

# Product Strategy for Algarrobo.

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<b>Title</b>	Product Strategy for Algarrobo.
<b>Language</b>	English
<b>About SIPPO</b>	<p>SIPPO, the Swiss Import Promotion Programme, is a mandate of the State Secretariat for Economic Affairs, SECO, within the framework of its economic development cooperation. It is carried out by Osec, the official Swiss foreign trade promotion agency.</p> <p>The programme helps SMEs in developing and transition countries to gain access to the Swiss and European markets by providing information, training courses and other matchmaking services. SIPPO also assists importers from Switzerland and the European Union with finding suitable partners and high-quality products from selected developing and transition countries. The programme has five main goals:</p> <ul style="list-style-type: none"> <li>• To inform the Swiss and European import economy about new market sources</li> <li>• To strengthen trade institutions and business sector associations in the trade promotion process</li> <li>• To increase the competitiveness of SMEs in selected partner countries</li> <li>• To develop the manufacturing and exporting skills of SMEs in selected partner countries</li> <li>• To establish qualified trade contacts between SMEs from emerging markets and markets in transition and the Swiss and European import economy</li> </ul>
<b>Report Content</b>	<p>Within the scope of the project Perubiodiverso, an initiative supported by the State Secretariat for Economic Affairs (SECO) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH (german cooperation), in convention with the Ministry of Foreign Trade and Tourism (MINCETUR), the Peru Export and Tourism Promotion Board (Promperu) and the Ministry of the Environment (MINAM), SIPPO is mandated to support Peruvian companies in accessing the European market. In this context, SIPPO compiled product strategies for: Maca (<i>Lepidium ssp.</i>), Sacha inchi (<i>Plukenetia volubilis linneo</i>), Tara (<i>Caesalpinia spinosa</i>), Aguaymanto (<i>Physalis peruviana</i>), Algarrobo (<i>Prosopis ssp.</i>), Camu Camu (<i>Myrciaria dubia</i>) and Native cacao (<i>Theobroma cacao</i>).</p>
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### List of abbreviations

API	Active Pharmaceutical Ingredient
APOs	Asociaciones de Productores Organizados
EOI	Expression of Interest
FAO	Food and Agriculture Organization
Ecocrop	Database by FAO AGLL., Tool to identify plant species.
FLO	Fairtrade Labelling Organization, Fair Trade International (Bonn, Germany)
GACP	Good agricultural and Collection Practice
GIZ	Gesellschaft für Internationale Zusammenarbeit, Eschborn, Germany
GMP	Good Manufacturing Practice
HACCP	Hazard Analysis and Critical Control Points, see Codex Alimentarius and ISO 22000
HR	Human Resources
KFPE	Schweizerische Kommission für Forschungspartnerschaften mit Entwicklungsländern (Bern, Switzerland)
R&D	Research and Development
MRI	Maximum Residue Level
MSDS	Material Safety Data Sheet
PBD	Perúbiodiverso (Phase I, Phase II)
REACH	Chemical legislation in European Union (Registration, Evaluation, Authorization and Restriction of Chemicals); European Community Regulation: Regulation (EC) No 1907/2006
SECO	Swiss States Secretariat for Economic Affairs
SIPPO	Swiss Import Promotion Programme (under Osec)
SMEs	Small and Medium-size Enterprises
SNV	SNV Netherlands Development Organization
SWOT	Analysis of Strength, Weaknesses, Opportunities and Threats
TDS	Technical Data Sheet
UN	United Nations
WHO	World Health Organization

# 1. Product relevance.

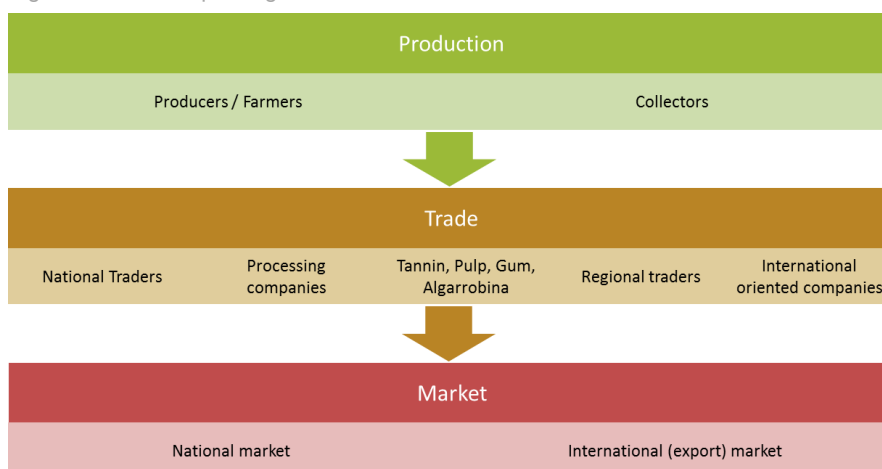
**Algarrobo, *Prosopis pallida*** (H. & B. Es Willd.) H.B.K. (syn. *P. limensis*) belongs to the family Leguminosae (Fabaceae), sub-family Mimosoideae, and is native to Central and South America. The species is described in Flora of Peru by Macbride (1943) and referenced to Burkart (1940) as *P. chilensis* (leaflets longer than 16mm) and *P. limensis* (leaflets shorter than 12 mm). It is also known American carob or mesquite (Galera 2000). Especially suitable for arid and semi-arid regions, the species trees or shrubs are fast-growing, drought-resistant and nitrogen-fixing. The Algarrobo tree has greenish-yellow flowers; its fruits are pods and contain small brown seeds.

