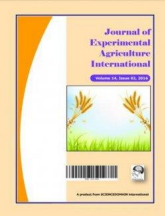

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Evaluation of the Impact of Normative Instruction No. 48 on the Production of Citrus Seedlings: A Case Study in Santa Luzia de Indua, Captain Poco-PA-Brazil

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Capitão Poço is considered the land of orange, having citriculture as the main source of income of producers in the municipality. Among the citrus production, the production phases is, the production of seedlings, which is heavily developed and marketed in the community of Santa Luzia of Induá, rural area of the city. The research objective consisted of accomplishing a survey of the production and marketing of citrus seedlings as in paragraph 48, in the community of Santa Luzia of Induá, municipality of Capitão Poço/Pará. The study was carriedout based on structured questionnaires founded in 48, where 50 producers of seedlings assets were interviewed at random. The data were tabulated in an electronic spreadsheet Microsoft Excel 2010® and 2013® for analysis and results

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presented in charts and tables formats. The study found that a large proportion of small and medium-sized producers had little knowledge of the regulations, but the large nurseries had reasonable knowledge. Because of this, and because of lack of information, understanding and correct interpretation of the Normative Instruction, most of the producers were not adapting to the imposed legislation, being thus afraid of changing the way of cultivation, since they have been working for a long time with the production of seedlings in the soil.

Keywords: Citrus cultivation; standardization; nursery.

1. INTRODUCTION

Citriculture is one of the agricultural sectors which is in constant expansion in Brazil, which is increasingly becoming a power of great socioeconomic importance and recovery in the external market, being the fruit exported in the form of juice and raw fruits. This enhancement is related to the assessment by the taste of the fruit, the citric aroma for manufacture of cosmetics, use in cooking, among others. It is a commodity responsible for generating direct and indirect jobs.

In the state of Pará, citriculture presents itself as one of the main activities, the status being one of the few poles citric in equatorial zone of the world. The paraense northeastern region was the site of course chosen as citrus pole due to 40 years of introduction of the cultivation of citrus in the state. Among the municipalities that compose the pole are Capitão Poço, Garrafão do Norte, Irituia, New Hope of Piriá and Ourém [1,2].

Capitão Poço is a municipality that is approximately 215 km from the capital of the state of Pará, and features prominently in the production of citrus the main source of income of producers in the municipality. Among the activites of the citrus production, the production of seedlings is the strongly developed in the community of Santa Luzia of Induá, rural area of the city. The community is a reference in this activity, since it is regarded as a strong element for the generation of jobs, training of capital, adding value and also for regional development.

However, in 2013, it was approved by the Ministry of Agriculture, Livestock and Food Supply (MAPA) Normative Instruction (NI) No.48 that comes to establish rules for the production and marketing of propagating material of citrus to obtain seedlings of better quality with lower susceptibility to attack by pests and diseases, where producers have to adapt the regulatory framework.

The Normative Instruction 48, will cause major changes in the dynamics of the production of seedlings by farmers, this being a factor of overall relevance to be studied, since there is no related searches that bring equivalent results, as well as information necessary to address this theme and allowing a higher compression of compliance of producers to this normative.

The study would provide nursery a reflection in the form of production so that they can develop alternatives in the raising system which favors the compliance to NI 48. For the scientific community, the work may serve as a reference for future research and actions performed by the institutions and organs that work around this issue, also contribute to the training and/ or staff of researchers involved in this process.

In this sense, the research had as objective accomplishing a survey of the production of citrus seedlings, in accordance with paragraph 48 of 2013's NI of the MAPA, in the community of Santa Luzia of Induá, municipality of Capitão Poço, Pará/Brazil.

2. MATERIALS AND METHODS

2.1 Location of Study Area

The field research was carried out in the period from 02 December 2017 to 12 January 2018 in, the community of Santa Luzia of Induá, a rural area of the municipality of Capitão Poço/PA (Fig. 1), approximately 13 km from the headquarters of the municipality. This community features prominently in the production of citrus seedlings by small, medium and large producers, which configures as well, the main agricultural activity undertaken by the community.

The municipality of Capitão Poço is located at a latitude of 01º44'47" S and a longitude of 47º03'34" W. It belongs to the microregion of the Guamá, birthplace of northeastern Pará and is 226 km from the capital, Belém. The

temperature, ranged from 25.7 to 26.9°C with an annual average of 26.2°C, only 1.2°C variation. According to the Köeppen classification, the climate was Ami type [3], with annual rainfall around 2,500 mm and a short dry season of September to November (monthly precipitation around 60 mm). The relative humidity was between 75% and 89% during months with a lower and higher rainfall, respectively [4].

