

3.3 CLUSTER CONCEPT AND STRAEGY

3.3.1 Cluster concept

The industrial sector creates higher added value per capita than the agricultural sector. As a result, it is essential to increase industry's participation in a country's economy so as to attain constant growth, in particular for one with a per capita GDP less than US\$10,000. In Paraguay, the industrial participation in GDP, however, has fallen since the 1990s and per capita GDP has stagnated. On the other hand, the broader agro-industrial sector, including wood products and cotton, accounts for 80% of the industrial sector in production and added value generated. Hence, agro-industry's development plays an important role in the economic development of Paraguay.

Although soybeans and cotton have a comparative agricultural advantage, the agro-industry is not taking advantage of them due to the sector's lack of internal and external connections. In the world economy, more importance is given to competition in the same industrial bases, which must be able to produce both competitive products and low-cost products of quality. Here, what is called the industrial base is a "cluster" of industries and businesses that are direct or indirectly related. The industrial competitiveness depends on productivity development in the clusters, the essential factor that supports long-term competitiveness.

The development of agro-industry not only increases generally the added value of the industrial sector but also broadens the agricultural market. At the same time, the development of clusters creates a favorable capital absorption cycle which results in more clusters' development. In this manner, the formation of appropriate clusters and the strengthening of competitiveness will follow as an effective micro-level strategy for the economic development of Paraguay. The three following development strategies are important:

(1) Cluster based on the agro-industry

A more effective strategy is the exploitation of existing advantages. In this area, it is better to take advantage of the agricultural potential - one of the country's strengths - that can increase the added value of products. A realistic option is an industrial development centered around the agro-industry with its existing productive base. This implies a focus on agro-industrial clusters, a union of agriculture and industry.

(2) Strategically important clusters firstly

Many clusters can be considered to link agriculture and industry, as the economy needs immediate

improvement. However, it is more realistic to select the strategic clusters and begin with them, given the limited amount of human resources and funds in central and local governments.

(3) T-form links to strengthen them

As supply chains, the clusters in Paraguay have weak connections between related companies. Many world producers of raw materials better the competitiveness of their agro-industrial products through vertical integration. So, an important way to develop clusters is to facilitate the vertical integration between related sub-sectors. On the other hand, the "downstream" companies tend to be small and have difficulties to attain scale benefits and government assistance. Hence, it is also important to strengthen the horizontal relation between companies of the same sub-sector so as to get integration benefits, and it is necessary to give appropriate aid to "downstream" companies.

3.3.2 Cluster selection

The selection of clusters should be made based on the production of raw materials and the processing. After examining the production potential of 32 types of agricultural raw materials, the following 13 were selected: soybeans, wheat, corn, sorghum, mandioc, cotton, oranges, melon, tomatoes, paraíso gigante, cattle, pigs, and chickens. For processing, we examined the production potential (technology, equipment and experience), the export competitiveness and the capacity for generating added value. Also, we evaluated which clusters support the agro-industry. As a result, six high-priority clusters were selected which are shown in the following table.

Table 24 Outline of Clusters

⊙ high ○ very high □ normal

Cluster	Raw Materials	Final Products	Target Market	Quality Competitive-ness	Price Competitive-ness
Mixed Feeds Cluster	Expeller of soybeans, corn, mandioc, wheat bran	Chickens, pigs, milk products	MERCOSUR countries, Chile and Bolivia are promising. Other Latin American countries, EU and Russia are possible.	○	⊙
Vegetables Cluster	Tomatoes	Tomato paste	Short-term competitiveness in North Argentina due to low distribution costs. Long-term potential in EU and US for some products	□	○
Fruits Cluster	Oranges	Orange juice	Natural juice to Brazil and parts of Argentina. Good EU market for concentrate.	○	○
Cotton Cluster	Cotton	Cloth, yarn and cotton pants	Argentina and Brazil for yarn and cotton cloth. Good US market for pants.	□	○
Wood Cluster	Paraíso gigante	Sawed wood, furniture and cabinet materials	Argentina and Brazil for sawed wood. US and Argentina for furniture in mid-term.	○	○
Metal-working Cluster	Junk metal, electricity, iron and steel.	Electric furnace for steel, small machinery, metal products.	At present local market is priority. Brazil is possible for parts, small machinery and metal products in mid-to long-term.	□	○

3.3.3 Cluster strategy

Of the mentioned areas, the mixed feed cluster has the most priority so it is given more importance.

(1) Mixed feed cluster

1) Purpose and current state

The advantage of this cluster is the local production of soybeans and corn, being 20 to 30% less expensive than the market prices of Chicago. Since Paraguay is an inland country, freight cost and service fees are high, which lowers producer prices in Paraguay. If raw materials are exported without any processing, as in the past, value-added will escape. The goal of the mixed feed cluster is increasing the value-added created in Paraguay by raising the level of processing.