***Prosopis pallida*** together with ***Prosopis juliflora*** are the two most economically and ecologically important tree species in arid and semi-arid zones of the world. Generally both are similar in terms of flower, pod and leaf morphology as well as tree shape. They are, however, distinct from most other species in terms of these characteristics and mostly geographically distinct from other *Prosopis* species in regards to their native ranges. The equivalent to *Prosopis* species (algarrobo) in the Americas is *Ceratonia siliqua* (Algarroba) in semi-arid regions of the Mediterranean and the Middle East (FAO Ecocrop & Duke 1983)..

The algarrobo bark can be tapped for tannin. Gum exuding from the trunk can be used in glue and varnish manufacturing. The tree is browsed and the pods used as forage for livestock. Algarrobo pods are high in sugars, carbohydrates and protein. In Peru algarrobo pods are ground to flour (algarroba), added to soups and corn meal, made into sweet syrup used to prepare various drinks. The sector map (Figure 1) explains the supply chain and the principal actors in the three distinct categories and functions.

In the national market of Peru, algarrobina (concentrated extract) syrup is used in many typical cuisine recipes as a sweet syrup, and very appreciated for its nutritional and vitamin value. It is used in mixing cocktails and “pisco” (Peruvian grape brandy) preparations. In USA it is well appreciated in gluten-free preparations in cookies, chocolates and candies.

Figure 1. Sector map of Algarrobo



## 2. Product status.

### Introduction to the market

Algarrobo (*Prosopis pallida*) grows both as wild tree and as orchard crop. The production between both varies significantly, ranging from 1 to 8 tonnes per hectare annually. Historically, Algarrobo has not only been a source of food for humans, but also showed high quality as fodder, fertilizer, fuel wood, gum, thickener and for medicinal use, since ancient times. This multiple uses are a result of its high content of sugars, carbohydrates and protein. Moreover, a potential application for algarrobo is as thickening agent in the food industry, due to its content of galactomannan polysaccharide.

Basically, algarrobo is available as powder, extract, gum, syrup, honey, flour, fuel and as dried plant material. In Europe, algarrobo is found mainly as powder exported from Peru to the United Kingdom, Germany and Spain.

The United Kingdom has imported large quantities of algarrobo in the years 2006 and 2010. In the latter year, the Netherlands, Germany and Spain also purchased a high amount of algarrobo flour/powder.

Likewise, organic algarrobo from Peru was mainly exported to the United Kingdom, the Netherlands and Germany, also mostly as flour or powder. Since the trend towards certified products with a traceable origin is strong in Europe, organic or fair-trade certification of algarrobo would add value to the product and spur market interest.

At present, only 5% of all algarrobo pod production is processed, while most (95%) is sold as cattle feed.

Algarrobo uses are clearly related to the principles of sustainable forest management. Promoting the value added manufacturing of algarrobo non-timber by products should be a priority, as a way to discourage indiscriminate logging.

The annex provides more detailed information regarding trade data and production.

Offering new products is the main aim of the cosmetic products industry. Sacha Inchi could be rapidly introduced in European markets by properly vaunting its product value propositions, such as being a natural ingredient, high Omega content and

Amazonian origin. Increasing production and preserving outstanding quality are the key factors to successfully bring Sacha Inchi to the global market.

The annex provides more information on trade figures and characteristics of Sacha Inchi.

### Constraints and opportunities

Constraints are determined by production, processing, regulatory (Peru and Europe) environmental, funding, business, labour and ethics, and market conditions.

In the EU and Switzerland algarrobo enjoys a well established import market. Algarrobo is sold under the name of mesquite as chips for grills, and as Natural Mesquite Smoke Flavour, brand name of USA's One World Foods Inc. In Europe it is also presently marketed as an organic Superfruit product by Planet Bio, for example. In October 2011 however, the UK Trading Standards Institute, the UK Food Standards Agency and the WTO announced that Novel Foods Regulation (EC) 258/97 will be implemented. Therewith algarrobo is considered Novel Food and falls under Article 1(2) (e) of the regulation. Algarrobo can consequently only be legally marketed after a successful application for authorisation.

The main entry barrier to enter European markets is the lack of product information on consumer safety and history of import from before May.

The following SWOT analysis articulates specifically the core needs for export marketing and market entry in Europe. It points out specific bottlenecks in product development, and in documentation concerning compliance with market access standards required by national rules and laws.

Table 1. SWOT Analysis (Biotrade 2005, reviewed by K. Duerbeck 2011).

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Peru is recognized worldwide as an algarrobo supplier.</li> <li>• Income generation for costal desert areas.</li> <li>• Preliminary pharmacological research of aqueous and/or ethanol extracts.</li> <li>• Appropriate legislation governing conservation and sustainable use.</li> <li>• Native communities have ancestral knowledge about the utilization of plants.</li> <li>• Medicinal plants and native natural products could be source of innovation for the development of new products.</li> <li>• High acceptability by population of natural ingredients.</li> </ul>	<p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Lack of standardized scientific information.</li> <li>• Lack of comprehensive research on the use and validation.</li> <li>• Difficulties in domestication due to botanical identification; taxonomic confusion.</li> <li>• Limited R &amp;D for application and costing.</li> <li>• Producers and processors do not implement Good/Best Practices.</li> <li>• Adulteration of products in local market.</li> <li>• Reality gap in enforcing international/regional laws and norms.</li> <li>• Definitions of products</li> <li>• Land ownership (community lands)</li> <li>• Indiscriminate logging for multiple uses.</li> </ul>
<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Widespread worldwide use of algarrobo.</li> <li>• Consumers are aware of the importance of algarrobo for arid areas management.</li> <li>• Implementation of marketing strategies.</li> <li>• Institutional support to companies.</li> <li>• Income generation: a resource for sustainable development in arid areas.</li> <li>• Increased R&amp;D for production, processing, product development and market development.</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Growing competition of other natural ingredients producing countries.</li> <li>• Loss of markets for failure to meet international quality standards and buyer requirements, like hygiene and quality conditions (HACCP, GACP, GMP).</li> <li>• Native natural products are domesticated and cultivated in other countries.</li> <li>• Global presence and use in arid areas.</li> <li>• Novel food status (UK).</li> </ul>

