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Brazil Nut Almonds: Nutritional and Market Aspects

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1 Introduction

The para nut or brazil nut is the seed of *Bertholletia excelsa* tree. *B.excelsa* belongs to Lecythidaceae family and is native from the Amazon rain forest. In Brazil, its fruits and seeds are being collected in the states of Acre, Amapá, Amazonas, Pará, Rondônia and Roraima (SOUZA ET AL., 2006). Its fruit has high caloric and protein content. Additionally, it has selenium which reduces the effects of free radicals. Some studies also recommend it for cancer prevention.
Beside of being an appreciated food because of its flavor, the brazil nut has a considerable nutritional value. It contains 60 to 70% of lipids, being 45.2% linoleic acids (omega 6), 31.4% oleic acids (omega 9), 13.8% palmitic acid and 8.7% estearic acid (TATEO, 1971). The essential fatty acids (omega 3 and omega 6) carry out metabolic functions in human organism, which is not able to synthesize it. In a classic research done by DYERBERG ET AL. (1975), where food consumption habits were related to cardio-vascular diseases, the authors conclude that more important than the ratio between satured and unsatured fatty acids is the relation of poli-unsatured acids omega 6 and omega 3 in prevention of cardio-vascular diseases. Beside of the positive effect on prevention of cardio-vascular diseases, the equilibrium of omega 6/omega 3 also has positive effects on other health problems like stress, atopic dermatitis, lupus, psoriasis, hemicrania, rheumatic arthritis, multiple sclerosis, diabetes mellitus, ulcerative colitis and cancer. The recommended daily intake of poli-unsatured fatty acids omega 3 and omega 6 are available in MARQUES (2006). A balanced diet, satisfying the daily nutritional needs of an adult, indicates an consumption of 20 to 30% of lipids. The vegetal oils, in adequate proportions, are responsible, among other functions, for the transportation and absorption of fat-soluble vitamins. A research by Vanessa Coutinho (CASTANHA-DO-PARÁ…, 2000) showed that brazil nut is an efficient dietary supplement capable to provide the daily needs of selenium. This mineral avoids cancer propagation and diminishes its incidence, preventing cardiomiopaties and improving the immunologic system. Acts in the equilibrium of the active hormone of thyroid gland, reduces the toxicity of heavy metals and acts as antioxidant, protecting the organism against the damages by free radicals.
It is highly consumed by local population *in natura*, toasted or as flour, sweets and ice cream. The pit of the brazil nut is very resistant and demands high manual efforts for extraction (CASTANHA-DO-PARÁ..., 2006). The North region is responsible for 98.72% of Brazilian brazi nut

production. It represents about 30 million reais in local economy with direct impacts on livelihoods of local communities, smallholders and indigenous populations. Only in Acre state there are over 15 thousand families having brazil nuts as their main source of income. The brazil nut is of high economic importance in the majority of Amazonian states. About 60% is being exported *in natura* to Europe, Japan and United States of America (GLÓRIA AND REGITANO D'ARCE, 2000) and only about 5% is being domestically consumed. The average Brazilian exports during several years (1986-1995) was about 13 million US$, but decreased 50% in the period 1998-2003 (FAO, 2006). Bolivia's entrance into world market as an exporter is one important aspect to explain the reduction in Brazilian exports. Another factor that limiting Brazilian exports is the occurrence of aflatoxins in badly stored brasil nuts (SOUZA ET AL., 2006). Bolivia invested in processing during 10 years and increased its competitiveness. The Bolivian processing plants have a minimum of direct human contact with the nuts, reducing sources of contamination. Additionally, Bolivia imports almost all *in natura* production of Acre state e exports derived products with added value. Therefore, the aim of this study was to estimate the annual growth rate in production and exportation of brazil nut almonds.

2 Material and Methods

Production and export data was obtained from FAO (2006). The production data is based on brazil nuts, in shell. The export data is based on brazil nut almonds or brazil nuts shelled. The annual growth rates of production were statistically estimated through a non-linear regression model of functional form $y=ab^t$ adjusted to data, where t is the year and y the annual production, in the first item. In the following analysis y represents the exportation of brazil nut almonds. The software used in the analysis was PROC MODEL of ETS module of SAS 9.1.3. All growth rates of production and exports: (a-1) obtained for different countries were statistically tested regarding null hypothesis H0: a-1=0 (growth rate equal zero), which were rejected at a 1% significance level.

3 Results and Discussion

In 1999 Bolivia went beyond the main worldwide exporter Brazil. Currently, Brazil and Bolivia produce 89.87% of worldwide production, being Bolivia the main producer of brazil nut almonds with 38,170 tons in 2005, followed by Brazil with 30,000 tons (Table 1) (FAO, 2006). In Table 1 Brazil appears as the country with the highest share in production as the estimation is based on data of 20 years (1986-2005). This composition may change in the near future, due to the high growth rate of Bolivian production: 5.10% (±0.94%) per year while Brasil has had a negative annual growth rate of production of -1.28% (±0.81%), without any significance

Table 1. Share of production and annual growth rate of main brazil nut producing countries, representing 89.87% of worldwide production, 1986-2005.

