Assessment of Palm Kernel Provision and Market Alternatives

EXECUTIVE SUMMARY

Founded in 1865, BASF started its operation producing inorganic chemicals and dyes. Currently, the company is arranged into five segments (Chemicals, Performance Products, Functional Materials & Solutions, Agricultural Solutions, and Oil & Gas), and has operating units in Europe, North America, Asia-Pacific, South America, Africa and the Middle East. Based on the purpose of the company - 'We create chemistry for a sustainable future' -, BASF seeks to grow its business using sustainable and innovative practices.

The palm kernel (palmiste) oil serves different industrial sectors, such as food products, pharmaceutical and cosmetics. As there is a wide array of uses for that oil, combined with an increasing demand for certified raw materials, it is worth pointing out there is a current deficit of about 85% in Brazil, considering how much palm kernel oil is produced and how much is imported. Production of palm kernel oil involves other issues, such as greenhouse gas (GHG) emissions, which occur in different stages of the oil palm agricultural production, particularly the conventional palm kernel; variations in palm kernel prices due to climate events; demand from the Brazilian domestic market, which is higher than local production; and a growing demand for certified palm kernel, which can cause scarcity of the raw material.

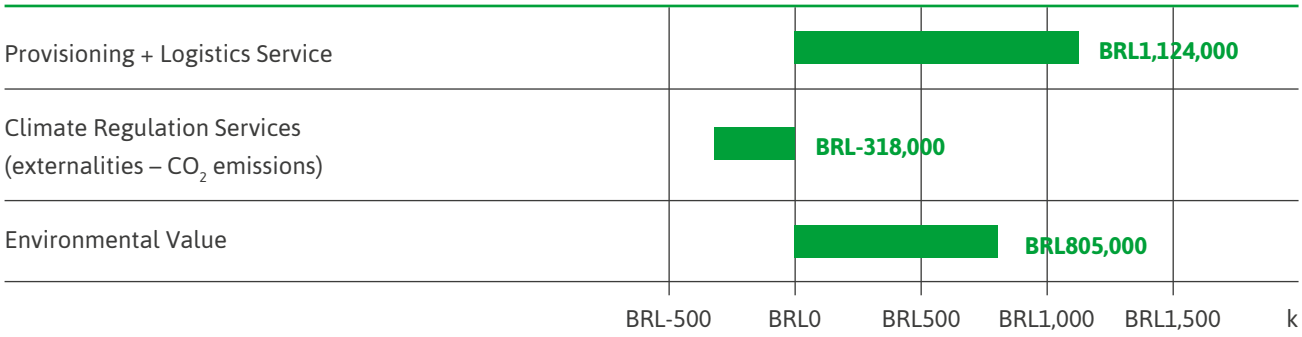
BASF uses palm kernel oil to develop some of its products and there are few alternatives in the market to actually replace it. Among the alternatives, there is the babassu oil, which can be manually harvested from the seeds found in babassu nut. Babassu is a palm largely found in the transition areas of the Amazon biome, between the Northern and Northeastern regions in Brazil.

In this case study, the company decided to make a comparative study of valuation related to dependency and internal impact, considering the needs of the company's production units in South America when it comes to palm kernel ecosystem provision and global climate regulation. Different scenarios were considered: i) conventional palm kernel, ii) certified palm kernel and iii) replacement of 85% of palm kernel oil with babassu oil. The third scenario also considered the possibility of charging a tax for emissions, following the example of the carbon market in New Zealand. To calculate valuation, the Replacement Cost Method (RCM) was used.

