of choice and in the real opportunities for the development of individuals and the family group (SEN, 2008). Therefore, some infrastructure factors and their compliance among the properties should be investigated.

Regarding the infrastructure of the UPF houses, all of them, in both years, had access to electricity from the public grid; complete bathroom with shower, toilet, and sink; and the roof of the house was made of either clay or asbestos tiles. In 2012-2013, the flooring of 19 houses was made of concrete, and six were made of wood. The external walls of 17 houses were made of concrete, and eight were made of wood. In 2016-2017, these numbers changed due to renovations and constructions that occurred in some UPF houses. The data shows that three houses changed their wood flooring to concrete. As a result, 22 houses, out of the total of 25, now have concrete flooring, and only three continue to have wood flooring. It is worth noting that 21 houses predominantly have external walls made of concrete, and only four continue to have wood walls.

Regarding consumer goods, the data shows that all families, in both years, had more than 10 consumer goods. However, it is worth noting that from the 2012-2013 agricultural year to the 2016-2017 year, there was an average growth of one consumer good per UPF, which in most cases was the result of purchasing a new television for the house.

In 2012-2013, regarding the respondents' own transportation, 23 UPFs had only a car or a car and a motorcycle for transportation. One UPF had only a motorcycle, and one UPF did not have any means of transportation. In 2016-2017, 24 UPFs had

their own car or car and motorcycle. On the other hand, during the same period, only one UPF (the same as in 2012) did not have any means of transportation.

The categorization used to compose human capital regarding the available workforce in the establishment was the family workforce (UTH family), as it is understood that livelihoods should be composed of data from the family residing on the property. However, Table 1 shows the average data of the family workforce, hired workforce, and the total workforce of the establishments in both years of analysis, as it is important to highlight the availability of the total workforce of the families over time and compare them with the others.

From Table 1, an increase in the availability of family, hired, and total workforce can be observed when comparing the first and second agricultural periods under analysis. Despite the increase in family workforce over the years, it was also necessary to increase the hiring of labor in the establishments. In this sense, it is worth noting that in the 2012-2013 agricultural year, only three UPFs hired labor to perform work on the property. In the 2016-2017 agricultural year, the number of UPFs that hired labor doubled: six UPFs started to hire labor to perform activities on the property. Additionally, it is important to note that one of the families, out of the six that hired labor, started to hire a person to work eight hours a day on their property to perform activities related to poultry farming, dairy cattle, and farming.

Table 1 - Average values of available labor in family production units in agricultural years 2012-2013 and 2016-2017

	Family labor (UTHf)	Hired labor (UTHcont)	Total labor (UTHtotal)
Crop year 2012-2013	1,87	0,057	1,932
Crop year 2016-2017	2,20	0,148	2,348

Fonte: Elaborado pela autora com base em pesquisa de campo (2013) (2017).

Thus, it can be inferred that, through field observations, despite the increase in family labor over the years, it was necessary to increase hired labor due to the intensification of productive activities in the UPFs, especially those related to the increase in grain and milk production, despite the decrease in useful agricultural surface and the increase in the number of machines and equipment, indicating optimization of agricultural productivity.

However, in the previous table, the presence of "service exchange" among farmers is not accounted for, even though it is one of their strategies to reduce production costs. This means that, in addition to the numbers presented, there was the report of mutual aid in the form of service exchange and favors not involving monetary payment, but rather values of reciprocity, which is why it is not classified as hiring labor (SABOURIN, 2009). The mutual aid present in these relationships is called reciprocity by Sabourin (2009), a practice responsible for creating ethical value, of relationships that are doubled, understood as the dynamics of reproduction of services that generate social ties.

