

Non-Conventional Food Plants in Paraná Coast-Brazil: A Brief Overview of Production and Trade

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Abstract— In Paraná Coast lacks production alternatives in rural areas due to the high natural declivity of the land, as well as the low natural fertility of the soil and few areas available to plant because the large presence of environmental preservation areas. In this context, new alternatives within the pluri-activity perspective should be considered in the generation of income for family agriculture. Non-conventional food plants (NCFP) seemingly meet the prerogatives, but studies were not found on this regional production system that could attest the production and trade of this plants as an income alternative. Thus, from June to October of 2018, a descriptive exploratory research with qualitative nature was carried out with farmers that had recognized tradition in the cultivation of these types of food plants, in order to delineate an overview of the regional activity, as well as the implication and potential of the crops. The study found that farmers lived in rural areas and on average had a cultivation of 0.5 hectares of NCFP, which generated an income of approximately USD 180.00 per month. The most cultivated species were Taioba (*xanthosoma taioba*), serralha (*sonchus oleraceus*) and Hibisco (*hibiscos acetosella*). The main implications of the farmers' perception were the lack of agronomic knowledge for the introduction of new crops, few specialized technicians for technical assistance, and the lack of public sector incentives. The main potentialities observed were the loyal customers, the species of NCFP which are traditionally more resistant to pests and diseases and that favor the cultivation, besides being a factor that provides an alternative of income in the concept of rural pluri-activity.

Keywords— Agribusiness, Family Agriculture, Rural pluri-activity, Non-conventional food plants, Caiçara culture, Organic agriculture.

I. INTRODUCTION

Family agriculture in Brazil is responsible for approximately 70% of the national agricultural production and within this productive context the variability of species and crops is diversified, guaranteeing better food conditions (Fuhr, 2016).

Besides contributing positively to the country economy, the family agriculture also promotes alternative of income to families with lower monetary conditions, although in these cases the cultivation was more oriented toward their own consumption, surplus trade generates income and has a relevant social character (Guilhoto, 2007).

The National Program for Strengthening Family Agriculture, Pronaf, came specifically to meet the demand of these families who do not have guarantees and help such as financing for agricultural production, which further strengthens the practice of farming as a change in the social and economic reality of the Brazilian farmers (Nead-Fipe, 2004).

The public policies created for the family farmer in the National Family Agriculture Policy (Law No. 11.326, 2006) established relevant issues to the national and local development in relation to the farming practices in rural areas. Part of this is because the family farmer is the main agent of a complex heterogeneous and flexible system in terms of the means of production, new markets, being also a provider of income and the main form of farmers' sustenance, reducing the exodus rural (Buainain et al., 2003).

In front of new forms of cultivation, especially with the adaptation to the reality of the upward consumption of new types of food, the small family farmer has been pioneering in these systems combining the social and economic transformations to the modernization of its properties, inserting the cultivation of new species which

previously did not have a high commercial interest (Schneider, 2003; Barreira et al., 2015).

The portfolio of new forms and species of crops for family farming in Brazil has been relevant the production of Non-Conventional Food Plants (Borges, 2018).

The NCFP are an acronym to refer to Non-Conventional Food Plants which, according to Knup and Lorenzi (2014), have one or more parts or even derivatives of these parts which can be used directly in the human food and a significant amount of these species of unconventional food plants are nutritionally richer than domesticated plants (Kinupp, Barros, 2008), which explains the rise of NCFP in some regions of Brazil and the world.

The cultivation of NCFP has been being a relegated activity in Brazil both for the general population as related to the farmers, but it has the potential to generate income, having importance in the family budget, as well as in the local economy and in the guarantee of the food security of the farmers' families, since the majority of the species also present significant nutritive contents (Borges, et al., 2018).

It is estimated that there are approximately 12,500 species, 3,100 genera, within 440 families of eatable plants. They are characterized by flavoring products, condiment species or parts of a plant that can be "reused", such as: roots, bulbs, tubers, leaves, shoots or seeds (Knupp, Barros, 2007).

Thus, for the expansion and production of NCFP, there should be incentives for this sector of the family agriculture, since they can bring considerable gains to all parties involved, especially to the small farmer (Mda - Sead, 2017).

According to Embrapa (2014), the overview related to the new ways of producing shows positive trends, in this context it is urgent to evaluate the development of new technologies for the small farmer in the expansion of the crop portfolio, as well as to guarantee quality assurance and food security to these families, which from the expansion of knowledge could also have the aggregation of value and generation of value and family income.

