Agroindustry for drying pink pepper (*Schinus terebinthifolius*)

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Abstract: The pepper tree (*Schinus terebinthifolius*) is a tree native to Atlantic whose planting is seen as an alternative to agricultural diversification. Besides being suitable for reforestation, its fruit, known as pink pepper, pepper or brazilian-poivre rose, is widely used in European cuisine. This paper aimed to design an agribusiness for processing the fruits of 100 trees. These 100 trees could be planted in two ways: planting planned or consortium, as well as restore degraded areas, because this specie needs a small area for planting. Lining surveyed the procedures used for drying of pink pepper as well as those required for the marketing of this spice patterns. The starting process is the manual collection and pre-cleaning stage where pepper is separated from branches and leaves, the product follows after the washing to which sieves and drinking water are used, then goes into the pre-drying and drying in a dryer trays, which reaches its optimum moisture around 5%. After, with strict control of hygiene, healthy fruits are manually selected, weighed, packaged and intended for sale. The drying process is thorough, yet simple, and requires little initial investment and may be an alternative secondary income for family farmers.

Keywords: pepper, agro industry

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1 Introduction

Pepper tree (*Schinus terebinthifolius*) is known as Brazilian pepper, aroeira, rose pepper, or Christmas berry, a native Brazilian tree, found in the Atlantic Forest (IBF, 2010). Currently, this species is suitable for reforestation, restoring degraded or altered areas by human action. Its planting emerges as an alternative to agricultural diversification, because it is possible to extract timber used for fences, posts, and firewood, essential oils used in herbal and fruit, known as pink pepper (FAES, 2009). This pepper, also known as pink pepper, is very famous in European cuisine, especially in France, where it is known as rose-poivre. Despite being an extremely common plant, and even considered harmful in some places, the price of dried fruit here in Brazil can reach a considerable value (Motta, 2012).

In the country, this condiment appears to be restricted to haute cuisine, which restricts the economic exploitation to a few niche markets, but that tends to widen the extent that advances in knowledge on crop production, processing of fruits and popularization revenue that valorize the local cuisine (Cardoso, 2008).

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Pepper trees produce fruits in their first year of life, and their production increases with the development. There are two ways of producing pink pepper in different systems of seed production: by extraction in their natural habitat or by a planned cultivation in agricultural or forest lands for commercial purposes. Considering the planting, the spacing recommended for satisfactory development of the plants is 3 m between plants and 2 m between rows (Leles, 2012).

However, it is possible to make a consortium with other species of lower size, such as corn or pumpkin. In this case, it is suggested a spacing of 10×10 m, it would be possible to plant other crops between the rows (Boina, 2014).

The cultivation of Brazilian pepper can be led by a family farming, because it is a native tree. This can become an important alternative source of income for these families (Fonseca, 2012).

This study aims to stimulate the planting, cultivation, and processing of Brazilian pepper as a sustainable alternative to increase the income of farmers that own small amount of land in Southern of Brazil. The Brazilian pepper will be processed as a dried product.

2 Material and methods

Initially, research in Pelotas/RS was performed to determine the popularity of the product and the consumer intention, by Google Docs®, disclosed via email and social networks. Prices for this product in several Brazilian markets were also surveyed.

The planned agro-industry was based on an existing one, which is a market leader company, located in Southeastern Brazil (Bandes, 2008).

An economic-financial analysis in which indicators were used to establish the viability the project was held. These indicators are: NPV (Net Present Value), IRR (Internal Rate of Return), IRRm (Modified Internal Rate of Return) and payback, according to Buarque (1991) and Casarotto (2009). The analysis was performed considering 10 years with a MRA (Minimum Rate Attractiveness) of 12% per year.

A financing of 50% of total investment was considered, by a Brazilian program called PRONAF - National Program for Strengthening Family Agriculture, with a grace period of three years and interest rate of 2% per year.

Three scenarios were studied: 1) construction of the agro-industrial plant, investments, equipment, furniture, and fixtures; and considering one employee to assist a family of three people; 2) it was considered that the entrepreneur has a spot available for agro-industrial plant, plus investments of R$ 3.000,00 for reform, equipment, furniture, and fixtures were counted; and considering a harvest contract paying R$ 30,00 per day; 3) it was considered the same fixed investments in construction, but production was increased by five times, which means that the farmer will plant 500 trees, and will need to hire two harvest workers.

3 Results and discussion

The consumer intention of Brazilian pepper showed that the market for this kind of pepper is still not explored, however, the majority of those consulted and the main restaurants in the city have shown interest in consuming it in cooking recipes. Surveys also show that none of the pharmacies prepares any type of drug or cosmetic using the essential oil of this fruit. It was considered that there is a demand for a production of 0.2 kg of fruit/tree in the first year and 1 kg of fruit/tree in the sixth year, stabilizing production in the following years. The company will process the same amount of fruit daily, varying only the number of days worked.

The processes consist of manual harvesting. Pre-cleaning and washing processes of the Brazilian pepper with drinking water, using circular sieves made with 10 mesh and wire 28 were done. Subsequent processes are pre-drying and drying, when the fruit is brought to a small tray dryer, as Machado et al. (2012) recommend, reducing the moisture to 5%. Then, dry Brazilian pepper is classified manually, and the greens and shriveled fruit that will be taken to the compost are removed. Only fruits with red color on the scale will be packaged and sold in pots of 25 g, 280 g, and 750 g,

priced R$ 5.00, R$ 20.00, and R$ 67.00, respectively, considering US$ 1.00 ≈ R$2.224.

The flow chart (Figure 1) depicts the unit processes as well as the mass balance of the agro-industrial plant.

