

# *Platonia insignis* Mart. species richness in secondary forests of north-eastern Pará, Brazil

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**Commercial interest** in the fruit of the “bacurizeiro” is increasing. Even so, most production results from extractive use by native populations, which does not cover demand. This work is part of a study of the management of natural populations. We aim to develop a small-scale socio-cultural system of fruit production in areas with naturally occurring *P. insignis*, which would contribute to sustainable development.



**Figure 1.**  
*P. insignis* trees in secondary vegetation.  
Photo M. S. Ferreira.

## RÉSUMÉ

**PLATONIA INSIGNIS MART. :  
RICHESSE DES FORÊTS SECONDAIRES  
DANS LE NORD-EST DU PARÁ  
AU BRÉSIL**

L'État du Pará en Amazonie brésilienne est un centre de dispersion d'une essence de grande utilité, *Platonia insignis* Mart. Clusiaceae, dont l'importance s'accroît sur les marchés et pour les scientifiques. Les utilisations de cette essence sont très diverses : son bois de grande qualité se prête à de nombreuses applications, les fruits sont comestibles et fort appréciés, et le latex s'utilise en pharmacopée. De plus, l'essence est intéressante pour le maintien de la biodiversité et sa croissance rapide la rend particulièrement apte à la revégétalisation. La pulpe des fruits, appelés "bacuri", est utilisée pour assaisonner les plats traditionnels. Au Pará et dans d'autres États brésiliens, les fruits sont traditionnellement cultivés et potentiellement exportables. Cependant, la production est issue pour la plupart des activités extractives menées par les populations autochtones. Cette essence se développe et se reproduit très facilement dans toute zone aménagée de façon appropriée, et peut donc aisément s'intégrer dans les systèmes de production agricole déjà bien maîtrisés par les paysans locaux. Dans ces conditions, il convient de mener une caractérisation globale de cette essence dans différents domaines botaniques et écologiques. Par la suite, les produits issus de cette essence doivent être étudiés en termes de potentiel commercial et de commercialisation. Ces études devront inclure les résultats sur les produits forestiers non ligneux (Pfnl) obtenus par les scientifiques durant huit ans d'études dans le nord-est du Pará.

**Mots-clés :** *Platonia insignis*, fécond, forêt secondaire, commercialisation, Pfnl, Brésil.

## ABSTRACT

**PLATONIA INSIGNIS MART. SPECIES  
RICHNESS IN SECONDARY FORESTS  
OF NORTH-EASTERN PARÁ, BRAZIL**

In the Brazilian Amazon, the state of Pará is the centre of dispersion of a useful species, *Platonia insignis* Mart. Clusiaceae, the importance of which is increasing in markets and for agriculturists. This species has a wide variety of uses, producing high quality wood with a variety of applications, a highly valued edible fruit, and latex used for medicinal purposes. Furthermore, it is valuable for the maintenance of biodiversity and is capable of rapid growth, thereby making it useful for revegetation. The pulp of the fruit, known as "bacuri", is used to flavour traditional foods. In Pará and other Amazonian states, the fruit has been cultivated traditionally and has export potential. Even so, most production results from extractive use by native populations. Given the ease with which this species can grow and reproduce in suitably managed areas, it can easily be incorporated into crop systems that are familiar to local farmers. In this context, an overall characterization of the species should be conducted from diverse botanical and ecological angles. Subsequently, the various products from this species should be considered in terms of market potential and commercialization. This should include the results obtained for this non-timber forest product (NTFP) by agriculturalists in the north-eastern region of the state of Pará during eight years of study.

