American-Eurasian J. Agric. & Environ. Sci., 15 (12): 2346-2353, 2015
ISSN 1818-6769

DOI: 10.5829/idosi.aejaes.2015.15.12.12622

Production of Traditional Vegetables in Indigenous Communities in Amajari – RR, Amazon Region, Brazil

Hudson do Vale de Oliveira, Eli Carlos de Oliveira and Édison Miglioranza

Agronomy Department, State University of Londrina, Londrina, P.R., Brazil

Abstract: Roraima is the Northern most state of Brazil with an area of 224,300 km^2, slightly less than the territory of Great Britain, accounting for around 50% of the total indigenous areas. Whereas, the state differs from other Brazilian regions, it is expected that the implementation and development of new economic activities of great importance regarding environmental sustainability, will contribute to effective social progress in the region. The present study aimed to assess aspects related to vegetable production in indigenous communities in Amajari, Roraima, to strengthen the agricultural practices. The exploratory and descriptive study was conducted in the indigenous land called Araça, formed by the communities: Araça, Guariba, Mangueira, Mutamba and Três Corações. Data collection was performed using a semi-structured questionnaire applied *in situ* to 55 producers. Descriptive statistics was use in data analysis and it was found that the five indigenous communities produce vegetables, with emphasis to: lettuce (*Lactuca sativa* L.), accounting for 49.1%, followed by salad rocket (*Eruca sativa* Mill.), with 18.2 %. Also, the communities adopted organic fertilizer (100%), weeding (100%) and irrigation (100%) as indispensable agricultural practices for production. When asked about technical assistance, 80% responded that they never received specific professional guidance, this aspect being the greatest difficulty encountered by producers. It is concluded that vegetable production in the referred indigenous communities is an excellent alternative to the consolidation of agriculture and scientific knowledge related to technical support should be made available.

Key words: Technical assistance · Indigenous communities · Organic production

INTRODUCTION

Horticulture, for the purposes of this study, is a technical-scientific terminology widely used in agriculture that concerns specifically the study and cultivation of vegetables [1]. Some characteristics of these cultures are, as follows: consistent herbaceous plants have generally a short life cycle and are cultivated with the use of intensive farming. Its edible parts are eaten by humans, raw or undergoing little processing. [2]

The vegetables are often present in small family farms, either as a subsistence activity or market-oriented, on a small scale in most cases [3].

Vegetables are considered protective factors or regulators and more and more people are eating them. This increase in consumption is directly related to the accelerated path of development, leading to changes in eating habits and specifically the requirement for foods that provide an important source of essential nutrients, namely vitamins and minerals.

Accordingly to the growing concern with a healthier diet rich in vegetables, the population in general is eating more vegetables. This increased consumption of vegetables is particularly explained by the fact that plants are excellent sources of vitamins, minerals and antioxidants, like vitamin C, â-carotene and lycopene. Also according to Moretti, since this increased consumption of vegetables is observed in the entire country, the production needs to be increased to face this higher demand [4].

In different regions of Brazil, growing vegetables in general is considered a very viable alternative for small farmers, either for the subsistence of their families or for selling the production in the markets, although on a smaller scale.

Corresponding Author: Eli Carlos de Oliveira. State University of Londrina

In northern Brazil, in the state of Roraima, this reality is quite common. The horticulture sector has greatly expanded, especially with the cultivation of watermelon in intensive system. It should be emphasized, though, that some alternatives in vegetable production are raising awareness of the need to adopt organic production, e.g. the one in the municipality of Pacaraíma, responsible for the production of over 50 vegetable species, in a large scale [5].

The state of Roraima has currently thirty-two indigenous lands already demarcated by the federal government. This demarcation is the result of a long process of struggle and conquest of indigenous peoples' rights [6]. Indigenous peoples cultivate vegetables, especially for subsistence.

Given this context, the main objective of this research is to analyze aspects related to vegetable production in indigenous communities in Amajari, Roraima, in order to expand the agricultural production in these communities.

MATERIALS AND METHODS

Amajari is formed by communities of pastoral tradition, though not capable of using sophisticated technology. It is 153 km far from the capital, Boa Vista. The county has a demarcated indigenous area of 16790.99 km², accounting for 58.71% of the entire area of the municipality [7].