The agro-industrial plant was planned to have 42 m^2 to produce small quantities daily. The need to separate the dirty areas from the cleaned area was considered. Therefore, after being taken to pre-cleaning, the product does not return to the initial area designated as pre-cleaning and weighing. The product will only pass through the receiving area to leave agro-industrial plant already properly packed.

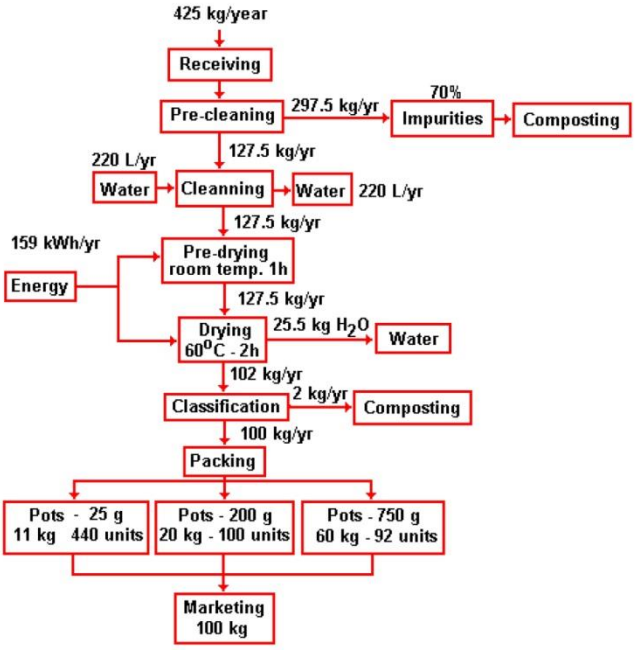

Figure 1 Flowchart and mass balance of the agro-industrial plant

The economic analysis showed it is necessary an investment of R$ 52,006.74, with 89% of this for the plant construction.

The first scenario proved to be unfeasible due to the high cost of deployment when compared with net income. The sets 2 and 3 were viable (Table 1), since the IRR was greater than the MRA, the NPV was a positive value, and payback was small. It can be seen that increasing the production by five times, even having to build the agro-industrial plant, this factor enabled the project, along with a decrease in spending on effective employee due to high taxes.

Table 1 Studied scenarios for processing Brazilian pepper in an agro-industry

Index	Scenario 2	Scenario 3
NPV (R$)	14,073.44	110,099.53
IRR (%)	62	67
IRRm (%)	34.3	45
MRA (%)	12	12
Payback (years)	3	2

4 Conclusion

The cultivation of Brazilian pepper proves to be a viable solution to increase the income of rural family producer, demonstrating to be a sustainable alternative that requires small areas. The agro-industry can be used to process other products, such as tomatoes and dried fruits, dehydrated spices, among others, which would be a viable alternative for the project.

The economic analysis showed that the project is not viable if implanted exclusively to process Brazilian pepper, due to the high initial cost with the construction of the agro-industry. The project becomes feasible, even considering the low production, if the investment in building the agro-industry is not necessary, and hand labor contractor employee is changed to a daily harvest worker.

Whereas an initial investment is made with the construction of a building for processing, the project will be viable only if output rises five times.

References

Bandes. Banco de Desenvolvimento do Esp ŕito Santo. 2008. A cultura da aroeira em S ão Mateus e arredores: um pioneirismo que o Bandes deve apoiar. Estudos Bandes, pp39.

Boina, A. M., personal communication, Rio Grande, RS, Brazil 19 november 2013.

Buarque, C. 1991. Avaliação econômica de projetos: uma apresentação didática. 6. Ed. Rio de Janeiro: Campus, pp124.

Cardoso, J. H. 2008. Aroeira, cultura e agricultura**:** reflexões que embasam a necessidade de uma educação ambiental rural para uma percepção social agroecológica. Embrapa Clima Temperado, Pelotas. pp.23.

Casarotto, F.N. 2009. Elaboração de projetos empresariais: análise estratégica, estudo de viabilidade e plano de negócio. São Paulo: Atlas, pp236.

FAES. Federação da Agricultura e Pecuária do estado do Espírito Santo e Serviço Nacional de aprendizagem Rural. Informativo 212, Nov. 2009. Available in: <http://www.faes.org.br/doc/jornal/1259682672_SenarNov_OK.pdf>. Access to: 27 out. 2013.

Fonseca, J.R. 2012. Conhecimento, energias renováveis, produtos de alto valor agregado e nichos especiais de mercado, para erradicação da pobreza crônica em comunidades remotas. In: Microgerar, mai. Brasília.

IBF. Instituto Brasileiro de Florestas. 2010. Aroeira pimenteira destaca-se entre as sementes mais vendidas. Available in: <http://www.ibflorestas.org.br/sementes-disponiveis/ 25-noticias/237-aroeira-pimenteira-destaca-se-entre-as-sementes-mais-vendidas.html>. Access to: 2 nov. 2013.

Leles, P.S.S. Espaçamento de plantio em recomposição florestal. UFRRJ, 2012. Available in: <http://www.apeferj.org.br/Seminario-Reflorestamento-da-Mata-Atlantica-no-Estado-do-Rio-de-Janeiro-julho-2011/Bloco-II-Modelos-e-Tecnicas-de-Reflorestamento-Ecologico/Espacamento-de-plantio-em-recomposicao-florestal-Paulo-Leles.pdf>. Access to: 29 out. 2013.

Machado, M. B., V.S. Scherer, G. C. Fuentes, C. A. S. Luz, and M. L. G. S Luz. 2012. Secagem de tomates em secador de bandejas de pequeno porte. In: *Congresso de iniciação científica*, 21, 2012. Universidade Federal de Pelotas.

Motta, A. P. 2012. Aroeira, a pimenta rosa. Revista Procampo, n.38, ago.