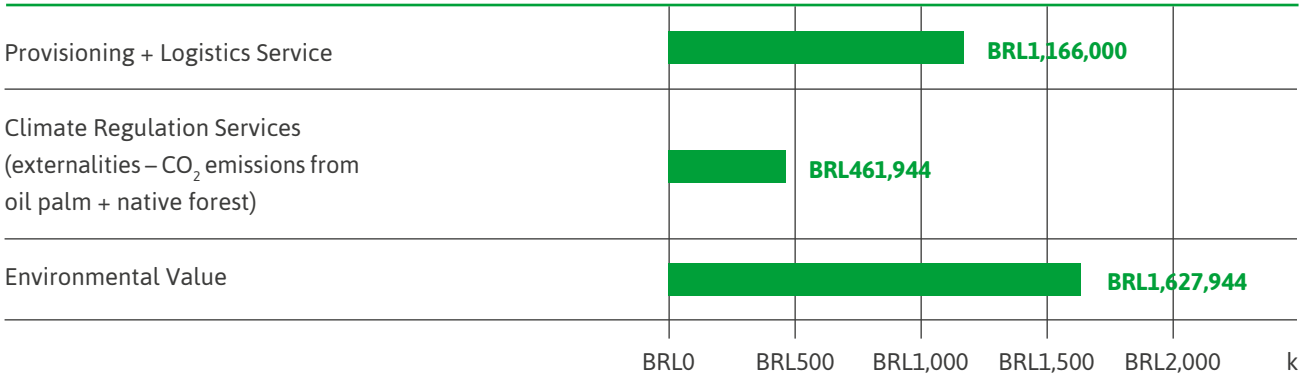
Results can be found in Figure 1; as shown, conventional kernel oil is the cheapest option. However, considering the environmental aspect, certified kernel palm shows greater environmental value due to the CO_2 sequestration occurred in Legal Reserve areas, a percentage of native vegetation that must be kept in Brazilian rural properties, according to the Forest Code.

Figure 1 - Valuation using the Replacement Cost Method (RCM)
Environmental Value = Provisioning + Regulation Services

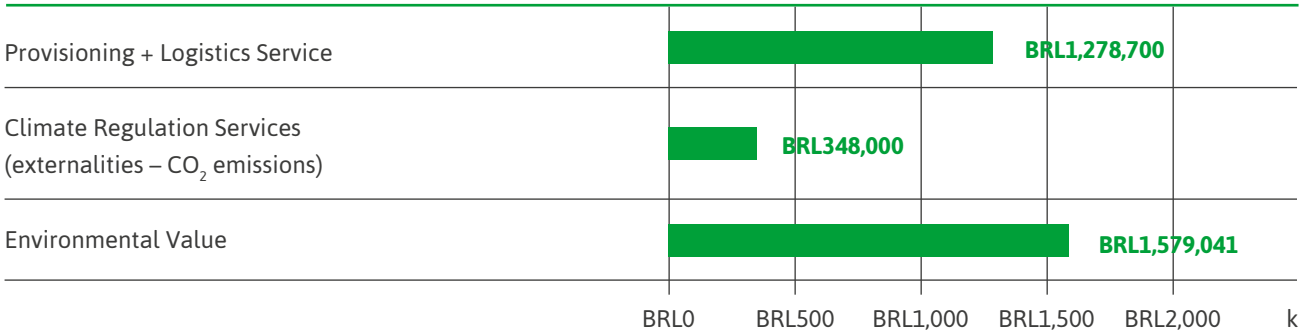
CONVENTIONAL PALM KERNEL



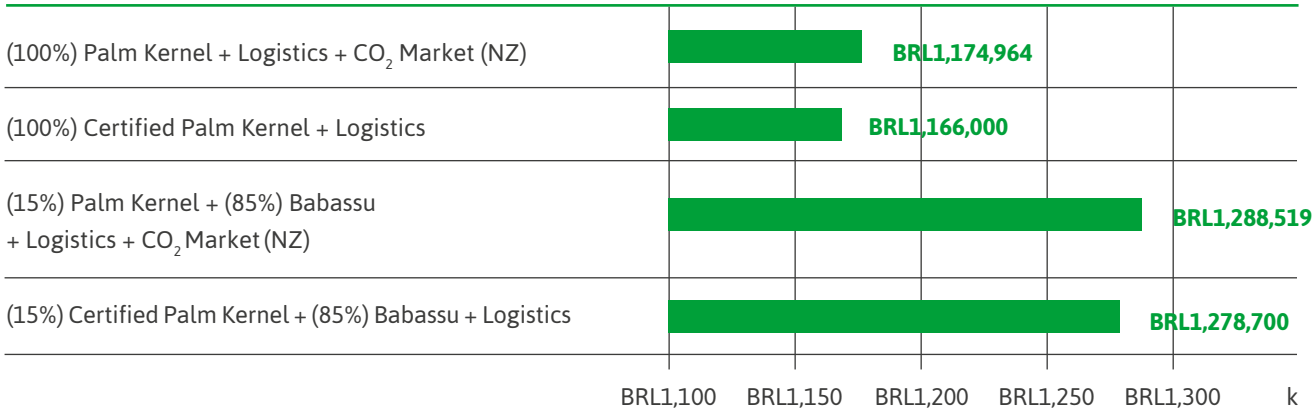
CERTIFIED PALM KERNEL



PALM KERNEL AND BABASSU (85%)