Products from *P. juliflora* and *P. pallida* are important commodities in local economies in many parts of the world. There is also some local trading in other non-timber forest products, mainly honey and exudate gums from *P. juliflora* and *P. pallida*. However, substantial quantities of ‘acacia’ honey from the Americas may actually be from *Prosopis* species. Certified environmentally or socially sound production systems have expanded in recent years in response to increased consumer demand. Organic foods, fair trade goods and sustainably-managed forest products are the main examples, but there is scope for the promotion of goods from arid zones that help ‘green the desert’.

A good market option is algarrobo flour as a gluten-free bakery ingredient. Due to increasing number of cases of celiac disease being diagnosed, more and more people choose to eliminate wheat from their diets as a lifestyle choice. Gluten-free products are on the rise also based on the consumer’s wish to eat healthier, better-for-digestion foods. (Specialty Food Magazine, 2010). A gluten-free ingredient for bakeries, Peruvian algarrobo is marketed by Navitas Naturals in North American markets in conventional and in organic certified forms known as “algarrobo” or “mesquite powder”.



Although impact is currently limited to local markets, these products can be promoted regionally, nationally, or even internationally through certification, trade shows and promotion in a variety of environmentally and socially-sound networks.

Lack of suitable technologies for processing Prosopis tree products has been identified as a limiting factor to further develop the species. For many centuries, trees have been harvested for firewood and post making, and pods collected to feed livestock without further transformation. Rural communities also process the pods into various human foods. As the tree was introduced around the world, these traditional uses and technologies did not follow. Technologies must be developed and promoted to process Prosopis wood and pods that adapt to a variety of situations. There is also a need to develop high-technology solutions to problems associated with the extraction and separation of high value substances, such as galactomannan gums from seed, solvents from the wood and various chemicals and possibly medicinal drugs from gums.

When it comes to algarrobo flour as a bakery ingredient, gluten-free is definitively a good market option. As an increasing number of cases of celiac disease are being diagnosed and more people choose to eliminate wheat from their diets as a lifestyle choice, gluten-free products are on the rise. This \$1.56 billion market is growing not only due to the rise in people with gluten intolerance and celiac disease, but it is also attracting consumers wanting to eat healthier, better-for-digestion foods. (Specialty Food Magazine, 2010)

The objective should not be just to give the poorest in the world's semi-arid regions more firewood, but to create a large market of high value products that can lift them from deep poverty. Prosopis has the technical timber and pod qualities and environmental attributes to be a species of world-wide commercial importance. Scientists and development agents must adopt a balanced approach to research, development and marketing to ensure that such benefits reach the poor people of arid lands who need them.

The following constraints need to be acknowledged before considering opportunities and pathways to improve responses to environmental and natural resource issues.

Table 2. Constraints, opportunities and objectives.

Constraints	Opportunities	Objectives
Resource management and control mechanisms	Access rights/land tenure policy Best practices	Application of improved management interventions
Enabling environment Socio-economic	Market information Access to markets Product quality	Organize access to market information and increase transparency of value chain
Enabling environment Policy	Consumer safety R&D Policy framework conditions Access to credits, subsidies	Documented evidence of consumer safety for export markets
Enabling environment Institutional	HR development and management Access to rural extension	Encourage capacity development in management skills
Enabling environment Production and processing	Land tenure Access to resources Access to R&D	Development and application of processing technologies Product documentation

The most important objective is the evaluation of the “novel food” status of *Prosopis pallida* Algarrobo by products. Once the

novel food application is established preparations from novel foods must face the following requirements, costs and timelines:

Table 3. Requirements, costs and timelines for Novel Food

Requirements	Costs	Timelines
Toxicological tests		
Minimum requirements	- 100,000€	9 months
Full tox package	- 1.2 million €	24 – 36 months
Pre-assessment meeting	6,000 – 9,000 € + 5,000€	3 months
Compilation of file	30,000 – 50,000€	3 months
Initial evaluation of national authority	0 – 25,000€	6 – 12 months, or longer
Final opinion by EU Commission		6 – 36 months
Total	136,000 – 1.3 million €	27 – 90 months

Source: Armbruster, a&r (2011), modified by K. Duerbeck 2011

Additional consultant costs may arise once if data have to be filed before the national authority and/or EU Commission.

### **Risks and constraints**

The greater uncertainties are in market supply and demand. As markets become increasingly global and complex international supply network relationships emerge, the result is higher exposure to risks in the supply chain, including disruption and decision risks. Four categories of risk (supply, process, demand, and control) have a direct impact from the standpoint of environmental risk and its management. Production risks include:

- Difficulties in assuring raw material supplies
- Poor quality of raw materials
- Poor supply chain risk management processes
- Vulnerability (logistics, extent, elements at risk and why, people and their locations at risk)
- Degree of resilience in natural resource management and logistics
- Lack of supply chain confidence
- Lack of visibility
- Lack of supply chain controls

Producers also face difficulties in approaching international markets due to poor reputation of the country, and therefore its companies, and complicated and lengthy export procedures.