Producing country	Share of worldwide production (%)	Annual growth rate (%)	Standard Deviation (%)	*p* Value	R^2
Brazil	50.08	-1.28 $^{n.s.}$	0.81	0.136	0.12
Bolivia	39.79	5.10 **	0.94	<0.001	0.63
Total	89.87	-	-	-	-

Statistical significance: ** different from zero at 1.0% level; n.s. not significantly different from zero.
Source: Estimation by the authors with original data from FAO (FAO, 2006).

The worldwide exports of brazil nuts are concentrated in four countries, which are responsible for 89.30% of exported brazil nut almonds. Figure 1 shows the evolution of exports in the analyzed period of 1986-2004. In 1998 we see the first data on exports of Bolivia (28 million US$), already being higher than the Brazilian exports in that year (8.8 million US$). Brazil is the second

largest worldwide exporter of brazil nut almonds, with 14.87 million US$ exportations in 2004. As can be seen in Figure 1, even Brazil being the second largest exporter considering the value of brazil nut almonds, its main competitor (Bolivia) exported more than 50 million US$ in 2004. The third main exporting country is Peru, with 9.8 million US$ in 2004, followed by Holland as fourth main exporting country, with 3.9 million US$ in 2004. According to analysis carried out with FAO data (FAO, 2006), Brazil had 40.47% of worldwide exports of brazil nut almonds during the analyzed years, followed by Bolivia with 36.20%, Peru with 7.44% and Holland with 5.19% (Table 2). With exception of the Brazilian growth rate (negative and statistically significant), the export data of the main exporting countries did not show significant growth rates in the considered period, 1986 to 2004. Peru reached the highest growth rate in exports, with 43.57% (±24.24%), followed by Bolivia, with 8.72% (±5.24%), but without statistical significance. Holland and Brazil have had negative annual growth rates of -1.62% (±3.54%) and -6.01(±1.71%), respectively.

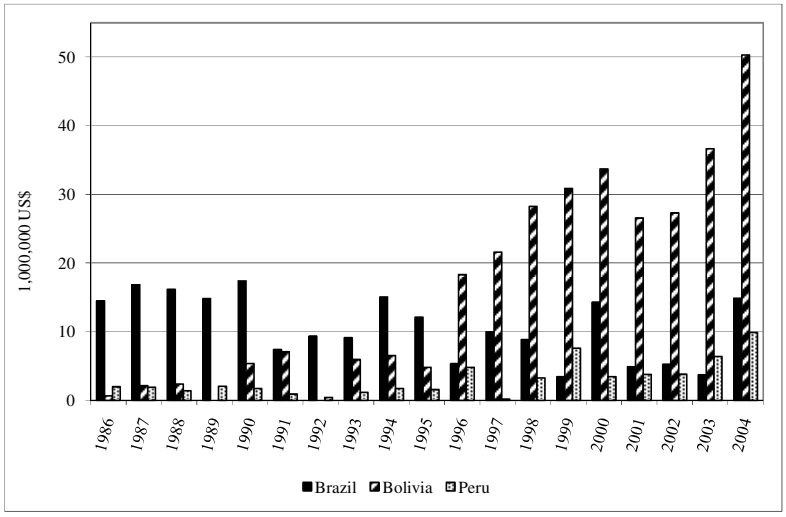

Figure 1. Export value (million US$) of brazil nut almonds of main exporting countries, 1986-2004.
Source: FAO (2006).

Table 2. Share of exports and annual growth rate of the main exporters of brazil nut almonds, representing 89% of worldwide brazil nut almonds exports, 1986-2004.

Exporting country	Share of worldwide exports (%)	Annual Growth Rate (%)	Standard Deviation (%)	*p* Value	R^2
Brazil	40.47	-6.01 *	1.71	0.004	0.42
Bolivia	36.20	8.72 n.s.	5.24	0.168	0.50
Peru	7.44	43.57 n.s.	24.24	0.049	0.48
Holland	5.19	-1.62 n.s.	3.54	0.669	0.03
Total	89.30	-	-	-	-

Statistical significance: * different from zero at 5% level; n.s. not significantly different from zero.
Source: Estimation by the authors with original data from FAO (FAO, 2006).

4 Conclusions

The brazil nut almonds reach high prices outside of production regions. Therefore many Brazilians do not have access it in their daily life. In the global market of brazil nut almonds Brazil is clearly disadvantaged. Brazil is still second most important explorer, but with a negative annual growth rate, in contrast to Bolivia, main exporter, which is increasing its participation in the world market. The same happens with production: Bolivia is increasing and Brasil decreasing.

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