COMPARISON – CARBON MARKET



Reporting of Environmental Dependencies, Impacts and Externalities

Responsible for completing: Tiago Egydio Barreto

Project drivers

Objectives: Compare options

Description: In some segments, BASF purchases inputs of biological origin to elaborate its products. In this sense, it is relevant to understand the scenario of future availability of some raw materials, understand their social and environmental impacts and assess whether there are alternatives in the market to replace them, diversifying provisioning risks.

Project scope

Object of the project analysis: Product

Description: This study aims at understanding the dependency upon palm kernel oil and the impact on business if palm kernel were replaced with babassu. In addition to that, the idea was to find out if there would be any changes in the externalities related to climate change comparing exclusive use of conventional palm kernel, certified palm kernel, and replacement of 85% of palm kernel with babassu.

Geographic area: Brazil

Step(s) of the value chain included: Upstream (suppliers)

Type of approach: Prospective

Time horizon: one year

Ecosystem services: Other provision services; global climate regulation

Other provision services

Provision ecosystem services result from ecologic processes (or functions) that produce tangible/material goods which are somehow useful and produce well-being.

Method(s) used: Replacement Cost Method (RCM)

Results

Dependency:
Scenario 1: BRL 1.12 million
Scenario 2: BRL 1.16 million
Scenario 3: BRL 1.17 million

Impact:
Scenario 1: BRL 1.27 million
Scenario 2: BRL 1.28 million

Externality:
Not calculated

Data used	Type of data
Target Ecosystem Good (TEG): Palm kernel oil	Primary
Dependency on the TEG demanded: 200 tons/year	Primary

Alternate good: Babassu Oil

Collateral information

Results from physical metrics: Based on literature from the Brazilian Foreign Trade Database – Ministry of Industry, Foreign Trade and Services (MDIC), we found out there is a deficit of 85% of palm kernel in Brazil, considering production, export and import.

Assumptions made in valuation estimates:

- We considered palm kernel productivity as 0.5 ton/ha.
- Oil palm cultivation to meet BASF's demand is 400 hectares.
- We considered babassu oil productivity as 0.112 ton/ha.
- For the scenario of 85% use of babassu oil, the demand in the area is equivalent to 1,518 ha.

Adjustments or derivation applied to the methods and tools adopted: In scenario 3, we included charges on CO_2 emissions, adopting the values charged by New Zealand carbon market (US$ 12.64 per tCO_2), which is the only existing example that charges GHG emissions for agricultural production.

Other pieces of information: The industrial stage in which the oil is refined was not taken into account, since there is no similar information for babassu oil.

Explanatory notes:

References

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- Informações Gerais sobre o babaçu (General Information on Babassu) – Embrapa Meio Norte 2008. Estado da arte e potencial do babaçu para a agroenergia (State-of-the-Art and Potential of Babassu for Agroenergy). In: CONGRESSO BRASILEIRO DE PLANTAS OLEAGINOSAS, ÓLEOS, GORDURAS E BIODIESEL (BRAZILIAN CONFERENCE ON OIL PRODUCING PLANTS, OILS, FATS AND BIODIESEL), 5.; CLÍNICA TECNOLÓGICA EM BIODIESEL (TECHNOLOGICAL CLINIC IN BIODIESEL), 2., 2008, Lavras. Biodiesel: tecnologia limpa (Biodiesel: clean technology). Anais. Lavras: UFLA, 2008.

Global climate regulation

Role played by ecosystems in carbon and nitrogen biogeochemical cycles, thus influencing emissions of important greenhouse gases, such as CO_2, CH_4 and N_2O.