### **Trade barriers**

European product requirements and specifications, and European companies' own internal control systems, are constantly expanding (e.g. API, REACH, GACP, GMP etc.). More strict EU regulations have a direct effect on the market of supplier services for finished products. To sell their produce in Europe exporting companies must comply with regulations based on international guidelines provided by different UN organisations (WHO, Codex Alimentarius of WHO/FAO), or otherwise identify new markets outside Europe which might be easier to penetrate.

Although some actors in the supply chain may regard consumer safety considerations and requirements as non tariff trade barriers, they are a requisite for international marketing.

## 3. Product strategy.

The aim of the SIPPO product strategy is to achieve consistency of Perúbiodiverso II (PBD II) with SIPPO's indicators. It also seeks to develop a common platform for any other potential project and business partners that SIPPO may work with so that they can develop separate interventions and still be consistent with this strategy.

Such a strategy may appeal to SECO and enable them to use this paper as a unifying document for the selected products. The bulk of data and analysis comes from the sub-sector analysis done by Biocomercio & Perúbiodiverso in recent years.

The strategies for the products preselected by PBD II will revisit earlier recommendations for entering European markets using the following filters:

- market access
- achievable target for March 2013, and
- work planning for 2013 and beyond.

Our SWOT analysis allows identifying short and long-term strategies to leverage true strengths while simultaneously mitigating those weaknesses that might create significant disadvantages.

The short-term strategies should concentrate their efforts on R & D to meet the product documentation required to expand the product's market first in Peru and then in international markets, paying attention to the two types of algarrobo in Peru from the northern (Piura) and southern (Ica, not PBD) regions.

In the longer term, a strategy to conduct a comprehensive review of the value chain can help to eliminate structural weaknesses, which significantly hinder greater competitiveness.

The principal weaknesses to be considered are the lack of international and national research about resource management, use and validation of therapeutic results, land tenure systems and local culture, and fiscal and sanitary requirements.

Clearly, greater emphasis must be placed on R & D as a strategic priority for product development. Since the volumes

involved are not too large, SIPPO recommends increasing exports should be adopted as a secondary strategic component of the strategy.

Given the constraints mentioned so far, SIPPO sees three core elements of R & D of the product strategy to achieve this target:

- An increase in collection and production
- An increase in the value addition of exportable products by increasing the share of certified products
- Moving up the regional and national value chain for extraction of active principles national level
- Develop a promotional strategy that supports these initiatives through creating greater awareness in international strategic markets of the value proposition of Peruvian algarrobo's health benefits.
- As seen from the above section, the industry is too small to compete with any economy of scale even when it expands to its full potential. Hence, the option for Peru is to utilize a focused strategy in terms of cost or through differentiation by price for conventional, organic, and/or fair trade markets.

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## 4. SIPPO Focus.

### Guiding criteria

This section explains where SIPPO will focus its attention along the value chain to have the greatest possible impact on the industry’s competitiveness and export orientation.

Clear guiding criteria for the intervention area are articulated by the three questions that follow. They should help identifying the greatest impacts that can be gauged through SIPPO’s indicators:

- Is the desired change feasible for the selected target group?
- Can the project output be delivered in a sustainable way?
- Can this be done in the time frame and with available project resources?

Building on this rationale/logic SIPPO establishes a plausible hypothesis on the sector’s evolution. SIPPO’s facilitator/national expert will focus on local governance, environmental education and awareness through institutional strengthening with and among resource owners and users.

Table 4. Assessment of market-based solutions

Type Value Chain Constraint/Opportunity	Identified potential market-based and commercially viable solutions
Product Development and Registration	<ul style="list-style-type: none"> <li>• Organize training courses for personnel of companies in quality standards, export requirements, new technologies, and product documentation based on own available data.</li> <li>• Promote the domestication of selected plant species that have become endangered or vulnerable in the wild</li> </ul>
Service Providers	<ul style="list-style-type: none"> <li>• Assist sector service providers, such as consultancies, research institutions, to improve service capacities</li> <li>• Support promotion of authentic products</li> </ul>
Organization and Management	<ul style="list-style-type: none"> <li>• Encourage companies to introduce business plans and management plans and to implement good practices</li> <li>• Organize trainings for producers on development of management, marketing and business plans</li> </ul>
Regulatory (Policy)	<ul style="list-style-type: none"> <li>• Support national legislation development in accordance with UN guidelines and to enable its appliance</li> <li>• Generally improving the business enabling environment</li> </ul>
Finance	<ul style="list-style-type: none"> <li>• Micro-finance schemes for collectors and companies</li> <li>• Identification of service providers for access to finance</li> </ul>
Input Supply	<ul style="list-style-type: none"> <li>• Promotion and support of cultivation of plants, especially threatened, vulnerable and endangered plant species</li> <li>• Conservation of traditional knowledge and practices</li> </ul>
Infrastructure/Human Resources	<ul style="list-style-type: none"> <li>• Collectors training</li> <li>• Logistics</li> </ul>
Business Membership Organisation	<ul style="list-style-type: none"> <li>• Keep permanent dialog and cooperation among all stakeholders in the value chain</li> <li>• Strengthen sector work and develop into competent sector representatives on national, regional and international levels</li> <li>• Organize education trainings</li> <li>• Leverage associations to provide services and generate income</li> </ul>

The assessment of market-based solutions should result in identification of:

- a) Existing service providers: agricultural extension service consulting firms, institutes, etc.
- b) Existing and potential users: collectors, farmers, companies, etc.
- c) Constraints to provision (by type of service provider)
- d) Proposed providers of sustainable market-based solution
- e) Commercial feasibility of market-based solution (by service provider type).