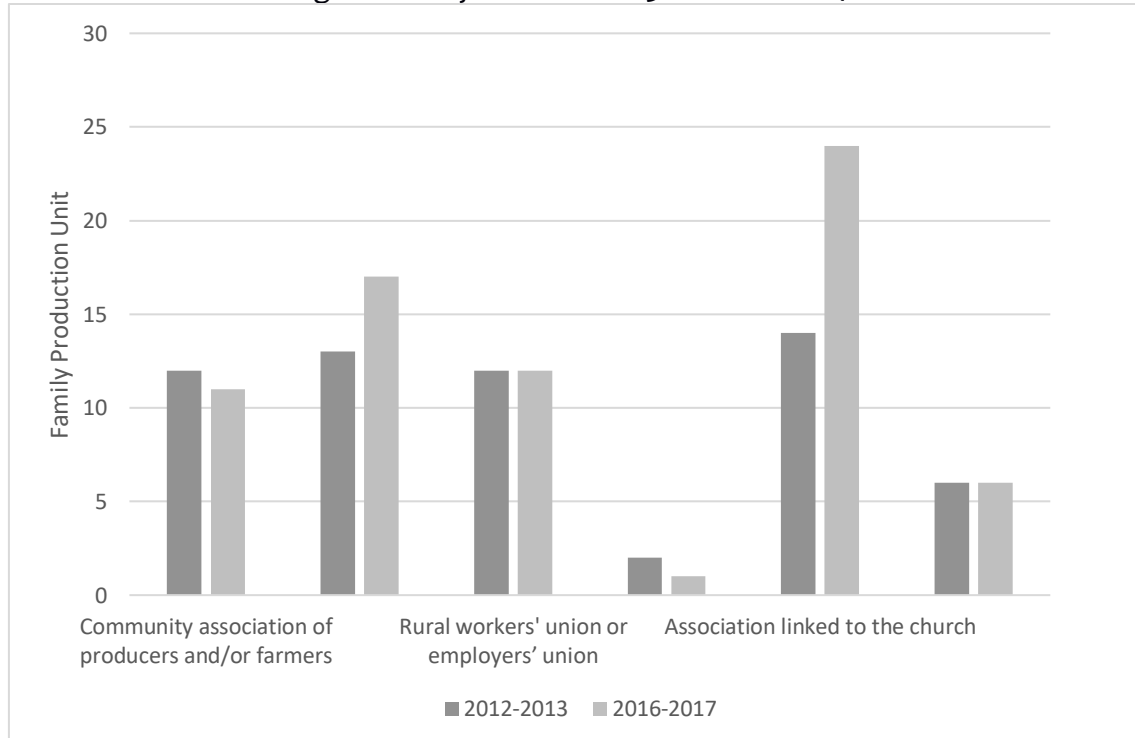
Social Capital

For the group of 25 families, the "social capital" parameter increased. Conceptually, the social aspect - development opportunities (SEN, 2008) and social capital (ELLIS, 2000) - refer to the daily relationships that families establish, both in their community nucleus and in external relationships, such as neighboring communities, technical assistance institutions, production and banking, entities, etc. Thus, the social dimension stands out for the participation that families have in their community, for the ways in which they establish trust relationships and how they obtain essential information for organizing life and everyday strategies.

Social capital corresponds to relationships of reciprocity and trust, and in this study, the relationships that farmers establish with unions, associations, cooperatives, and neighbors were identified. The discussion of social capital helps to understand how social networks are formed that can facilitate the access of individuals and family groups to other assets since social capital itself represents the fundamental means to achieve goals and obtain new assets.

The data from Chart 4 present the participation of respondents in social practices, showing that from the agricultural year 2012-2013 to the agricultural year 2016-2017, the number of participation in cooperatives expanded from 13 to 17 UPFs, and that participation in the community church also increased from 14 to 24 UPFs. Only one of the 25 interviewed families did not attend church.

Chart 4 - Social practices of the members of the family production units in agricultural years 2012-2013 and 2016-2017



Source: Prepared by the author based on field research (2013) (2017).

The data showed a decrease from 12 to 11 UPFs containing members participating in community associations of producers and/or farmers, and from two

to one the number of UPFs containing members participating in mothers' clubs, from the agricultural year 2012-2013 to the agricultural year 2016-2017. Additionally, the number of participants in rural workers' unions or employer unions and in soccer, bocce or any leisure-related entity remained the same from 2012-2013 to 2016-2017, namely 12 and six people composing the UPFs, respectively.

For these interviewed individuals, cooperatives offer benefits in accessing the acquisition of fertilizers, seeds, and pesticides for pasture and crop cultivation, and in some cases, promote courses, field days, and training. Thus, the entitlements that comprise social capital - participating in cooperatives - also promote access to the entitlements that comprise families' human and financial capital, showing in practice the multidimensionality that theory brings.