2.2 Data Collection

Initially the survey was conducted total number of producers who provided information on their owned nurseries. With this, it was possible to define a sample representative of the community.

The research was based on structured questionnaires in relation with the NI 48. They were part of the scope of the questionnaire for some aspects such as:

- Identification of salmon :that aimed to obtain information regarding the type, characterization and certification;
- Production system :for which a survey was performed to know the production and management of citrus seedlings in nurseries, as well as aspects related to technical assistance;
- Production of rootstock which: sought to collect information about the choice, production, management and classification of rootstock, as well as the production of grafting;
- Proper marketing of seedlings: took into consideration the criteria imposed in the NI 48 and approached the socioeconomic importance, suitability of market, and limitations encountered during the marketing process.

In addition, the use of other resources as photographic records, recording, audios, annotations in books of field, and direct and indirect observations, also served as a support for the rationale of the research.

To have accurate information, 50 producers of seedlings were interviewed randomly, which ensured a representative sample. The interviewees were divided into three classes according to the number of seedlings produced and identified as small, medium and large producers as shown in Table 1. The framework of producers of seedlings was defined with the aim to organize them based on similar characteristics, thus facilitating the manipulation and organization of data.

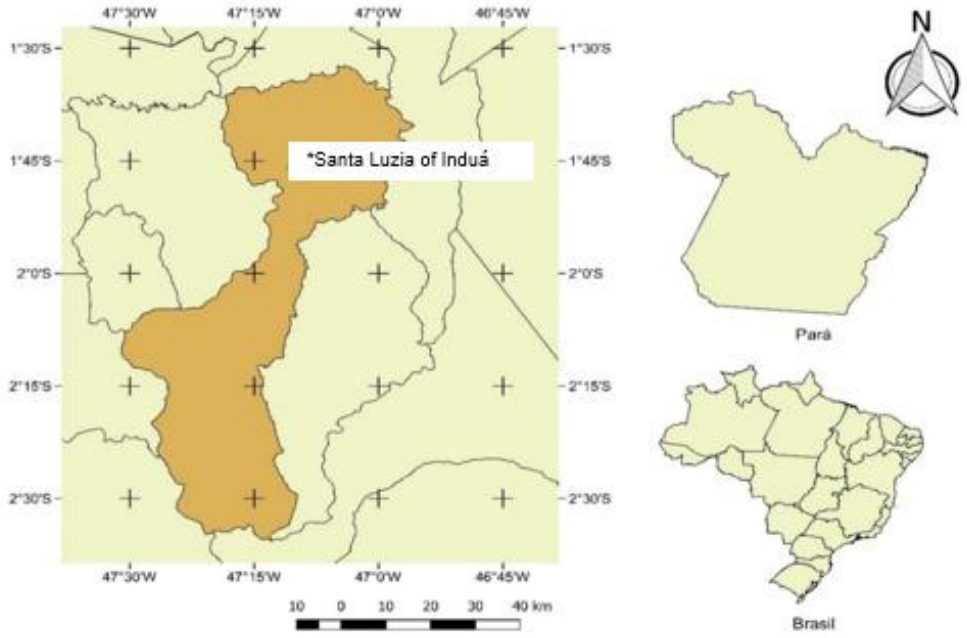

Fig. 1. Geographical location of Santa Luzia of Induá from municipality of Capitão Poço (Reproduced from NERES, 2018)

Table 1. Classification of producers of seedlings of Santa Luzia of Induá

Classes	No seedlings (x1000)	No interviewees
Small producer	5 up to 10	27
Medium producer	>10 to 50	16
Large producer	Over 50	07
Total		50

2.3 Data Analysis

Data tabulated in Microsoft Excel 2010® and 2013® spreadsheet, were utilized to generate results in the forms of graphs and tables.

3. RESULTS AND DISCUSSION

The analyses showed that 74% of nursery gardeners worked over 20 years in the production of citrus seedlings, 22% worked from 10 to 20 years, and 4% of producers work from 5 to 10 years. This stage of production of citrus is the main activity carried out by producers from Santa Luzia of Induá, which was also a great powerful contributor to the economy of the city, and even becoming a culture increasingly consolidated and highlighted in the municipality.