The two major targets that can guide establishing priorities in choosing market-based solutions are the potential value chain growth resulting from an expansion of raw material production, and the enhanced competitiveness and greater number of SMEs in the target group that will directly and indirectly benefit from this initiative (outreach potential).

### **Supply and strategy**

The main characteristics of the supply situation of Peruvian companies were described earlier in the strategy and are the following:

- Need to assess the production area and expand it (agriculture, forestry and wild collection)
- Technological development leading to well prepared product documentation
- Building better working and business environments, including R&D services
- Raising interest of authorities to become more actively involved in this industry
- Further develop a legal framework based on international guidelines,
- Sector marketing focusing on the fragile ecosystems where raw materials are procured.

Visibility and control can be achieved through better and more documentation, transparency and open pro-active communication all along the supply chain. Such transparency will eventually also become visible in consumer markets. Certified labelling or verification framework help to preserve trust along the whole supply chain. Over the long term fair trade certification for these products will help to mitigate any supply risks.

### **Partners**

For this plant species, SIPPO's limited contribution should place great emphasis on the national core partners when implementing the PBD II project's interventions:

- Intervention: R&D engaging the universities in Piura and Cajamarca, including the Algarrobo Herbarium in Cajamarca for resource management and product development beyond raw material exports.
- Intervention: Implementation of market access requirements based on national legislation. With this intervention, PBD would act as a facilitator and link between service providers and companies.
- Intervention: Export promotion in partnership with PromPeru, which gathers export oriented MAP companies and supports the IPPN organic resources industry association.
- Other interventions: PBD will work on identifying other partners by type of intervention, for example, regarding assistance in drafting national legislation together with partners from the concerned government agencies, etc.

## 5. Interventions.

The interventions considered in the context of this product study are primarily part of component II in Perúbiodiverso II. Component I will get included once the company and product documentation becomes available.

### Ongoing interventions.

Identification of new companies: The purpose of this activity is to increase the impact of the interventions to as many companies as possible so that all good export-ready companies in Peru can profit from better market access.

Collaboration with IPPN as the sector association and PromPeru: The sector associations so far have always had difficulties because they were not able to build up trust and get enough funding for their activities.

### Types of interventions needed

The overall objective of this PBD II SIPPO project is to enhance the export readiness and competitiveness of involved companies and therefore help to alleviate poverty in the partner countries. In order to measure these objectives similar indicators should be used as in other SIPPO activities, including increased sales or exports, increased revenues and employment, diversification of markets, products and services, and larger number of participants attending promotional events.

Two interventions were identified, namely implementation of market access requirements and the preparation to access markets. Although interventions to prepare access to markets are much closer to SIPPO's daily business, they are a priority for the plant species discussed in this paper.

### Sequencing of SIPPO interventions

After mapping the productive environment, human resources and miscellaneous basic infrastructure needs, and determining the categories of interventions, the context and the sequencing of activities, it will be required to identify access opportunities, available service providers, and leading firms. After the first intervention the number and expertise of the leading firms is expected to unfold and develop. The leading firms and the service providers may vary for the different interventions and their sequencing.

Consistent with their temporary nature, the interventions need to define a clear exit strategy from the beginning. The access

strategy must be linked to the achievement of the development objective, as for instance the establishment of sustainable service providers for the target group of companies.

Desertification can only be reversed if economic value can be given to arid zones. This involves the production, processing and commercialisation of desert crops. Tree planting has been largely promoted for its positive effects on the environment. However, these reasons are not immediate priorities for land users. Only trees which produce financial returns have been widely planted by farmers.

The detailed portfolio of services of PBD II is available in the context of Estrategia del Proyecto Perúbiodiverso para Empresas y Asociaciones de Productores Organizados (APOs) as implementation pathway on company/APO level.

### Ranking and prioritization of issues

During the stakeholder meetings, the expert presented the "gap analysis" findings including the prioritization on the basis of the identification of potential market-based and commercially viable solutions. These are all to be based on the new focus of research and development along the value chain for *Prosopis pallida* with special emphasis on:

1. Developing products and the corresponding supporting documentation.
2. Implementing market access requirements based on national norms and legislation.
3. Promoting exports.
4. Assisting service providers .
5. Organizing training courses .
6. Creating an enabling environment (national and international).
7. Encourage stronger business planning.

The stakeholder meeting reviewed the expert's findings and recommended to include R & D for product development and documentation and access to markets in the national priority listing.

Table 5. Priority matrix.

Interventions	Aim	Actor	Time	Lead by
<b>Producer performance</b>				
<b>Identification of R&amp;D inputs</b>	Claim substantiation for botany, chemistry, use, novel food	National research institutions, universities	April 2011 - March 2013	PBD
<b>Product development: Elaboration of production/process parameters</b>	R&D for MRL, HACCP, Codex Alimentarius requirements, audit and certification/ verification	National research institutions, universities	April 2011 - March 2013	PBD
<b>Product documentation</b>	Product profiles, specifications, TDS; and if required, MSDS	Companies, national service providers	June 2011 – June 2012	PBD
<b>Resource management</b>	Sustainable resource management and raw material procurement, including financial resources	Companies, national service providers	August 2011 – March 2013	PBD
<b>Market development</b>				
<b>Access to market</b>	Market entry in Switzerland and European Union through trade fair participation and trade missions.	PromPeru, SIPPO	May 2011 – March 2013	SIPPO

In the course of the first two interventions, a number of raw ideas will be validated and result in new interventions. For additional interventions new sourcing and funding can be made available by national interest groups, service providers or national government and donors.