It is fundamental the role of the family farmer in the dynamization of the local economy, promoting the innovation, evidencing its preponderance as a factor the leads to the increase of the cultivation potentialities, aligned the interface with local institutions adding value to the crops (SCHNEIDER, 2010), in this context the NCFP could represent a relevant alternative of production diversification and productive innovation for the benefit of small producers (BORGES, 2018).

As for the Paraná Coast due to the high slope of the land and the low natural fertility of the soil, there are few alternatives of agricultural production, especially those

with scarce planting space (Negrelle, Anacleto, 2013). Thus, the NCFP are easily adaptable, resistant and may represent a viable alternative for cultivation (Kinupp, Barros, 2008; Barreira et al., 2015).

The Paraná Coast covers 7 municipalities, of which in the rural context can be characterized by the practice of family agriculture, having a maximum of 4 fiscal modules, approximately 20 hectares, being the main source of income with agricultural origin (Mda, 2016).

The region has the largest area of conserved Atlantic Forest in Brazil (Ferreira, Negrelle, 2007), which limits agricultural practices in the region, but it is classified as an environment auspicious for the cultivation of NCFP, since there are more than 15 thousand species of plants available along the forest with a large contingent that can be used in agriculture as food and source of resource for family income (Barreira et al., 2015; Sosma.Org 2018).

Despite the relevance of the NCFP as an alternative income and its adaptability the Paraná Coast region, few and sparse studies deal with this regional theme, thus, in this context, this study aimed to elaborate, in the perception of the family farmer, that also produces non-conventional food plants, an overview on the NCFP encompassing the socioeconomic implications and potential in the regional context.

II. MATERIAL AND METHOD

A prospective study on the possibility of cultivating Non-Conventional Food Plants as income alternative for five small family farmers from Paraná Coast was conducted as the basis for the execution and composition of this paper. Then, similarly to that was proposed by Barreira et al. (2015) it was carried out between June and October of 2018 an exploratory descriptive research with qualitative nature in Paranaguá, Morretes and Guaratuba.

It was used as data collection instrument, a semi-structured interview with a script with a pre-elaborated questionnaire (Triviños, 1987). The interviews were recorded in audio and performed in the residence of the farmers who voluntarily agreed to participate in the research and consented to the recording process.

Initially the interviewees answered about the socioeconomic profile regarding to the age group, time working in agriculture and types of NCFP cultivation. Then, the farmers answered questions about NCFP cultivation, related to the main implications and trade of these species, as well as the greater opportunities of working in this segment, since the farmers that participated of this research had experience in NCFP cultivation.

After collecting data from the previous phase, with the help of the five producers of NCFP and two expert technicians, according to what was proposed by Campos

et al. (2017) and Costa et al. (2018), a cross-impact matrix was organized.

The matrix employs percentage values from 0 to 100 for each opinion that the interviewees shared collectively in relation to the other opinions expressed, comparing each analyzed item in the relation to the influence exerted and the influence suffered in the cultivation and commercialization of NCFP, thus the higher the index, the greater the relevance and attention to be given in order to solve the problem suffered by the family farmers or the valuation to be attributed to the opportunities that can prospect to the activity.

The impact matrix generates an index of relevance (the development importance) that can be obtained by the equation:

$$IR = \frac{FA \times FB \times 100}{\sum SF}$$

IR= Relevance Index of the evaluated situation;

FA = Influence received indexes;

FB = Influence suffered indexes;

$\sum SF$ = Indexes sum (FA x FB) of all the issues analyzed.

hen according to Costa et al. (2018) it was adopted the interpretive and descriptive analysis of the contents obtained through the technique of data triangulation among the observation of the researchers, the similar answers obtained from the farmers and the specialized literature on the subject.

III. RESULTS

The interviewees in the totality were married or in a stable union, masculine gender, with age average fifty years old, their school level was in the majority of High School (n = 75%) or with Elementary School yet (n = 25%).

The producers lived in rural areas, where they have cultivated traditional agricultural species such as banana, cassava, rice, vegetables among others. As well as they raised small animals such as poultry and pigs for the family alimentation. The average size of the rural properties was approximately 7 hectares, and on average each producer used 0.5 hectare for the NCFP cultivation, and in these areas the cultivation was practiced on average of 11 years. Similar to the traditional foods, most NCFP require a process of transformation such as cooking, boiling or drying for human consumption, and in this context that is a decisive factor in the choice of what species the farmers will cultivate, the simpler the process is, the lower the consumer rejection. The species and parts of NCFP most cited in cultivation or extractivism in