**Keywords:** *Platonia insignis*, fruitful, secondary forest, commercialization, NTFP, Brazil.

## RESUMEN

**PLATONIA INSIGNIS MART.: RIQUEZA  
DE LOS BOSQUES SECUNDARIOS DEL  
NORDESTE DE PARÁ EN BRASIL**

El Estado de Pará, en la Amazonia brasileña, es un centro de dispersión de una especie de gran utilidad, *Platonia insignis* Mart. Clusiaceae (bacuri), cuya importancia va en aumento en los mercados y entre los científicos. Sus usos son muy diversos: la gran calidad de su madera hace que tenga muchas aplicaciones, los frutos son comestibles y muy apreciados, y el látex se utiliza en farmacopea. Además, esta especie es interesante para el mantenimiento de la biodiversidad y su rápido crecimiento hace que sea especialmente idónea para la revegetalización. La pulpa del bacuri se utiliza para aderezar los platos tradicionales. En Pará, como en otros estados brasileños, existe un cultivo tradicional de los frutos que son potencialmente exportables. Sin embargo, la mayor parte de su producción proviene de actividades extractivas de las poblaciones autóctonas. Esta especie se desarrolla y reproduce muy fácilmente en cualquier área convenientemente ordenada, esto hace que pueda incorporarse fácilmente a los sistemas de producción agrícola, bien dominados por los campesinos locales. Teniendo en cuenta esto, sería conveniente realizar una caracterización global de esta especie en distintos ámbitos botánicos y ecológicos. Posteriormente, habrá que evaluar el potencial comercial y de comercialización de los distintos productos de esta especie. Dichos estudios deberán incluir los resultados sobre los productos forestales no maderables (PFNM) obtenidos por los científicos durante ocho años de investigaciones en el nordeste del Pará.

**Palabras clave:** *Platonia insignis*, productivo, bosque secundario, comercialización, PFNM, Brasil.

## Introduction

In traditional agriculture in the Brazilian Amazon, “capoeira”, or the clearing of an area of bush by burning or cutting down, is important. Following a fallow period after “capoeira”, the productivity of crops is restored and the system of agricultural production is maintained. The secondary vegetation that grows is also a source of products for local communities and aids the environment as a whole.

The economic importance of secondary forests is also increasing, as they provide a diverse range of useful products, such as edible fruits, medicinal ingredients, plant materials for construction, animal feed, and timber.

Such forests are also an ecologically important resource in terms of forest growth, the accumulation of biomass, and in the maintenance of biodiversity. Given their ability to accumulate biomass quickly, especially during the first 20-30 years, they are also important carbon reservoirs for the atmosphere (VIEIRA *et al.*, 2003).

Secondary forests exist in almost all agricultural areas, particularly in the northeast “Paraense” region, where they are used for numerous products. A recent study in this region found that 10% of the gross income from familiar agricultural products comes from secondary forests (staple fibers, seeds, fruits, wood for construction, charcoal, etc.) (SMITH *et al.*, 2003).

In Bragança and Captão Poço, two municipalities in the north-east region of the state of Pará, more than half of the income from secondary forests is in the form of cash from the sale of various products. According to the same source, this demonstrates the economic importance of secondary forests to local populations (SMITH *et al.*, 2003).

The species *Platonia insignis* Mart. Clusiaceae, which is abundant in this type of vegetation, is an example of the potential for the productive management of secondary forests, hence its importance for the communities in which it occurs.

## Description of the species

*Platonia insignis* is an evergreen species belonging to the Clusiaceae family. It is found mainly in open areas, especially anthropozoic areas, and is rarely found in dense primary forests. When fully grown, it can reach a height of 37 m and a diameter 1.30 m above the ground (DAP) of 1.7 m.

In areas where it occurs naturally, this species plays an important role in the recovery of areas cleared for agriculture (slash and burn followed by periods of rest and recovery), as it is a pioneer species, generally the first to appear. After 50 years, “bacurizeiro”, the common name for *P. insignis*, remains the most abundant species where such areas are regenerating (REIS JUNIOR, 2000). It can grow in soils with low to average fertility, its main limitation being that it is restricted to upland (terra firme).