It is noteworthy that general information is important for expanding the range of opportunities to create different strategies that comprise their livelihoods. However, the knowledge for agriculture transmitted by public extension technicians or cooperatives, and even by instructors from companies, is essential in the productive issue and expansion of knowledge for agriculture in general. In this logic, the data show that, both in the agricultural year 2012-2013 and in 2016-2017, 18 UPFs out of 25 received technical assistance on their premises.

The technical assistance provided to families, in the two cycles analyzed, was carried out primarily, in decreasing order, by private (liberal) technicians, technicians from production cooperatives, and technicians from the Verê Municipal Government. It should be noted that in 2012-2013, UPFs received technical assistance from only one of the aforementioned places. In 2017, some UPFs received technical assistance from different entities, such as one UPF that received assistance from the production cooperative for its crop and from the municipal government for milk production.

Regarding social capital, we must consider that reciprocity within the community is primarily defined by kinship and neighborhood relationships. In the case of this community, there are many kinship relationships defining exchanges of workdays, participation in community and leisure activities included in family meetings, which often aim to build ties that lead to productive and reproductive benefits. In these cases, reciprocity involves mutual aid, sharing resources and knowledge, acting on a symbolic level through words, rules, norms, and customs, associated or not with some tradition, and producing different values (SABOURIN, 2009). This form of relationship is identified in the social relationships of farmers, with mutual aid identified in the realization of crop management activities.

Physical capital

Physical capital is composed of assets/endowments that are created, consumed, and conquered through the economic production process, being used as an instrument for the functioning of activities. Thus, it refers to the household's infrastructure conditions, in other words, the possession of machines and equipment, improvements, and the amount of land available for carrying out productive activities.

In Table 2 below, it is noted that the average value of available capital in machines and equipment, available capital in improvements, and consequently the total available capital of families increased from the agricultural year 2012-2013 to

2016-2017, and that the useful agricultural surface (SAU) decreased, resulting in a higher total available capital index divided by the SAU in the second agricultural year than in the first evaluation.

Table 2 - Average values of capital and land indicators available in family production units in agricultural years 2012-2013 and 2016-2017

	<i>Available capital in machines and equipment</i>	<i>Capital available in improvements</i>	<i>Total available capital</i>	<i>SAU (ha)</i>	<i>Total available capital / SAU</i>
Crop Year 2012-2013	R\$101.594,74	R\$62.893,86	R\$164.488,60	22,6	R\$7.278,26
Crop Year 2016-2017	R\$114.890,80	R\$96.295,24	R\$211.186,04	17,2	R\$12.278,26

Source: Prepared by the author based on field research (2013) (2017).

The increase in available capital for machines and equipment, as well as improvements, was 13% and 56%, respectively, from the agricultural year 2012-2013 to 2016-2017 in the UPFs. In other words, families showed improved infrastructure conditions and greater possession of machines and equipment in the second year of analysis, an investment aimed at facilitating agricultural work in family farming, making labor available for other activities, or optimizing crop productivity. Supporting the data, Ellis (1999) asserts that infrastructure facilities and equipment have an important impact on reducing vulnerability, contributing to increased mobility of resources and people in their choices.

Furthermore, it is worth noting that the increase in available capital can be justified by the increase in technical assistance, access to rural extension, and the acquisition of credit through the Program for Strengthening Family Agriculture (PRONAF), for which families usually sought equipment to invest in activities, mainly dairy farming and grain cultivation.

Regarding the area of production units, the data from Table 3 below demonstrate that the average total area, own area, and useful agricultural surface are greater in the agricultural year of 2012-2013 compared to the agricultural year of 2016-2017. In other words, on average, the size of UPFs decreased. Therefore, a fundamental asset for family development, considering that the activities carried out depend exclusively on it, was weakened between the surveyed years. This reduction may have been caused by the division of lands among heirs, or even by the sale of lands to third parties.