The objective of this study was the native land of Araça, which is formed by five indigenous communities: Araça, Guariba, Mangueira, Mutamba and Três Corações (Fig. 1). These indigenous communities are closer to the city and all their concerns are addressed by technical courses on rural activities, particularly the ones targeted to agricultural technicians and technicians in agriculture.

According to information obtained from the tuxauas (leading indigenous community) concerning indigenous communities, the number of families that produce vegetables for the community (Fig. 2).

The field research was conducted by applying semi-structured questionnaires to the participants. All the individuals contacted agreed to participate in the research, corresponding to a total of 55 participants (40% of the study population), 10 producers of each indigenous community and the representative of the community. Ease of accessibility was among the criteria of selection of participants for the research.

Some information was passed on by the leaders of indigenous communities, called Texas and obtained through the Director of the Regional Centre of Indigenous Education Amajari - CREEP. Data were collected during the March-August 2013 period through semi-structured questionnaires with open and closed questions, as well as by on-site observation. We also included statements made by the respondents.

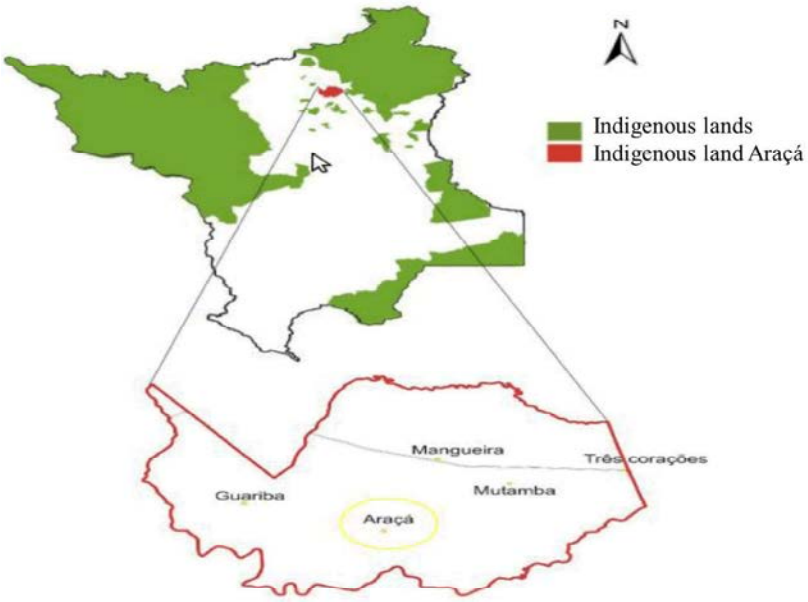

Fig. 1: Indigenous land Araçá.
Source: [8, 9, 10]

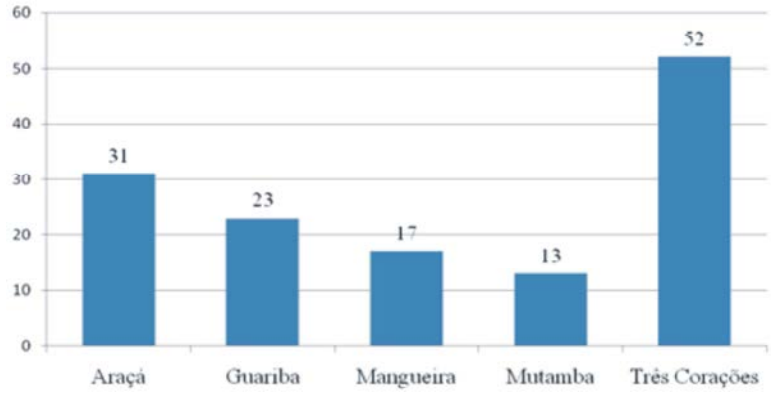

Fig. 2: Number of families that produce vegetables

The research method used is based on case study [11]. Since five indigenous communities were involved, we used the strategy of multiple case studies. This allowed us to classify the research as exploratory and descriptive [12].

To achieve the objective of this research, information on the production of vegetables was collected from the referred indigenous communities, including the most commonly produced vegetables, agricultural practices, technical assistance and difficulties in production.

Visits to indigenous communities were carried out during the data collection period, in order to make it possible to administer the questionnaires to the participants, since researchers must have direct contact with the field to capture the meanings of their observations [13]. Data were analyzed using descriptive statistics.