*P. insignis* produces edible fruits known in the Amazon region as “bacuri”, which are popular among the local population and sold in the markets of the main cities of Pará, in particular Belém. The fruit is a voluminous globose berry with a diameter of 7-15 cm and an average weight between 350 and 400 g. The edible part is the pulp, which is soft, white to white-yellowish in color, and contains the seeds.

According to SHANLEY and MEDINA (2005), quoting a trader, “bacuri” is “turning to gold” in the markets of the main cities of Pará. In the main market of Belém, 490 000 fruits are sold annually. In February 2001, in the market of Bragança, more than 4 000 fruits were sold in only one day (personal observation).

This species has other uses apart from the fruit. For example, its high quality timber is used in civil and naval construction and in the manufacture of furniture, and the oil extracted from the seed, as well as the latex, is used in popular medicines. However, it is mainly used for its fruit (SHANLEY, MEDINA, 2005).

In open environments, the “bacurizeiro” proliferates extremely easily, mainly by sprouting from roots, and can often completely dominate the landscape. Reproduction by seeds is more difficult, generally as a result of irregular and delayed germination.

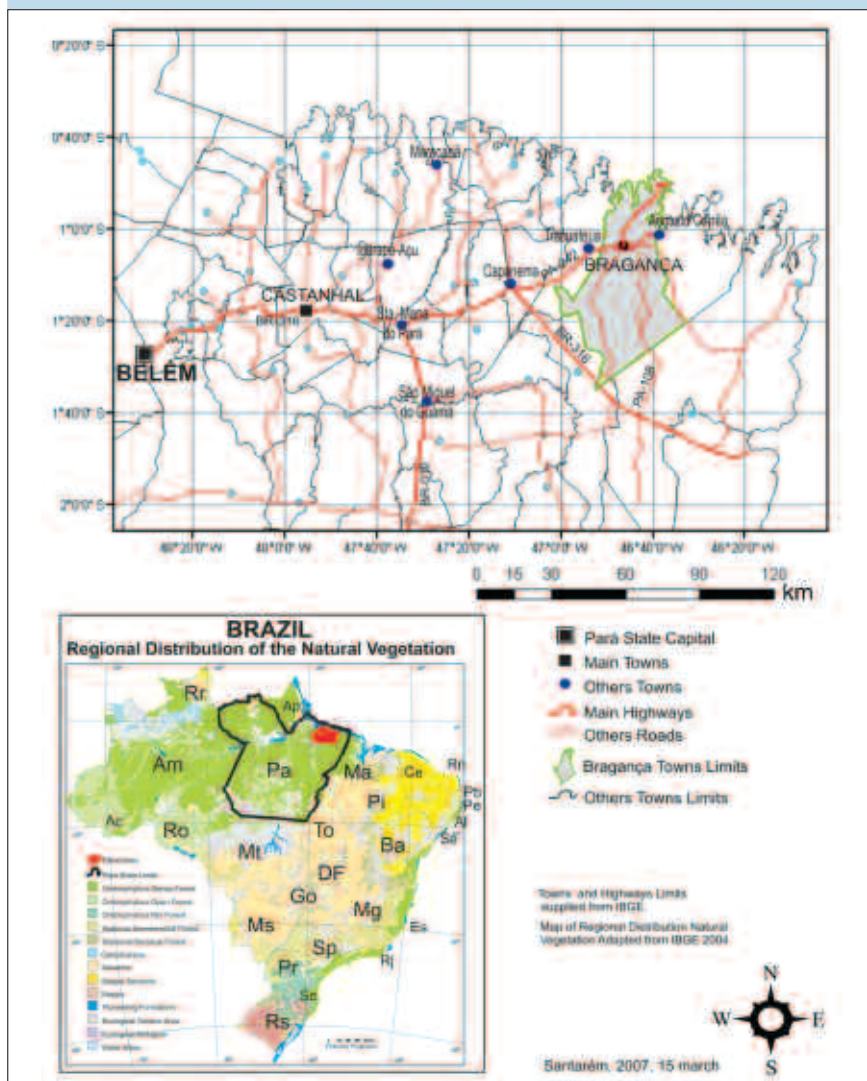
The characterization and importance of this fruit have been discussed in the literature since the 1970s (CALZAVARA, 1970; ALVES, 1971). However, until now, there was no established system of production for agriculturists or “fruticultores”, the fruit producers. This is partly because of difficulties with producing plants from seed (CARVALHO *et al.*, 1998) and the lack of a suitable approach to handling naturally occurring plants.