Table 3 - Average of the total area, owned area and useful agricultural area of family production units in the 2012-2013 and 2016-2017 agricultural years

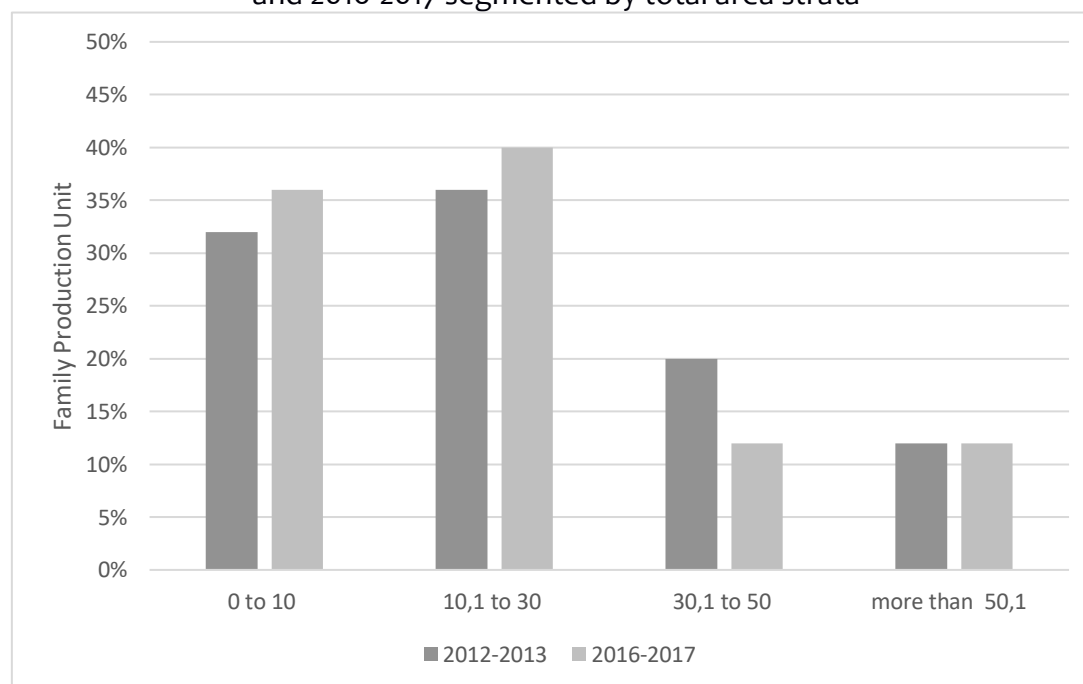
	<i>Total area (ha)</i>	<i>Owned area (ha)</i>	<i>Utilized agricultural area (ha)</i>
Crop Year 2012-2013	27,5	20,4	22,6
Crop Year 2016-2017	20,9	19,2	17,2

Source: Prepared by the author based on field research (2013) (2017).

It can be observed from Table 3 that in the first agricultural year, on average, families had a smaller average of owned land than the useful agricultural surface, leading to the conclusion that the UPFs rented land from third parties to use in their agricultural practices, thus increasing the total available area. In the 2016-2017 agricultural year, however, the owned land of the productive units was larger than the useful agricultural surface, indicating that the properties decreased their land leasing or stopped doing so.

Chart 5 below refers to the total area of UPFs surveyed, stratified for the first and second agricultural years under analysis. The data reveals a 4% increase in the number of UPFs with 0 to 10 hectares as well as in the number of UPFs with 10.1 to 30 hectares. The number of UPFs decreased by 8% from 2012-2013 to 2016-2017 in the stratum of 30.1 to 50 hectares and remained the same in production units that have more than 50.1 hectares. It should be emphasized that the most significant number in the graph is the decrease in the number of production units in the stratum of 30.1 to 50 hectares, which was five in 2012 and became only three production units in 2017.