Similar results were found Girardi et al. [5], which showed that approximately half of the nursery because of age, have been growing seedlings of citrus for more than 20 years, and the other half has join the activity at least 6 years, this is to say that in recent years there have been virtually no new nursery gardener starting the activity.

The beginning of production of seedling is the main criterion reported by small, medium and large producers, another criterion for the production of citrus seedlings was a search for a source of complementary income next to, the power of culture as shown in Fig. 2. There are other factors that evidenced the beginning of cultivation in the community such as an incentive to production by the Secretary of State for Agriculture (SAGRI) and motivation to an option for citrus nursery.

It was observed that 74% produce seedlings either copa formed or type gauge-single rod (Fig. 4), 19% of the cup type formed and only 7% were the production of type dipstick (Fig. 3). The production was a function of the demand from the market, so that the seedling production varied according to the preference of each buyer, because the nursery was producing seedlings on the basis of the buyer's requirement.

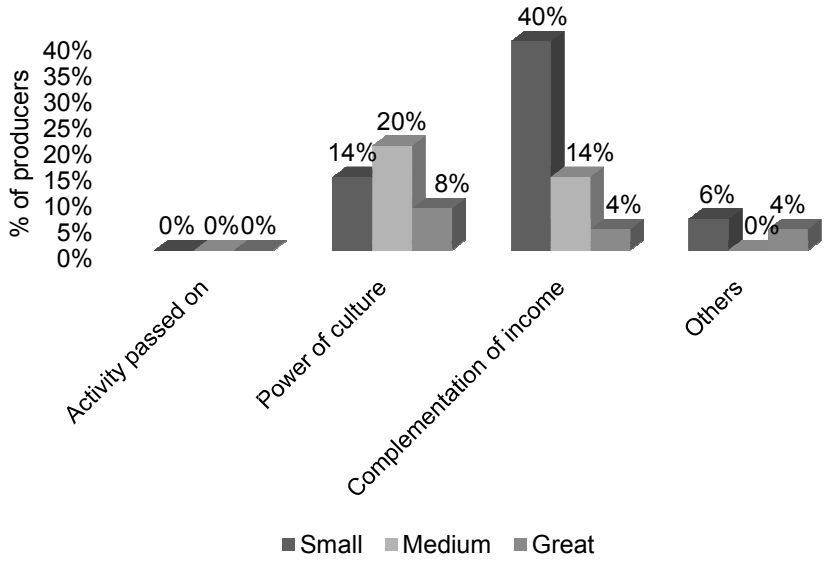

Fig. 2. Criteria used by producers of seedlings of Santa Luzia of Induá at the beginning of the production of citrus seedlings

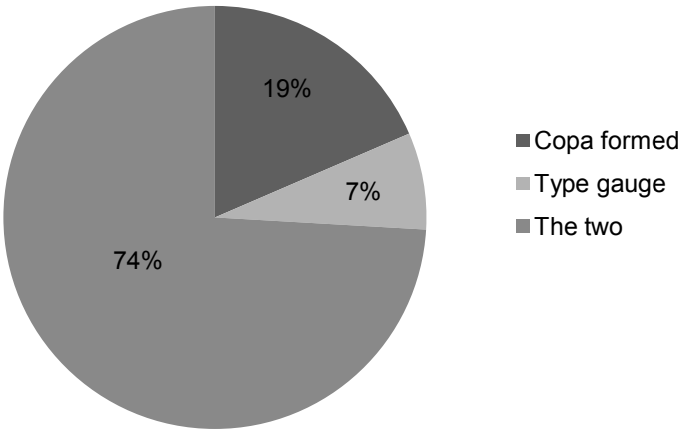

Fig. 3. Types of seedlings produced by the nursery in the community of Santa Luzia of Induá

Fig. 4. Types of seedlings grown in soil to open sky, by the producers of Santa Luzia of Induá

It was found that the nursery rose different varieties of citrus seedlings including Orange Pêra Rio (*Citrus sinensis* L. Osbecek), Lemon-Tahiti (*Citrus aurantifolia* C. Swingle), and Ponkan tangerine (*Citrus reticulata*). Mearina Murcott, and other varieties as volkamer, Natal, Valencia and Cleopatra, were cited, but were produced with less frequently by community producers.