Popularly known as “bacurizeiro”, *P. insignis* has a straight, circular trunk; brown-ash-gray to dark-brown rhytidome, tough, wrinkled and detached in small plates; cream to white albumen; rich sticky brown-yellow resin, internally dark yellow; yellow latex; simple leaves, opposed, canaliculated leafstalk in the superior face, oblong with slightly acuminate apex (Figure 1).



Figure 2.  
“Bacuri” fruit showing the edible pulp.  
Photo G. Medina.





**Figure 3.**  
Location of the study area.

The flowers are hermaphroditic, androgynous, and measure 7 cm in length and 3 cm in diameter on average. They are slightly perfumed, vary in colour from white to intense rose, and located at the end of the branches (Figure 1). *Platonia insignis* begins to flower after about 4-5 years, but does not produce fruit until later. Flowers are produced annually, generally from June to August. It is an allogamous species (MAUÉS, VENTURIERI, 1996), which is pollinated by insects (e.g., *Polistes infuscatus*, *P. carnifex*, *Synoeca surinama*, *S. virginea*, *Polybia striata*, *Trigona fulviventris* and *T. pallens*) and birds (e.g., *Pionites leucogaster leucogaster*, *Brotogeris chrysopterus tuipara*, and *Aratinga leucopthalmus*).

The fruit, known as “bacuri”, is of a pulpy globose type, measuring 7-15 cm in diameter and weighing 350 to 400 g on average. The rind is tough, and its color changes from green to yellowish as it matures (when young, it is completely green, the same color as the foliage). It has a white and sweetish pulp containing the seeds, or aborted seeds, known popularly as the “son” (MORAES, 1994; TEIXEIRA, 2000; personal observation) (Figure 2).

The word “bacuri” comes from the Tupí, where “ba” means to fall and “curi” means immediately. It was so named because the fruit falls as soon as it matures (TEIXEIRA, 2000). The fruit loosens naturally from the peduncle as it matures.

Fructification is seasonal, and the fruit falls mainly from January to March (FERREIRA, MEDINA, 2004). Under natural conditions, the trees generally begin to produce fruit at about 10 years of age. However, without competition, they can start to produce fruit at about six years of age (SOUZA *et al.*, 1996).

An adult tree will produce on average 500 fruit each year, although wide variations can occur between harvests. A year of high production for an individual is followed by one or two years of low production. SHANLEY and MEDINA (2005) have found an average annual production of 400 fruits per tree over a period of five years.

The fruit vary greatly in form, color, and composition. According to some authors, the fruit can vary from 100 g to 1 kg and contain 50-80% of rind and 12-30% of pulp (FERREIRA *et al.*, 1987; SOUZA *et al.*, 1996; VILLACHIA, 1996; CARVALHO *et al.*, 2001).

Because germination is slow and irregular, propagation has rarely been attempted. The difficulty in germination is attributed to the recalcitrant characteristics of the seeds, which lose their ability to germinate with desiccation (degree of humidity around 16%).

After studying propagation by seeds, OLIVEIRA (2002) concluded that the most appropriate method to accelerate the emergence of the radicle was to make two lateral cuts to the dorsal/ventral plane of the seed. This was stressed as a simple and effective method. However, CARVALHO *et al.* (1998) showed that despite sprouting relatively quickly and easily from roots (12-35 days, reaching a length of 177.7 cm after 210 days), growing plants from seed took much longer, occurring on average after 564 days (from 198 to 968 days after sowing).