RESULTS AND DISCUSSION

It was found that the five indigenous communities investigated here produce vegetables (Fig. 3). However, production is primarily used for the subsistence of the rural families, with the surplus production sold to the residents of the local community.

Therefore, the production of vegetables is a viable alternative for improving the incomes of small and medium producers, especially within the concept of family farming, because of the great demand for labor [14].

The most widely vegetables produced by indigenous communities in the municipality of Amajari - Roraima are, as follows: lettuce (*Lactuca sativa* L.), with 49.1%, followed by arugula (*Eruca sativa* Mill.), with 18.2%. The following vegetables were also cited: bunching onion

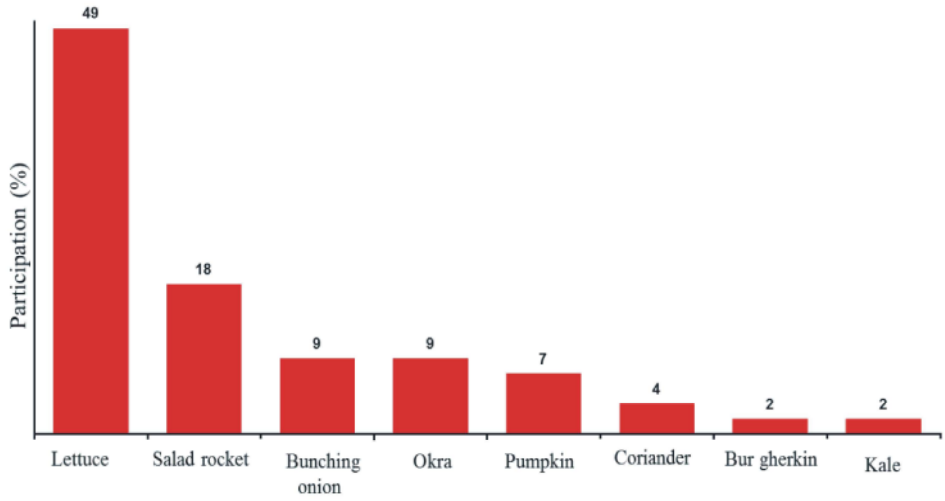

Fig. 3: Percentage share of the most widely grown vegetables in five indigenous communities in the municipality of Amajari - RR in the period March-August 2013.