The 'Tahiti' acid stands between the citrus species with higher early production. In Brazil, it stands out in the market for consumption as raw fruit and in the external market. It still meets the demand of industry for juice processing and extraction of essential oils [6].

According to the information collected and verified, it was verified that all nurseries were still raising seedlings in a traditional way, that is, in the open ground, in double rows, spaced 0.30 m x 1.00 m, while only four producers also used polyethylene bags (Fig. 6) and substrates consisting of coconut fiber and palm instead of soil, as required in Article 28 of NI, that it will be allowed to produce certified or uncertified citrus seedlings only with the use of substrate that does not contain soil. However, it is important to clarify that this Article does not apply to all production systems. Thus, for the installation of the Seed Orchard, the Basic Plant, the Matrix Plant, the Certified and uncertified Bubble, it is not mandatory to use substrate that does not contain soil.

The production of seedlings with better quality and healthy is essential to achieve care in production, for this reason, all nurseries performed the management and the appropriate cultural treatments such as chemical fertilization, thinning, weeding, pruning, weeding, spraying, and suchlike. However, 6% of producers have

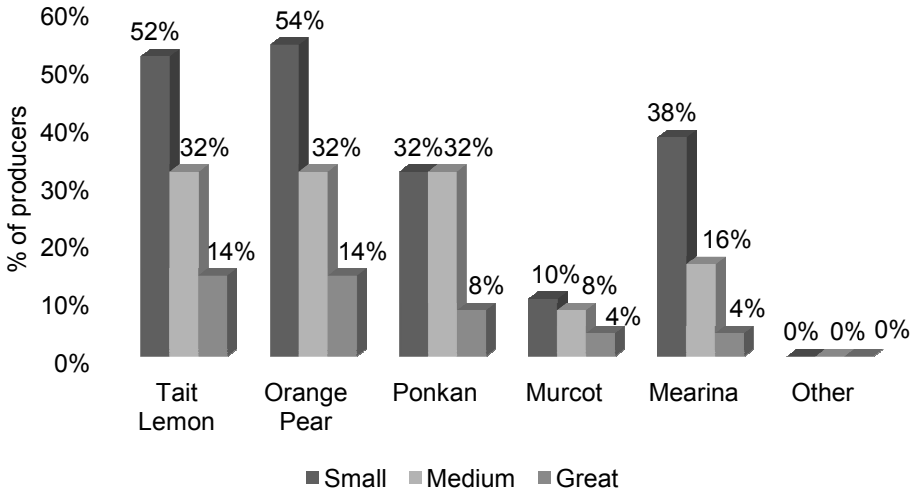

Fig. 5. Main varieties used by producers of seedlings of Santa Luzia of Induá

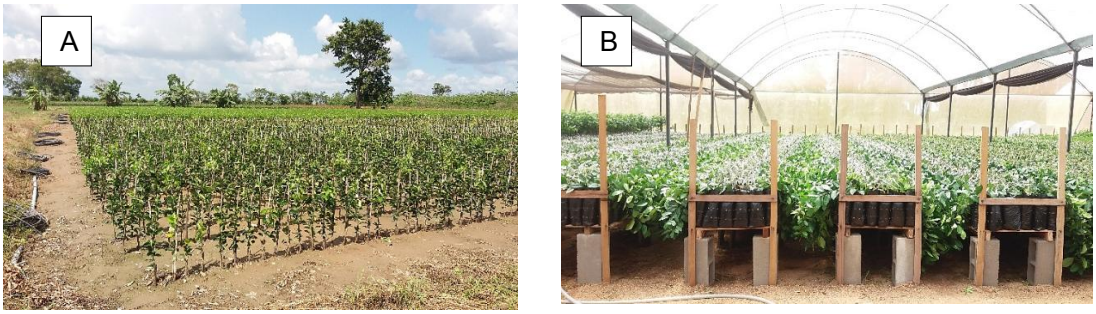

Fig. 6. Forms of production of citrus seedlings in the community of Santa Luzia Induá A- on the ground in open sky and B- in plastic bags in a protected environment

lost part of their production on account of the inadequate management and 28% from attacks of plant pathogens, but the vast majority (66%) reported never having lost production by any factor. Furthermore, the irrigation was another element observed in the course of the survey, in which 80% used it in their nurseries, further enhancing the system of production of seedlings.