#### **Intervention pipeline**

**First Intervention:** Product development and documentation. Based on the findings of national and international research on algarrobo, resource management, product development, and product documentation have been identified as the main constraints for the companies. Due to changes in international regulatory requirements, product documentation is identified as a main constraint in accessing (international) markets.



Impact Logic		Indicators of Impact Logic
Activity	R&D	Sustainable resource management, product development together with communities and companies, to identify products and parameters
Output	Documentation	Documentation for companies and products (e.g. registration, brochures, business contact sheets) Marketing strategy
Use of output	Contacts Offers	Market research and intelligence Contacts, marketing activities
Outcome	Contracts, orders	Pre-fair: company/product documentation, trade fair tools Fair: booth presentation, HR, contacts documentation, EOI Post-fair: contacts, EOI, trail orders, contracts
Impact	Sales	Increased turnover
Aggregated impact	Increase of employment	Increased number of jobs

Table 6. Impact logic and indicators for impact logic for sustainable procurement.

The Results Chain for this intervention with indicators at each level is as follows:

Table 7. Indicators and measurements used

Indicators	Measurements used
R&D results	Completeness of documentation for national and international product marketing
Documentation	Preparation of companies: TDS, MSDS, cost /price calculation
Marketing strategy	Brochures, posters, website, language, company visibility
Market research	Number of new ideas gained and quality/ technology/ marketing improved
Expression of interest	Number of offers sent
Orders and contracts	Number of contracts signed and orders made
Increased sales and turnover	% of business growth
Increased employment	Number of new workers hired after intervention

R&D interventions for product documentation and registration require support and leadership from PBD, specifically for sustainable resource management and product documentation to be executed by components 2 and 3 of PBD II.

### Second Intervention: Access to market

The implementation of market access requirements is based on national and international legislation. Market access is one of the main constraints for algarrobo companies. Beside algarrobina extract, the only recommended value adding activity is to get (organic and fair trade) certification. A combi-

nation of long standing raw material procurement and new extraction companies should be featured at the trade shows, exhibiting a diversity of products, i.e. not only raw materials, but also algarrobo ingredients for tanning, food and pharmaceutical applications should be present at national (PeruNatura) and international (Biofach) trade shows.

Table 8. Impact logic and indicators for impact logic for product documentation.

Impact Logic		Indicators of Impact Logic
Activity	Trade fair	Preparation for trade fair
Output	Documentation, Market entry strategy	Documentation, (e.g. brochures, business contact sheets) Marketing strategy
Use of output	Contacts Offers Contracts, orders	Market research, intelligence Contacts, marketing activities Pre-fair: company/product documentation, fair presentation tools Fair: presentation format, booth, HR, documentation, EOI Post-fair: contacts, EOI, trial orders, contracts
Outcome	Contracts, orders	Pre-fair: company/product documentation, tools for fair Fair presentation format, booth, HR, documentation, EOI Post-fair: contacts, EOI, trial orders, contracts
Impact	Sales	Increased turnover
Aggregated impact	Increased employment	Increased employment

The Results Chain for this intervention with indicators at each level is as follows:

Table 9. Indicators and used measurement within the result chain.

Indicators	Measurement used
Preparation for and participation at trade fair	Completeness of documentation; sample preparation of samples; booth arrangements; marketing strategy
Documentation	TDS, MSDS, price calculation, business contact sheets
Marketing strategy	Brochures, posters, website, language, company visibility
Market research Marketing activities	Number of new ideas gained and quality/ technology/ marketing improved, contacts established, brochures distributed, mailings campaigns done
Trade fair follow-up	EOI, number of offers sent out, contracts signed and orders made
Increased sales and turnover	% of business growth
Increased employment	Number of new workers hired after intervention

Two categories of interventions were studied, i.e. (1) producer performance, and (2) market development. A target group for each intervention is specified consisting of leading firms and core companies, and companies identified for the outreach initiative.

The following firms have been identified for different algarrobo products and interventions 1 and 2:

- Value addition through (organic/fairtrade) certification:
  - Algarrobos Orgánicos, Santa Maria de Locuto, Piura
- Extraction of active principles
  - Somerex, Lima, for liquid extracts
  - Fitofarma, Lima, for spray dried extracts.

These leading firms are considered the main pillars of PBD II in Peru, as they are blazing the trail way for sector companies in their respective business association, in building communications bridges with local service providers and, most importantly, in creating an enabling business environment.

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## 7. Annex.

### Algarrobo - use and production

Algarrobo, known by its scientific name *Prosopis pallida*, belongs to the family Leguminosae (Fabaceae), subfamily Mimosoideae. It is native to Central and South America. It is also known American carob. Especially suitable for arid and semi-arid regions, its trees and shrubs are fast-growing, drought-resistant and nitrogen-fixing. The algarrobo tree has greenish-yellow flowers; its fruits are pods and contain small brown seeds.

With naturally occurring hybridization, which is thought to occur in the overlapping ranges of *P. pallida* and *P. juliflora*, and the great variation within and between varieties, forms and land races. Few taxonomists world-wide could claim to be able to differentiate between these two species. The Mexican form is probably *P. juliflora*, the Peruvian form is likely to be *P. pallida*. The centre for *P. pallida* is clearly in Peru.

The genus *Prosopis* (44 species recognized) is described by Pasiecznik et al. (2001) and is grouped under the section "Algarobia" as part of the series Pallidae and characterized by two forms ("forma pallida" for Southern Peru (named "huarango") and "forma armata" for Northern Peru (named "algarrobo") by Pasiecznik et al. (2001). Technical support in identifying *Prosopis* species is provided by Pasiecznik et al. in a field guide (2003), and using molecular markers (2005).