Paraná Coast were Taioba (*Xanthosoma taioba*) for the trade of leaves and rhizomes, Serralha (*Sonchus oleraceus*) for the trade of leaves and Hibiscus (*Acetosella hibiscus*) for the trade of immature fruits that are eatable, used in the preparation of tea, soft drinks, juices and jellies and the pulp of mature seeds of Palmito Juçara (*Euterpe edulis*) for juices and jellies as an alternative to Açaí pulp, amazon Maná Cubiu (*Solanum sessiflorum*) for the trade of fresh fruits that can be used in the preparation of juice, picão preto and pico pico, (*Bidens pilosa* L) in the trade of safflower seeds, Ora-pro-nóbis (*Pereskia aculeata*) for the trade of leaves, Beldroega (*Portulaca oleracea*) for the trade of leaves. The most cultivated species were Hibisco, Taioba and Serralha cultivated in most part of the properties because according to those interviewees they have higher demand and higher profitability.

The lack of technical knowledge about the cultivation of NCFP is linked to the existence of few specialized technicians on the sector, resulting from a scenario that apparently in the short term is difficult to solve (Table 1).

Table 1. Implications of non-conventional food plants in the perception of rural producers in Paraná Coast.

	Implications	IR
1	Lack of agronomic knowledge for cultivation	19,10
2	Few technical experts on technical assistance	14,11
3	Lack of public power incentive	14,11
4	Absence of specialized fairs	11,97
5	Difficulty of products insertion in the conventional market	9,46
6	Little capital of the farmers in order to potentialize the means of production	8,91
7	Unaware of commercial practices	8,07
8	Product does not have the organic product quality stamp	6,52
9	Distance makes logistics difficult between producer and customer.	4,44
10	Some species are difficult to cultivate	3,31

The totality of the interviewees (Table 2) declared that the NCFP cultivation was the second most important income alternative to the family, being relevant in the regional context the cultivation of bananas, rice, artisanal fishing, thus they characterized the activity as an alternative of income supplement in the context of rural pluri-activities. In this sense, the average income of the producers with NVFP commercialization was USD 180.00 per month, and the activity was performed with the use of family labor in the majority of the cases (n = 80%).

The respondents in their totality informed that they were doing the cultivation of NCFP in a totally natural way and with no use of pesticides, but they did not have the stamp for organic certification.

Table 2. Potentialities of non-conventional food plants in the perception of rural producers in Paraná Coast.

	Opportunities	IR
1	Customers' loyalty	20,96
2	Species of NCFP resistant to pests and diseases	16,01
3	Provide alternative income in the concept of rural pluri-activity	11,77
4	NCFP market is rising	9,14
5	Organic Production	8,84
6	Weather conditions good for these cultivations	8,12
7	Exotic products with high nutritional content	7,31
8	Low competition among NCFP producers	6,99
9	Next to large consumer centers	5,75
10	Recent research growth on the topic	5,11

Regarding to the market expectations, the most part of the respondents (n = 80%) reported that they feel satisfied and have a desire to cultivate new varieties of NCFP, if the implications of the activity could be mitigated.

IV. DISCUSSION

The producers interviewed in their entirety reported that the sale of Non-Conventional Food Plants is seasonal, and that situation is a result of their respective natural cycle. Although they are holders of the cultivation knowledge and cultural treatments of some species, these factors were still classified as the main limiters for the activity to grow, which reduces the commercial prospection of new species.

The technical assistance system in Paraná Coast is composed with a qualified governmental network, but they have to fulfill the governmental attributions in the service of the great commodities such as banana, rice and ginger, mitigating the service to small producers, as those who cultivate flowers, produce sugar cane brandy as well as the promotion of NCFP.

Thus, in front of the fact that technical assistance from the private sector is costly to family farmers in Paraná Coast, the cultivation of new varieties is not carried out because the producers do not have a deep knowledge to work with new species. Since they do not have this know-how or guided agronomic technical assistance, they are limited to the same varieties that they produce for a decade, leaving stagnated the production system that apparently has been

a main alternative condition of family support, as also explained by Barreira et al. (2015).

The stimulus of the public power to the development of NCFP can be done by several ways. The first one is the provision of technical assistance, which although is not available in an individualized and a thematic way, could be treated in the format of a learning field day, technical excursion to other producing regions and technical or theoretical lectures.

Another issue to be analyzed by the public authorities is the inclusion of NCFP in the school lunch programs, which promotes the acquisition of fruits and vegetables from local family producers from all municipalities of Paraná, what nowadays does not contemplate the acquisition of NCFP.