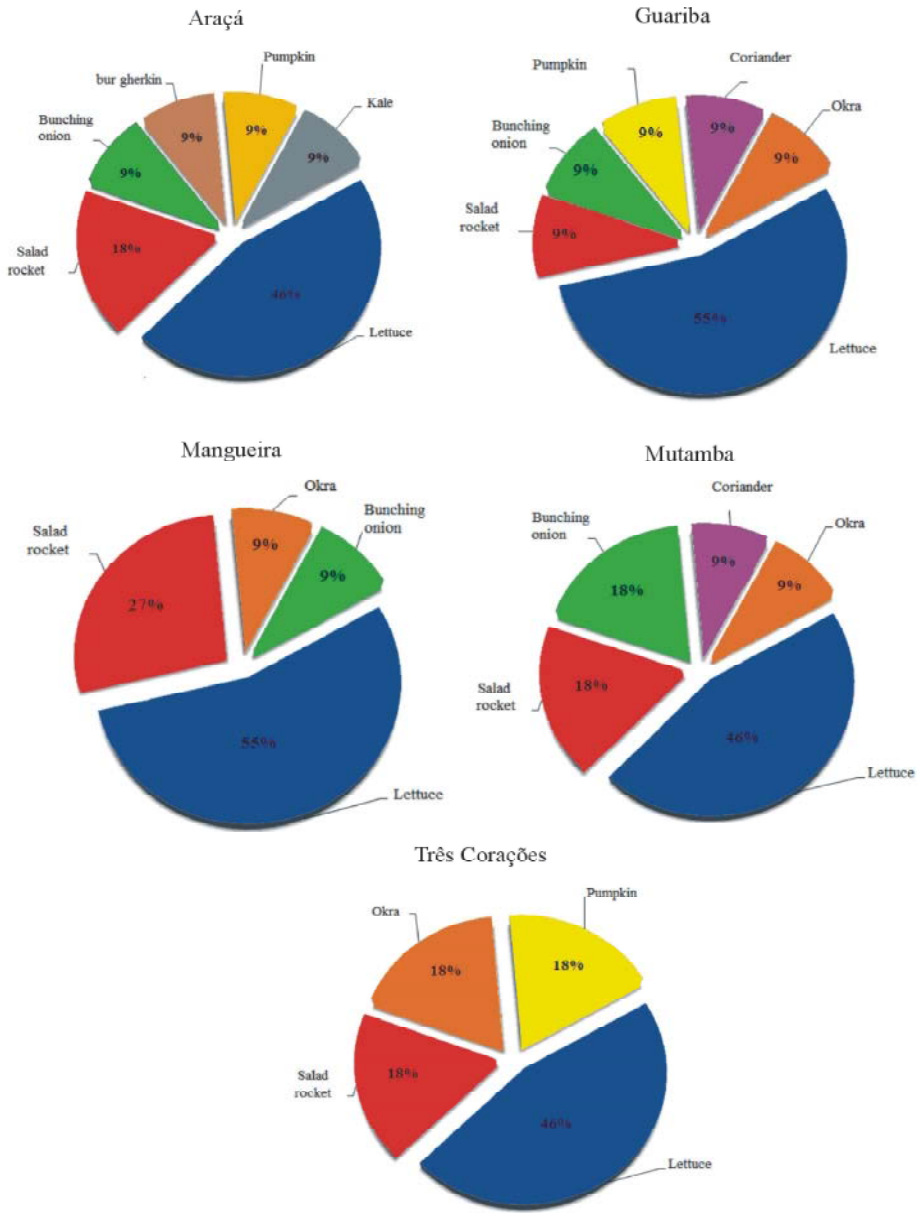

Fig. 4: Share of vegetables produced by indigenous communities in Amajari - RR in the March-August 2013 period.

(*Allium fistulosum* L.) okra (*Abelmoschus esculentus* (L.) Moench.), pumpkin (*Cucurbita maxima* L.), coriander (*Coriandrum sativum* L.), bur gherkin (*Cucumis anguria* L.) and kale (*Brassica oleracea* L. var. *acephala* D.C.).

In a study on protected crop production in Boa Vista, Roraima, the findings of the authors regarding the amount of vegetables produced were consistent with the ones obtained in the present research: lettuce accounting for 58.7% and arugula ranking 6th with 12.0% of the market share [15].

Lettuce is a vegetable with edible leaves widely produced in Brazil [16]. Its cultivation is intensive and usually made by family farmers. It accounts for the generation of five direct jobs per hectare [17]. The rocket (*E. sativa* L.) is a vegetable predominantly grown in the southern and southeastern regions of Brazil. It has higher levels of potassium, sulfur, iron and vitamins A and C than other vegetables, as well as a spicy flavor and pleasant odor [18]. Fig. 4 contains more detailed information on the share of each vegetable in each indigenous community.

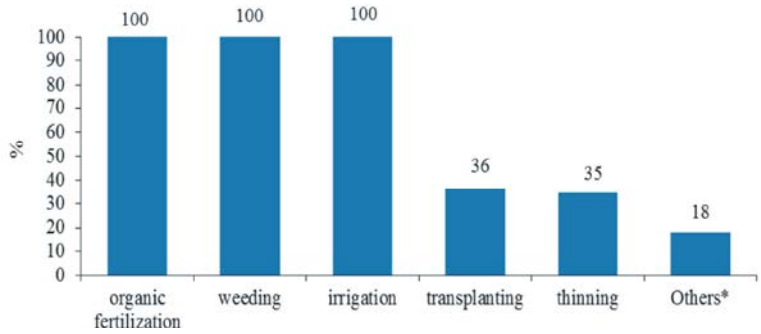

Fig. 5: Agricultural practices adopted by farmers in five indigenous communities in the municipality of Amajari - Roraima.
*Others = manual harvesting, use of natural products to control pests and diseases etc.

Lettuce was found to be the most widely produced vegetable in the five surveyed indigenous communities. Lettuce is considered the most consumed leafy vegetable in Brazil and has a great importance regarding economic and food safety related aspects [19].