Algarrobo grows both as wild tree and as an orchard crop. Historically, algarrobo has been a source of food for humans. Algarrobo pods are high in sugars, carbohydrates and protein. In Peru algarrobo pods are ground to flour. Further, algarrobo pods can be boiled to syrup and fermented beverages as substitutes for beer and wine. Algarrobo pulp flour can be converted into an instantly soluble powder, which can be used as thickener in the food industry. Roasted algarrobo is, moreover, a good-tasting and cheap substitute for coffee.

*Prosopis* from Northern Peru has a longstanding record with the Swiss Commission for Research Partnership with Developing Countries with dates back to late 1982. The different phases of the research partnership between the University of Piura and the Institute for Food Science of the ETH Zurich included as well other institutions like the Instituto Geofísico del Perú, Instituto de Hidráulica e Hidrología (UDEP), and research institutions in Europe and USA. (KFPE 1998)

Research work at ETH is well documented in the work by Daniel Mayer (1985), and by Gaston Cruz (1999). It is part of the FAO publication on "The Current State of Knowledge on *Prosopis juliflora*" (1988).

At present, *P. pallida* is recognized as one of the main native forestry species in tropical dry forest ecosystems in Northern Peru. Moreover, UNESCO has recognized the Northwest Biosphere Reserve located on the northern coast of Peru in Tumbes and Piura departments. The area straddles the Ecuadorian dry forest and the tropical Pacific forest, both presenting highly diverse flora and fauna. To summarize, algarrobo is a tree that has brought large benefits to the people of Peru since ancient times, due to its multiple qualities as food, fodder, fertilizer, wood and for medicinal use.

Moreover, algarrobo trees are thought to be able to bind moisture and counter erosion, a relevant property for the desert area west of the Andes in southern Peru.

Algarrobo grows both as wild tree and as an orchard crop. The production between both varies significantly between one and eight tons per hectare annually.

Historically, Algarrobo has not only been a source of food for humans, but also showed high quality as fodder, fertilizer, fuel, wood, and source of gums, thickeners and for medicinal drugs. At present, only 5% of total production is processed, while most (95%) is sold as animal feed (Cruz, 2008).

Tannins can also be extracted from algarrobo bark while gums exuding from the tree trunk can be used in making glues and varnish. The tree is browsed and the pods are used as forage for livestock.

Algarrobo pods are high in sugars, carbohydrates and protein. In Peru algarrobo pods are ground to flour, added to soups and corn meal, made into sweet syrup used to prepare various drinks. The flowers are a source of honey. Algarrobo pulp flour can be converted into an instantly soluble powder, which can be used as thickener in the food industry. Moreover, algarrobo plays also an important role as substitute for cocoa as powder or as a good-tasting and cheap substitute for coffee, when roasted. The tree is suitable for afforestation of hot dry areas of high salinity. Thornless varieties are plant-

ed for shade and as ornamentals, and it has been regarded as a possible agroforestry species (FAO).

Algarrobo flour is used as a bakery ingredient because it is gluten-free and therefore definitively a good marketing option. As an increasing number of cases of celiac disease are being diagnosed and more people choose to remove wheat from their diets as a lifestyle choice, demand for gluten-free products rises. This \$1.56 billion market is not only growing due to the rise in patients with gluten intolerance and celiac disease, but it is also expanding to consumers wanting to eat healthier, better-for-digestion foods. (Specialty Food Magazine, 2010).

Algarrobo fruit is high in sugars, carbohydrates and proteins. (Tables 10 and 11).

Table 10: Mineral and vitamin composition of pulp from *P. pallid* pods

Minerals	g/kg dry matter	Vitamins	mg/kg sample
Potassium	26.5	Vitamin A	Not detected
Sodium	1.1	Vitamin E	5
Calcium	0.8	Vitamin B1	1.9
Magnesium	0.9	Vitamin B2	0.6
Copper	Trace	Vitamin B6	2.35
Zinc	Trace	Nicotinic acid	31
Manganese	Trace	Vitamin C	60
Iron	0.3	Folic acid	0.18

Source: Cruz et, 1987, see Pasiecznik, N. M. (2001) p. 88

The main soluble component of the pulp is sucrose (46%), accounting for over 90% of total soluble sugars, while the reducing sugars (glucose, fructose and xylose) are present in very small amounts. With more consumers interested in low-glycemic foods, new alternative, all-natural sweeteners like Stevia stand to change the face of sugar-free labelling. (Specialty Food Magazine, 2010). Mesquite derivatives could be an interesting alternative in this field.

Further, their fat content is low and all in all these facts confirm a considerable human food value.

Table 11: Composition of *P. pallida* pulp

Component	g/100g dry matter
Total soluble sugars	48.5
Total dietary fibre	<b>32.2</b>
Protein (N x 6.25)	8.1
Fat	<b>0.8</b>
Ash	3.6

Source: Cruz et, 1987, see Pasiecznik, N. M. (2001) p. 88

The ground endosperm of algarrobo seed consists partly of polysaccharides, similar to those in locust bean and guar gums. Prosopis seed gum, also called mesquite seed gum, has potential application as thickening agent in the food industry, due to the presence of galactomannan polysaccharide. The gum was found to produce higher amounts of propionic acid compared with tara and carob gum. In sum, Prosopis seed gum could be used as a source of soluble dietary fibre. Although algarrobo gum is not yet produced to a high commercial scale, increasing production is feasible.

## Trade

Due to very limited information about European imports of algarrobo, the following data tables present figures for Peruvian exports as an indication of recent trade evolution.