The *P. insignis* species has great regeneration properties through the rapid development of radiciforms. This is the favored method for producing the trees. Quite productive areas of more than 40 years of age have been observed in the municipalities of Bragança and Augusto Correa (Pará) using this practice.

## Where is it found?

CAVALCANTE (1972) considers that this species originated in the state of Pará. From here, it was dispersed from Maranhão to Piauí in the north-east, to Goiás in the southeast, and from Mato Grosso to Paraguay in the south. It reached Amapá and the Guianas to the north, and the Amazon to the west. In Pará, it is found in areas near the coast, in the municipalities of Soure and Salvaterra, and on Marajó Island. It is also found at Marapanim, Maracanã, Curuçá, Bragança, Augusto Correa, and Tracuateua in north-eastern Pará (Figure 3).

*P. insignis* is generally found in mainland areas and on different types of soils. While in Pará it appears in areas originally characterized as humid tropical forests with firm soils, in states to the northeast it is found in transition areas (between humid tropical forests and savanna). Most “bacurizeiros” occur naturally, while some are planted next to houses as part of a home garden (quintal). They are rarely observed in a plantation. The species is observed in great densities in areas cleared for agricultural use, but decreases as the vegetation develops (REIS JUNIOR *et al.*, 2000). According to CLEMENT and VENTURIERI (1999), it is found in primary forests only in low densities (between 0.5 and 1.5 individuals/ha).

In a recent study of *Platonia* species, a density of 21 250 individuals/ha (higher than 50 cm) was observed in the municipality of Bragança, Pará. The area was a young secondary forest in the initial phase of vegetation development following clearing, and the bacuri plants represented 43% of all vegetation. In intermediate secondary forests, well known as vegetation of medium cut-over land (with an average height of 8 m and approximate ages of 10-15 years after fallow), the density was lower; however, although more species were present, *P. insignis* still accounted for 725 individuals/ha (starting from a DAP of 4 cm), which represented 22% of all vegetation. In advanced secondary forests (more than 20 years old),

*P. insignis* was still very well represented (Table I). However, species numbers were not determined and it was not possible to calculate relative densities and frequencies.

Since *P. insignis* is a pioneering and opportunistic species (VIANA, 1989) that needs light to develop and can be vegetatively propagated from the roots, it is capable of occupying spaces very quickly after removal of existing vegetation. For example, in an area following agricultural activity, their numbers were found in the hundreds. This is important in the context of the traditional slash and burn agriculture in the Amazon, because it enables the biomass to recover within a short time.

**Table I.**  
Absolute and relative density and frequency of the species *P. insignis*, in three groups of secondary forests vegetation in the Bragançina region, State of Pará. 2006.

<i>Platonia insignis</i>	Density (individuals/1 000 m <sup>2</sup> )	Frequency
Young secondary forest	21 250	100
Intermediate secondary forests	725	100
Mature secondary forests	105	100

**Table II.**  
Chemical composition of the fruit pulp of *Platonia insignis*.  
All results are expressed as mean±standard deviation.

Constituents	Value	Composition	Value
pH	3±0.1	Zn (mg/100g protein)	1.04±0.106
Protein (%DM)	6.4±0.1	Cu (mg/100g protein)	0.38±0.036
Sugars (%DM)	49.7±3.3	Ca (mg/100g FW)	17.09±0.84
Lipids (%DM)	13.5±0.8	Methionine (g/100g protein)	2.41±0.27
Dry matter (%)	21.1±0.7	Threonine (g/100g protein)	4.7±0.3
Phosphorus (mg/100g FW)	10.76±0.63	Glutamine + glutamic acid (g/100g protein)	14.35±0.42
Fe (mg/100g FW)	0.449±0.074	Lysine (g /100g protein)	8.13±0.14
Na (mg/100g FW)	26.37±1.48	Asparagine + aspartic acid (g/100g protein)	10.73±0.14
K (mg/100g FW)	149.81±2.74	Leucine(g /100g protein)	7.81±0.19
Mg (mg/100g FW)	22.16±0.42	Arginine (g/100g protein)	7.18±0.34

FW: fresh weight; DM: dry matter.  
Source: ROGÉZ *et al.*, 2004.