Furthermore, it is important to highlight that growing vegetables has become very common among indigenous communities over time.

This expansion of agricultural activities is also explained by the increased number of young people of these indigenous communities that have enrolled in technical courses in agriculture. This has aroused greater interest in this activity, especially as a way to generate income for their families, contributing to the maintenance of the young individuals in their local communities.

These indigenous communities use the organic system to grow vegetables (Fig. 5) and the production techniques used them are simple and based on their empirical knowledge.

The organic system is a process that has some special features related to each specific farm, such as soil, fauna, flora, wind, water and other resources that influence the system. Thus, deeper knowledge on the farm is required to ensure that local solutions are obtained for each culture [20].

An efficient use of natural resources available in the organic production system is of utmost importance to ensure the sustainability of the system [21].

Importantly, the empirical knowledge used in the production process has been continually associated to technical knowledge: many young individuals took technical courses on agricultural practices that were available in their communities). The statements of some respondents illustrate this point, as follows:

My parents have been producing vegetables since I was born s, so it has become a family habit (P09);

I like to cultivate the land; Furthermore, can an income for my family since besides producing for own consumption can sell some in my community and even provide vegetables for school meals (P17);

It is a way for my son to put into practice what he has learned in school: he is completing a technical course. Also, it is for our own consumption (P31);

By growing vegetables we meet the needs of our community and therefore we have no need to resort to the county seat for products of this nature. Not to mention that we can increase our production, because our young members are being trained in technical courses on agricultural practices (P45).

When the dynamics of production is more intense, as is the case of vegetables, small farms are more adequate for organic production, since small farmers can better master the production process and control weather variables in small areas [20].

However, the farmers of the communities assessed in this study are unaware of the fertility of the soil they cultivate and they have never conducted soil analyses. So, they made continuous use of organic fertilizers, especially manure, regardless of their knowledge of nutrient inputs in the area.

It was found that all indigenous communities used organic fertilizers (100%), weeding (100%) and irrigation (100%) as indispensable agricultural practices for the production of vegetables. On the other hand,