For that, the rural development of small producers, in order to meet new demands, also depend on incentives and support from development institutions that corresponding to these activities, according to Grisa and Schneider (2015), the National Program of Family Agriculture – PRONAF, has made available in the last few years, reduced-interest financing to small family farmers through the Plano Safra Agricultura Familiar (Family Agriculture Plan), which provided subsidies of approximately US\$ 6.51 billion to the conventional agriculture, but there is no investment considering NCFP segment.

In relation to the cultivation of NCFP and the performance of the governmental institutions, a new and contemplative dialogue should be initiated, being a resultant factor in practical actions which could benefit the sector, as described by Balsadi (2001) that there must be the understanding of the increasing incidence of new rural occupations due to crises in Brazilian agriculture in the last decade, and that the new perspectives of cultivation, aligned to the new technologies and agricultural occupations should be viable and have institutional support.

Apparently, the dynamization and growth of this market in relation to the family agriculture production and trade is very associated to the lack of information between producers and governmental institutions, being this question more evident, since all the interviewed producers have attested that they never used pesticides in the production system, and they still do not have the organic products stamp. Thus, the lack of information is evident given that there is an organic institution linked to a university research in Paraná Coast, which for more than a decade has been promoting the organic certification for the regional producers for free.

In this context, the communication between the public institutions for development, education and technical assistance provoked by the producers may result in a new

cycle of information that, using the traditional knowledge of the families involved, may align these new activities in the context of rural development.

The role played by productive sustainability according to Cheung (2013), aligning the rural development should be shared by the small family farmer towards the formation of a community system complex, promoting an environment with habit, historical experiences and values attribution, strengthening the territorial identity. This should also be a vision focused on the development of new technologies and new products for cultivation, promoting a relationship and trust network that supports each other, instigates and seeks new alternatives while creating ways to mitigate the implications of this process. The current overview on Paraná Coast has a diagnosis where the NCFP constitute an important strategy of food sustenance, as well as in the use of surplus family labor, which results in the generation of income. The set of these factors tied to the fact that according to Barreira et al. (2015) depending on the species, NCFP are easier to produce due to their natural resistance to pests and diseases, being in line with the perceived consumer loyalty, resulting in a scenario where the set of opportunities reveal the possibility of expanding the activities planned in the concept of rural pluri-activity what in the short and medium term can positively impact in the regional socioeconomic scenario.

On the other hand, the national economic scenario must be impacted by the entrepreneurial activity of family farmers, but besides that and according to Schneider (2003) it must also be linked to governmental actions, since that in the context of agribusiness public policies affect, in an intensive way, whether positively or negatively, the small family farmers. These producers, then, are the biggest ones affected by the current lack of incentive and promotion of NCFP in the development of pluri-activity.

Still in this context of rural pluri-activity, there is a correlation to the cause and effect phenomenon, where family farmers have a scarce source of income and they are motivated to look for new sources in order to obtain more income. As in the context of NCFP, it was observed that the producers from Paraná Coast region promote other activities related to the conventional agriculture such as fishing, handicrafts, or even rural micro-industry. Thus, the families divide the tasks so that each person performs a given productive activity and the diversified sources of income reduce the influence of the natural conditions such as climate and time on the preponderance of a food and economic guarantee.

The circumstances in which the rural pluri-activity is adopted by producers is emphasized in the integration of various occupational combinations of what is rural, in

order to promote a new perspective of obtaining income for these families and that this characteristic should be maintained as a form of autonomy and rural support.

V. CONCLUSION

The producers have lived in rural areas and on average cultivated 0.5 hectares of NCFP, generating income of approximately USD 180.00 per month, and the activity was performed using family labor in the majority of cases (n = 80 %).

The most cultivated species were Taioba (*xanthosoma taioaba*) for the trade of leaves and rhizomes, serralha (*sonchus oleraceus*) for leaf trade, hibiscus (*acetosella hibiscus*) for the trade of immature fruits that are eatable, used for the preparation of tea, soft drinks and jellies.

The main implications observed in the producers' perception were the lack of agronomic knowledge in order to introduce new crops, the shortage of specialized technicians for assistance and the lack of public power incentive to the sector. The main potentialities observed were consumers' loyalty, the species of NCFP are traditionally more resistant to pests and diseases what favor cultivation, and the fact that NCFP provide an alternative of income in the concept of rural pluri-activity. Then, related to the market expectations, the biggest part of the respondents (n = 80%) reported that they feel satisfied and have the desire of cultivating new varieties of NCFP, if the implications of the activity could be mitigated, which reveals a scenario where the set of opportunities in the producers' point of view is largely favorable in relation to the implications.

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