As the table below shows, the United Kingdom was the largest buyer of algarrobo in 2006 and 2010. The Netherlands, Germany and Spain imported a large amount of algarrobo flour/ powder in 2006.

Peruvian organic algarrobo flour or powder is also mainly distributed in the United Kingdom, the Netherlands and Germany. However, since the trend towards certified products with a traceable origin is growing in Europe, organic or fair-trade certification of algarrobo adds value to the product and makes it more interesting to the market.

In addition, because algarrobo is not registered as specific product in the European trade statistics, different trade guidelines have to be followed, depending on the algarrobo product, i.e. as food, thickener, gum and fuel. SIPPO guidelines are relevant in this respect.

Table 12. Exports of algarrobo from Peru to European countries in 2006 and 2010.

ALGARROBO		2006		2010		Total 2006-2011*	
Peruvian exports to:	FOB value US\$	Net weight Kg	FOB value US\$	Net weight Kg	FOB value US\$	Net weight Kg	
Poland			1,460	200	1,460	200	
Italy	1,131	375	480	161	3,982	1,048	
Czech Republic					482	57	
Germany	11	3	6,483	1,081	10,266	1,596	
Belgium	11	1	114	92	313	209	
Spain	499	126	2,581	882	10,026	2,939	
France	13	1	1,407	159	3,550	478	
The Netherlands	40	4	10,540	1,730	27,891	4,355	
United Kingdom	5,214	768	16,454	2,640	65,046	10,108	
Sweden	9	1	869	117	921	159	
Switzerland	165	20			994	169	
Luxemburg					3	1	
Norway			0	1	0	1	
Ireland					299	30	
<b>Total</b>	<b>7,093</b>	<b>1,299</b>	<b>29,588</b>	<b>7,063</b>	<b>120,724</b>	<b>21,350</b>	

Source: PromPeru, \*Data 2011: until April

Table 13. Exports of organic algarrobo from Peru to European countries in 2010.

Organic Algarrobo	2010		Total 2006-2011*	
	Peruvian exports to: FOB value	Peruvian exports to: value	Peruvian exports to: value	Peruvian exports to: value
France	1,305	150	2,900	350
The Netherlands	10,540	1,730	27,585	4,325
Germany	6,000	1,000	8,438	1,310
Poland	1,460	200	1,460	200
Sweden	779	75	779	75
Norway	0	1	0	1
United Kingdom	9,399	1,630	24,748	4,480
<b>Total</b>	<b>29,483</b>	<b>4,786</b>	<b>65,910</b>	<b>10,741</b>

Source: PromPeru, \*Data 2011: until April

As the numbers in Table 14 show, the exports are increasing between 2006 and 2010.

Since Algarrobo is not registered as single product in the European trade statistics different trade guidelines have to be followed - depending on the Algarrobo product, varying from food, to thickeners, gums and fuel. Please refer to the relevant SIPPO guidelines.

Table 14. Exports of organic algarrobo from Peru by value and weight, for the years 2006 to 2011\*.

Organic algarrobo		
Years	FOB value US\$	Net weight Kg
2006	5,673	990
2007	35,484	12,360
2008	16,112	2,692
2009	72,868	13,045
2010	76,994	12,853
<b>Total</b>	<b>207,131</b>	<b>41,940</b>

Source: PromPeru, \*Data 2011: until April

### Trends and perspective

The wide range of uses for algarrobo has already been mentioned and is completed with the figure below, which presents all the potential uses of algarrobo identified by the University of Piura.

Algarrobo imports into the EU and Switzerland are well established under the name of mesquite as chips for grills, and as Natural Mesquite Smoke Flavour, a brand imported from USA (One World Foods Inc.). In Europe it is presently marketed as an organic Superfruit product (for example, by Planet Bio). In October 2011 however, the UK Trading Standards Institute, the UK Food Standards Agency and the WTO announced that Regulation (EC) 258/97 will be implemented and therefore algarrobo is considered Novel Food. This news has led to a drop in exports to the European market. Since novel foods and food ingredients may only be marketed if they applied for the regulation and have been evaluated and authorised under the procedures defined in the regulation, such as: the product (a) does not present a risk to the consumer; (b) shall not mislead the consumer; and (c) is not nutritionally disadvantageous compared with other foods that it might replace in the diet. For further information: [novelfoods@foodstandards.gsi.gov.uk](mailto:novelfoods@foodstandards.gsi.gov.uk).

A major difficulty to penetrate European markets is the lack of product information on consumer safety and a history of imports from before May 1997 that could establish the fact that the novel food regulation of EU is not applicable.

The figure shows the products originating from the different parts of the algarrobo tree, such as the processed end-products from seeds or algarrobo pulp by products.



Figure 2. Potential uses of the algarrobo (Prosopis) pods

Prosopis pods		
<p><b>PULP (56%)</b> Exo- and Mesocarp</p> <p>Applications/use: Syrup Pulp flour Coffee substitute Alcohol by fermentation Protein enriched flour Bakery and extrusion-cooking products Dietary fibre Animal feed</p>	<p><b>ENDOCARP HULLS (35%)</b></p> <p>Application /use: Fuel Forage</p>	<p><b>SEEDS (9%)</b></p> <p>Seed Coat(20%)</p> <p>Endosperm (32%) Application/use: Gum</p> <p>Cotyledon (48%) Application/use: Protein, Concentrate</p>

Source: Cruz Alcedo (1999), modified by K. Duerbeck (2011).

In sum, algarrobo by products can be put to multiple uses. Moreover, the tree's constitutional support, ecological regeneration and conservation potential are significant. However, the potential of the tree has to be considered adequately and sustainable management researched to provide the farmers of Peru with interesting opportunities to penetrate European markets.

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