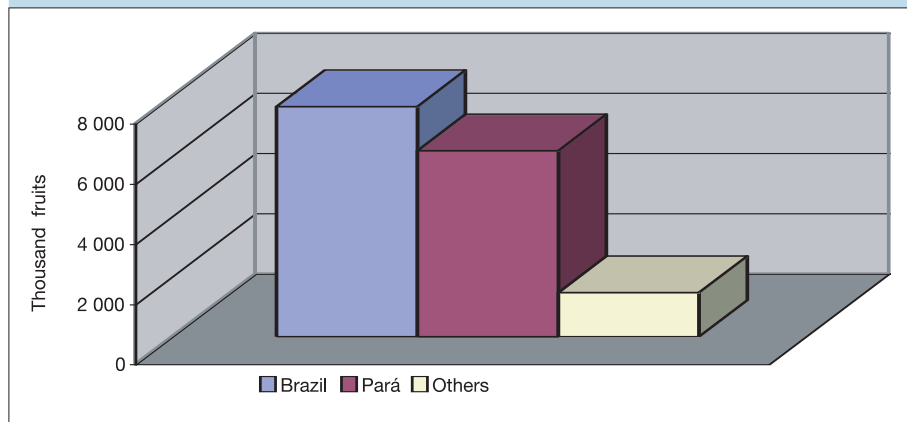
## Uses

The species has multiple uses, providing a variety of products such as high quality wood with a range of applications, edible fruit used in local cuisine, and latex, which is used in popular medicines and has industrial potential (VILLACHICA *et al.*, 1996; CARDOSO, 2006). It is also valuable for the maintenance of biodiversity, as it attracts many insects and animals (birds, bees, and rodents), and its rapid growth enables it to replace vegetation lost to agriculture or natural causes.

The wood is used commercially in the Guianas and Brazil, where its characteristics are considered good: density from 0.75 to 0.80, dark album and yellowish-brown heartwood, compact, hard, elastic, easy handling, and good final product. It is suitable for hydraulic engineering works, naval and civil construction, floorboards, carpentry, cabinetmaking, frameworks, box factories, struts, stakes, and domestic utensils. The rind of the fruit is used to calk boats, and the resin it releases has uses in veterinary medicine. The oil extracted from the seeds can be used as a raw material in soap industries.



**Figure 4.**  
Bragança market showing “bacuri” fruit for sale during the harvesting period.  
Photo M. S. Ferreira.



**Figure 5.**  
Bacuri production in the state of Pará and other states in Brazil (%). Censo Agropecuario, 1996. Source: IBGE, 2006.

## Processing and commercialization

The flavorsome pulp surrounding the “bacuri” seed has traditionally been considered a regional delicacy. It has also become appreciated as an exotic component of dishes in modern cuisine, mainly in the state of Pará. According to ROGEZ *et al.* (2004), it is a source of minerals such as potassium, calcium, and iron (Table II). The author notes that the fruit is rich in soluble sugars and concludes that its flavor characteristics allow it to be used in many diverse ways. It is consumed as a fruit, but is also made into jellies, creams, ice creams, juices, and as a filling in chocolates. The rind of the fruit is locally used for making jelly and comotes, apparently having similar characteristics to those of the pulp.

The pulp can be preserved in the freezer, where it can be kept for a year without losing any of its main characteristics. The fruit, however, can only be preserved for at most seven days after being harvested (BARBOSA *et al.*, 1979).