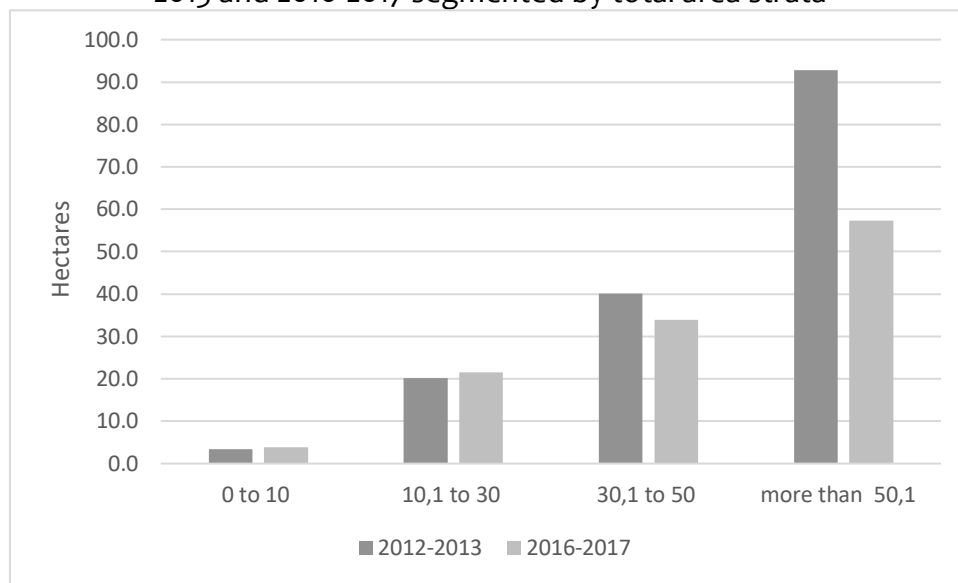
Chart 5 - Percentage of family production units in the agricultural years of 2012-2013 and 2016-2017 segmented by total area strata



Source: Prepared by the author based on field research (2013) (2017).

To help understand the decrease in area, Chart 6 illustrates the average number of hectares in each stratum in the agricultural years of 2012-2013 and 2016-2017. The data shows that in the strata of 0 to 10 hectares and 10.1 to 30 hectares, the average total area of the productive units increased from 3.4 to 3.9, and from 20.2 to 21.5 hectares, respectively. However, in the strata of 30.1 to 50 and over 50.1 hectares, the average total area of UPFs decreased significantly from 6.2 and 35.5 hectares, respectively.

Chart 6 - Average area of family production units in the agricultural years of 2012-2013 and 2016-2017 segmented by total area strata



Source: Prepared by the author based on field research (2013) (2017).

Therefore, based on the data from Charts 5 and 6, it can be concluded that both the increase in the number of UPFs with up to 30 hectares and the decrease in the average area of production units with more than 30.1 hectares led to a decrease in the areas and SAU of UPFs from the agricultural year of 2012-2013 to 2016-2017, resulting in a decrease in assets/entitlements related to the availability of land, which is essential for carrying out productive, economic, social, and environmental activities. Thus, this entitlement represents a lower possibility of improving the other entitlements that make up the means of livelihood.

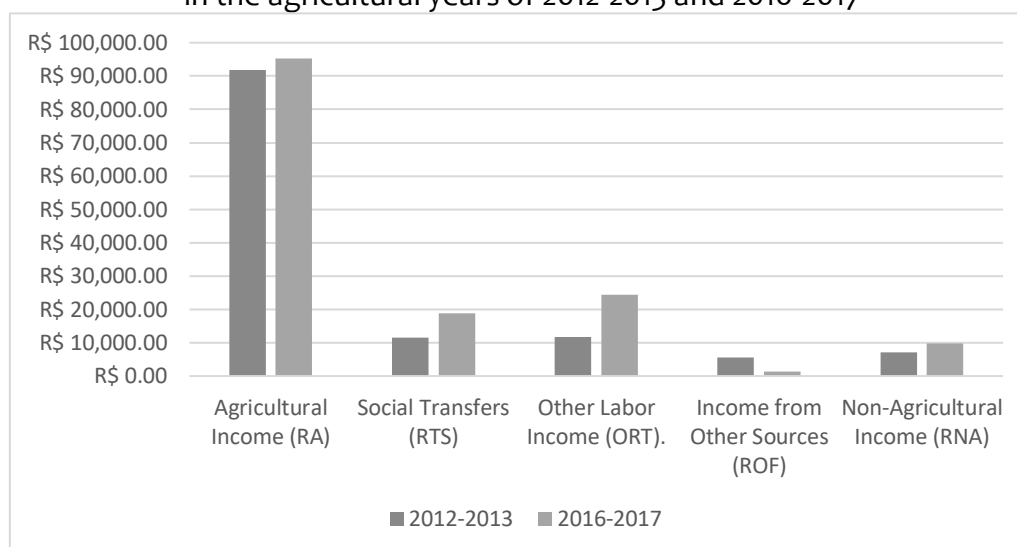
Financial Capital

Regarding financial capital, the assets that comprise this capital are the different sources of income that contribute to the total income of the UPFs. These assets can be accessed to acquire production and consumption goods, as well as to utilize the available labor force in the establishment.