In respect to the attacks of pests and diseases, 8% of producers when queried, responded that that they do not have problems with pest attacks, while approximately 92% of the nurseries said that there were attacks of plant pathogens on their seedlings (Fig. 7). In this sense, we have highlighted that 77% of the respondents reported that they have had problems of diseases including Gummosis, scab, larva caused and greenbug, 16% said they had problems with insects and 7% with the attacks of ants. The chemical control was the most used to minimize the incidence.

Phyllocnistis citrella of citrus is a small moth whose larvae, feeding on fresh leaves, cause serpentine lesions known as mines or galleries, usually on the underside of the leaves. These lesions damage foliar tissues, reducing the photosynthetic area, which can lead to premature leaf drying and fall and reduced sprout growth [7].

The aphids are sucking insects that can cause significant direct and indirect damage to the seedlings. The most important direct damages are caused by the sucking of sap and injection of toxic substances by the saliva leading to the formation of shriveled leaves and atrophied shoots when the infestation of aphids is high. The indirect damages are related to the transmission of the virus of sadness and

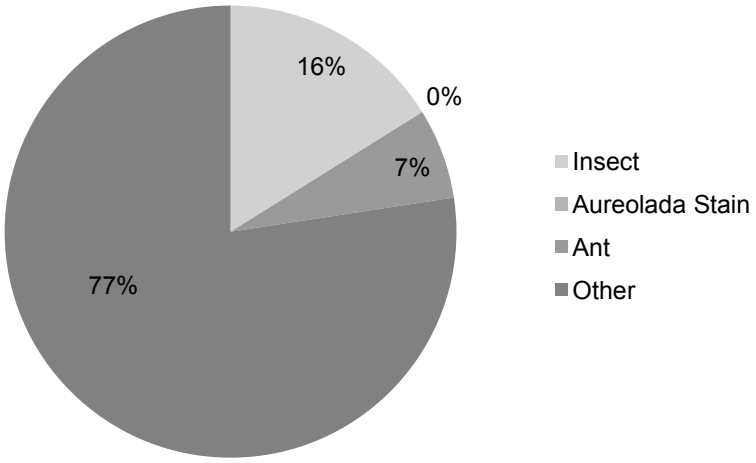

Fig. 7. Major Pests and diseases citrus seedlings in the community of Santa Luzia of Induá

formation of fumagina on the affected organs (dark cover formed by fungi of the genus *Capnodium* sp., which feed on substance rich in sucrose excreted by aphids). The presence of fumagine impairs respiration and photosynthesis of the affected plant, reducing its growth [8].

The production of seedlings free of pathogens is the most important measure in the prevention of entry and establishment of diseases in citrus orchards. All the major diseases of citrus crops may be disseminated by seedlings. Therefore, the whole process of production of citrus seedlings should be monitored by the nursery and preventive actions should be taken to ensure that the seedlings are produced and marketed free of any harmful pathogen to culture [9].

Another important factor to highlight concerns the questioning about the technical assistance, where 36% reported receiving assistance, while 64% said they did not receive until the survey period, i.e. when there was the emergence of something new in the seedlings that producers do not know how to monitor, they seek to chat with other producers, seek another source of information or use the empirical knowledge. In this sense, the role of technical assistance was of extreme importance, since the guidelines contribute to the best performance of the production system, by providing appropriate information to the nurseries directing them in the proper management of pests and diseases, cultural treatments in the area of cultivation, as well as recommending correct fertilization and irrigation. Technical assistance was also extended to production and marketing of seedlings, among other aspects that are essential in order to have -healthy and vigorous seedlings as well, thus influencing the marketing.

In the Law no. 12,188, of 11 January 2010, the Technical Assistance and Rural Extension (ater) is defined as a service of non-formal education of continued character, in the rural environment, which promotes the process of management, production, processing and marketing of agricultural activities and services, including the activities agroextractive, forestry and bracelets [9].

4. CONCLUSION

The majority of nursery seedlings of the community rose both type gauge as copa formed of orange, pear, lemon-Tahiti and Ponkan tangerine, in the soil with only four producers using polyethylene bags and commercial substrate as established by the NI 48.

In this context, to further enhance the production of seedlings in the community it was important to establish partnerships with public and private institutions, which could contribute to research, creating new seedling raising techniques for increased production as for example development of substrates made with materials available and easily accessible to the region, that nurseries would more easily produce; use biological control , in order to minimize the use of pesticides or development of new varieties

resistant to pest attacks, thus reducing the costs of production.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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