The fruit is generally sold to local retailers who sell it in markets, fairs, cafeterias, ice cream shops, hotels and restaurants. According to FERREIRA and MEDINA (2004), 90% of the crop reaching the chief municipality in Bragança, one of the main buyers, is sold as fruit (Figure 4). It is not used for other purposes because of factors such as hygiene and the existing infrastructure for packing the products. Fruit processing is done manually, and the hygiene conditions are inadequate. This reduces the use of *P. insignis* for purposes other than as a fruit on the market. The lack of electricity in some rural communities is also a handicap as it is not possible to preserve products for human consumption without it.

The farmers transport the fruit to the cities on bicycles or on collective transport (buses, trucks or boats). Collective transport is used less due to its high cost. The cost of transporting 20 litres or more of any agricultural product is approximately R\$5.00, to which about R\$3.00 has to be added for the farmer taking it to market (the total of R\$8.00 is equivalent to US\$3.20, according to the exchange rate of 2.5 in May 2006).

## Discussion

Most retailers (ice cream shops and cafeterias) who use “bacuri” pulp as a raw material note that it is consumed more rapidly than other product and rarely lasts until the arrival of the next harvest. Only a few claim that they have sufficient stock to last for periods between harvests. The retailers also note that “bacuri” is the most popular product in juices or ice cream. It is known that supply does not cover demand.

In the municipality of Bragança, the majority of retailers who use “bacuri” pulp as a raw material confirm that they acquire the product directly from the producers.

Fruit sold in the markets of Bragança goes either directly to the final consumer or to intermediaries, who take it to the state capital of Belém.

In the last agricultural census (IBGE, 2006), production of more than seven million fruit was registered. Of this, 80% originated from the state of Pará (Figure 5).

The data from the IBGE show that the fruit is registered in states in southeastern and southern regions. However, this is probably a different species (*Scheelea phalerata* Mart., Palmae), which naturally occurs in these regions and is also well known as “bacuri”. Research from the Farming Census shows that this name is popularly used and does not take into account the scientific name of the species.

The increasing encroachment of urban centers into rural areas is causing unease in the rural sector, due to the flow of people from urban centers and the lack of global policies for absorbing manual labor. Laborers from outside local populations enter particular areas to collect fruit, among which the “bacuri” is most highly prized because of its commercial potential. This makes it more difficult for local people to find the fruit and can lead to underestimations of production in official statistics.

Commercial interest in the fruit of the “bacurizeiro” is increasing, but there remains a need to conduct studies to produce better forms and more regular supplies of fruit. All current commercial production comes from natural populations, which do not cover demand.

Despite researchers’ interest in establishing systems of production for the “bacurizeiro”, there is still no method to produce fruit that would satisfy agricultural and fruit producers. This explains why no commercial plantations exist for this species. Methods for establishing orchards are laborious and their development is being undertaken very slowly and carefully. Results are therefore uncertain and their implementation is being delayed.

This work is part of a study on the management of natural populations. It aims to develop a small-scale sociocultural system of fruit production in areas where “bacuri” occurs naturally and which would contribute to sustainable development. With more regular fruit production, it would be possible to determine the overall value of *P. insignis*. This would guarantee the sustainability of its production.

## Conclusions

The rapid rate at which *P. insignis* can regenerate is favorable to the establishment of populations of this species. As the practice is both easy to perform and inexpensive, it has attracted the interest of landowners. This has been helped by the support of public policies, such as adequate assistance and promotion of agricultural products.

The lack of information on the production of *P. insignis* makes it difficult to determine both production and market trends. Even though existing information dealing with precise observations in some markets is of importance, it still does not allow more detailed evaluation and/or prognoses for the product in general.

Until recently, “bacuri” (also known as “uxi” and “piquiá”) was consumed by the families who collected it. Now, however, the commercial value of the product has increased. This is demonstrated by anecdotes about frequent thefts of the fruit in areas where there is no close monitoring by the owners. This may decrease the care with which the fruit is monitored in such areas (more distant from the residences), but it will increase the care with which the fruit is monitored in areas where the owners have greater control.



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