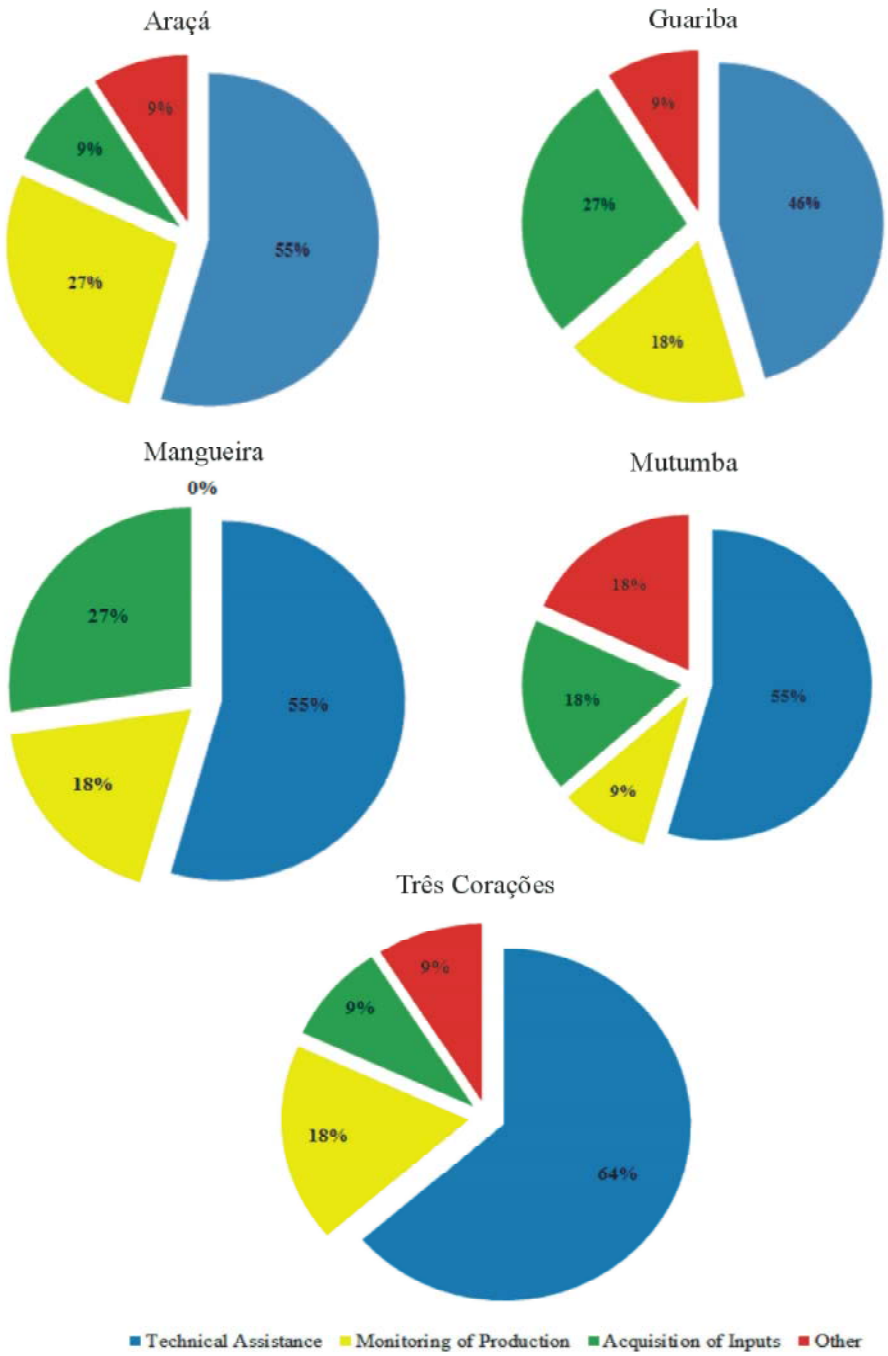

Fig. 6: Main problems faced by vegetable growers of five indigenous communities in the municipality of Amajari - Roraima.

more specific agricultural practices, for example, grinding, are adopted and transplantation by a smaller percentage, 34.5% and 36.4%, respectively.

Also, it was found that 18.2% of vegetable growers adopted agricultural practices other than the ones mentioned here, namely, hand weeding, hand harvesting and the use of natural products to fight pests in the production area.

Regarding irrigation [22], the quality of the water used was found to be one of the factors that might impact crop development and affect production. Farmers must be aware of the agricultural practices used d and make sure

they obtain good quality vegetables, considering the specific conditions of each site. Also, all the procedures used for vegetable production must be conducted under strict hygienic conditions and should minimize potential consumer health risks [4].

Food safety is an essential aspect that influences consumer preferences, e.g. vegetables with the lowest levels of pesticide residues [23]. According to Melo and Vilela [24] contamination of vegetables by pesticide residues, as well as the one caused by the use of poor quality water in the irrigation inhibit the expansion of vegetable consumption.

When asked about service, 80% of producers said they have never received guidance from specific professionals (agronomists, for example) on the production of vegetables. This result emphasizes the aforementioned need for the use of empirical knowledge in the production process.

In a socio-economic and environmental assessment of family gardeners of Macapa - Amapá it was found that one of the main grievances presented by some of the study participants was the lack of technique [25] assistance.

Technical assistance plays a key role in the agricultural scenario, for it answers questions and promotes the improvement of production aspects, optimizing new technologies available in the market [26]

In a study on greenhouse crops in Boa Vista, Roraima, 92% of respondents said they had already received technical assistance in production, especially from agronomists and technicians in engineering [15]. The main difficulties encountered by producers in the production process of vegetables are presented, by community (Fig. 6).

The greatest difficulty encountered by producers concerned the lack of technical assistance to support the production process of vegetables. This result corroborates the finding shown in Figure 06, in which 80% of unsuccessful producers have never received technical assistance. Access to technical support is one of the major difficulties faced by producers in managing their farms [26].

Thus, the lack of technical assistance in these indigenous communities may be a gap that can be resolved to ensure a better vegetable production, not only allowing production for subsistence, but also a market-oriented production, even for the referred communities.

CONCLUSIONS

Vegetable production in indigenous communities in the municipality of Amajari, Roraima, is an excellent alternative to expand agriculture among these populations that are naturally involved with these activities. For this, it is necessary to apply scientific knowledge associated with technical support to enable these communities to embrace farming not only for their subsistence, but also as an economic activity.

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