Method(s) used: Replacement Cost Method (RCM)

Results

Externality: Scenario 1: BRL - 318 thousand; Scenario 2: BRL - 461 thousand; Scenario 3: BRL 348 thousand

Data used	Type of data
Net emissions	
Actual emissions derived from deforestation, or environmental degradation, in tCO_2e: Scenario 1: 1,008 t/year	Secondary
Actual removals derived from environmental recovery, in tCO_2e: Scenario 2: 1,460 t/year; Scenario 3: 1,100 t/year	Secondary

Further information

Exchange rate used to convert the Social Cost of Carbon (SCC) into Brazilian Reais: BRL 4,00

Assumptions made in valuation estimates: In this study, the value considered for the Social Cost of Carbon (SCC) was US$ 79.10 (seventy-nine dollars and ten cents), using this value as reference having 2015 as the base year.

Other pieces of information:

- Using secondary data, we came to the conclusion that the transition areas in the Amazon biome where there is babassu palm absorb 0.725 tCO_2/ha.
- For palm kernel, emission data was gathered from secondary data of studies that applied the Life Cycle Assessment (LCA) during the oil palm agricultural stage in Brazil.
- Considering oil palms have a production cycle that lasts 20 years, GHG emissions are estimated as 84 tCO_2 per hectare, or 4.02 tCO_2/ha per year. However, in addition to palm kernel, palm oil is also a product obtained from oil palms. Thus, emissions during the agricultural stage should be allocated for both products - palm kernel and palm oil. To allocate emissions, we adopted the monetary criterion for decision making. Considering the value of palm kernel accounts for 60% of the products obtained from oil palms, that was the proportion used to allocate emissions. Therefore, in this study we considered palm kernel emissions to be 50.4 tCO_2/ha, or 2.52 tCO_2/ha per year.
- For certified oil palms, the estimated sequestration is 55 tCO_2/ha during the oil palm 20-year production cycle, or 1.65 tCO_2/ha per year when allocating to palm kernel.
- For certified farms that must comply with the Forest Code, keeping Legal Reserve areas, the minimum area established by the legislation in the states located in the Amazon region is 50% of the property area. Considering the area demanded for production is 400 hectares, another 400 hectares of native forest would be required to balance production with the Legal Reserve area. For the purposes of this study, we assumed an area in the Amazon Forest located in Para State captures the equivalent to 2 tons of CO_2 per hectare/year.

Analysis of the results

Based on the results of this study, we came to the conclusion conventional palm kernel is the cheapest option. However, when the environmental aspect is taken into account, certified palm kernel shows greater environmental value. This is due to the fact that the Forest Code (Federal Law 12,651 and 12.727/2012) requires rural properties to have at least 50% of their area covered with native vegetation in the municipalities located in the Amazon biome, where there is economic-environmental zoning, considering forests as active contributors for CO_2 sequestration from the atmosphere. And in this case, it is important to see the production unit in the context of its landscape, i.e.; 1:1 proportion between agricultural management and the forest area.

Certified palm kernel scored greater environmental performance when compared to babassu. A larger forest area is needed to meet the company's demand for babassu, but carbon sequestration in those forests is lower when compared to the Amazon forest area. However, it is worth pointing out the study did not valuate the potential social and environmental gain obtained with babassu extraction, which could derive from fair social and environmental extraction activities. The potential financial gain obtained with sharing the benefits with members of the value chain that use this raw material to produce a finished product (Law # 13.123/2015) was not taken into account, although it is a product used from the Brazilian biodiversity.

Use of LCA data in this Valuation of Ecosystem Services (VSE) study pointed to an interesting path of complementarity between these tools and was critical to calculate the externalities obtained in this study.

Ecosystem service management

Use of Ecosystem Services Valuation Results: Risk assessment

Description: According to BASF's internal policy, the goal is to purchase 100% of certified raw materials, in order to ensure the best social and environmental practices in production.

This is a path that impacts business decisions and this study helps understand guidelines to purchase palm kernel, taking into account the externalities caused by its production.

Land use change is one of the greatest factors affecting calculations of palm kernel GHG emissions and, thus, the positive externalities related to carbon sequestration promoted by certified oil palms. Legal Reserve areas located on certified farms are aligned with the company's goals.

Partial replacement of palm kernel oil with babassu oil is a topic the study brought for internal discussion. Since we understand there is some provisioning risk, we will be able to assess eventual action plans to ensure provisioning of that raw material.