The presented data consist of the average values of the identified sources of income in the production units, as well as the total income of these families and the family labor available in the production units for both years. It is important to note that, at this point, only the average values of the incomes that contribute to the total income are considered to verify their evolution over the years.

The first consideration regarding the assets that constitute financial capital is in relation to the different sources of income that make up the total income of the production units. As indicated in Graph 7, it can be observed that agricultural income has the highest values in both years of analysis, amounting to R\$91,874.99 and R\$95,229.61 in the 2012-2013 and 2016-2017 agricultural years, respectively. Other labor income, social transfer income, and nonfarm income all exhibited an increase in absolute values from the first to the second year of analysis. The only income that decreased was income from other sources, which had average values of R\$5,515.40 and decreased to only R\$1,364.80.

Chart 7 - Average values of agricultural income, social transfer income, other labor income, income from other sources, and nonfarm income of family production units in the agricultural years of 2012-2013 and 2016-2017



Source: Prepared by the author based on field research (2013) (2017).

Regarding the sum of all incomes that form the total income of the surveyed production units, the data showed that in the 2012-2013 agricultural year, the average total income of the establishments was R\$ 127,875.55, and in the 2016-2017 agricultural year, it increased to R\$ 149,537.77. That is, there was an average increase of 17% in the total income of the surveyed production units.

When the total income is divided by the available family labor in the production unit, which is what defines this capital, we have values of R\$ 65,713.40 and R\$ 78,842.04 for the 2012-2013 and 2016-2017 agricultural years, respectively. Thus, it is noted that there was a 20% increase in total income due to the availability of family labor, that is, the financial capital of the surveyed families increased between the agricultural years. This increase is attributed to the creation of strategies to maintain and expand their autonomy, according to Ploeg (2008).

4 Conclusions

The study empirically tested a methodological approach to measure the livelihoods that make up the entitlements of family production units through interviews with 25 family production units in the Barra do Santana community, located in the southwest of the state of Paraná. Measurement is important not only to know the level of development but also to determine potentialities and limitations that may be restricting the development of production units.

The analysis measured livelihoods and classified them into five categories: financial capital, physical capital, human capital, social capital, and natural capital. An important contribution of the tool is to quantify the level of development for different assets, identifying those that limit the development of the evaluated unit.

Another contribution of the research is that when applied to longitudinal data analysis, it can show a temporal variation, which may suggest improvement or worsening in livelihoods. In the empirical cases evaluated, the analysis showed a 26% expansion of livelihoods from the agricultural year 2012-2013 to the agricultural year

2016-2017. However, among all the capitals that formed the livelihoods, the physical and financial capitals were more vulnerable than the human, social, and natural capitals because comparatively, the values found are lower in both years. Therefore, it can be concluded that the average sustainability level of UPFs livelihoods increased in the analyzed period, as the harmonic mean of each capital also increased, despite fragilities being found in some capitals.

The livelihood analysis tool used in the study also allows for the evaluation of the distribution of capital. Better living conditions, in the context of multidimensional theory, require a harmonic distribution among all capitals that make up the livelihoods, which was not verified for the Barra do Santana community in any of the years analyzed. Thus, it is understood that there was greater vulnerability in physical and financial livelihoods, but that social, natural, and human assets would be those that potentialize a process of creating better living conditions.

Finally, it is essential to perceive development as a multidimensional issue of access and maintenance of entitlements as expanders of living conditions, with farmers controlling relatively autonomously the capitals necessary for building life trajectories they deem appropriate for themselves and their families. According to Grisa and Nierdele (2008), the set of assets constitutes the basis of power of actors and enables them to reproduce and alter institutional structures under which reproduction occurs.

It is worth noting that, although the approach proposed here produces important information on variation and limitations to development, this information represents the harmonic average of farmers from a specific location and is, therefore, useful in situations of relative homogeneity among the units. Situations of greater heterogeneity probably require stratification to have more precise results for each group. Finally, we suggest the need for interventionist research with local actors to test and adapt the approach as a practical instrument to support decision-making and the formulation of public policies for regional development.

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