At present, this cluster has a production of 3.05 million tons of soybeans, 820,000 tons of corn and 180,000 tons of wheat. Based on these raw materials, the production is some 570,000 tons of mixed

feeds and final products - including 40,000 tons of chicken, 30,000 tons of pork and 390,000 tons of milk. About 90,000 tons of mixed feeds is sold while it is estimated that 480.000 tons of them go locally to poultry and livestock operations.

2) Bottlenecks and benefits

Bottlenecks and benefits of this cluster are as follows.

a) Location

- More than half of existing oil mills are located near soybean producing districts. They have an advantage in location. However, since many of them belong to multinational enterprises, it is doubtful whether those being exported now would be available for domestic sales.
- Milling plants, which are concentrated in the national capital region, may have a slight disadvantage from the standpoint of the cluster's location.
- Since end products have been domestic demand oriented so far, existing plants are around consumer places, which are not originally suitable for the production of chicken, pork and raw milk.

b) Plant management

- Major existing mixed feed plants have the advantage of location. However, even the largest plant produces 150 tons a day, which is medium in scale.
- Only 1 plant produces 5,000 tons of feed a day, which is considered high productivity in Paraguay. Other plants are small in scale and their productivity is low.
- Shipment method affects the cost of feed. Many plants take the method of paper bag shipment, which has the highest cost.
- From the standpoint of supply chain (raw material production - feed production - livestock farming - meat production - exports) the payment of IVA and its repayment are not linked. There are cases that some industries are forced to pay the total amount of IVA, which may weaken their cost competitiveness.

c) Quality standard

- The quality standard of mixed feed is not set officially. The quality of mixed feed on the market is

irregular.

- Meat products, except for beef and dairy products, have not been exported so far. There are concerns whether the products can meet the quality suitable for exports.
- In this cluster, chicken, pork and dairy products are assumed as export products. However, it would be difficult to export them to surrounding countries due to reasons related to animal quarantine and food quarantine

On the other hand, following points can be considered as benefits:

- In Paraguay, raw materials for mixed feed are produced affluently and are supplied at a lower price than the international market price.
- The domestic demand for chicken meat and dairy products is growing rapidly. They can expect not only an enlarged export market but also greater domestic demand.
- There are potential markets in neighboring countries; Chile for pork and dairy products; Argentina for chicken meat.

3) Cluster model

The best location for this cluster is the Departments of Itapúa and Alto Paraná, where raw materials for mixed feeds are widely produced and the main producers of mixed feeds are situated. The importance of the cluster's location in soybean and corn zones is clear with the growth in chicken production in Brazil. In the central western zone of Brazil (next to Paraguay), the production of corn and soybeans is rapidly expanding, as well as the fast-rising production of chickens. This indicates the potential of this cluster in Paraguay.

Supposing that 100,000 tons of chicken or pork were sent abroad, GDP would increase 1.6% due to chicken exports or 3.8% because of pork exports, creating 34,000 jobs in chicken production or 80,000 positions for pork. World demand for chicken and pork is growing more rapidly than demand for beef. In the last ten years, the markets have expanded 83% for chicken and 39% for pork.

Chicken meat is promising. Unlike pork and beef, eating chicken is not prohibited by any religion. Since chicken can be produced efficiently with a small amount of feed and at low cost, its consumption is expanding rapidly in developing countries where income levels are starting to rise. In countries where income levels have been high and beef has been consumed largely, the consumption of beef is declining due to people's health-consciousness, while chicken consumption is increasing. Thus, the potential for chicken is high. When we see the production growth of chicken in a breakdown by district, it is growing sharply in Asia and North and South America.

Compared with Brazil, a chicken exporter, two advantages exist in Paraguay:

- Salary levels are 30% lower here than in Brazil. This is a great cost advantage for labor-intensive production, such as meat slaughtering.
- Lower cost of soybeans to permit a higher soybean proportion in mixed feeds, producing more flavorful chicken at a lower cost.

Other markets for these products can be Japan, United Kingdom, Germany and Spain. They are importing slaughtered meat, rather than whole chickens. This processing requires many workers so, with a 30% lower labor cost, Paraguay has an advantage over Brazil.

4) Strategy

The necessary strategy to strengthen this cluster is:

- Establishment of standards for mixed feed production.
- Elimination of bottlenecks, such as difficult export procedures and the livestock sanitation system (especially the eradication of Newcastle's disease and pork plague).
- Formation of a promotion organization, such as a cluster committee of mixed feeds.
- Publicity for investment promotion.
- Establishment of investment incentives
- Differentiation of mixed feed products.
- Differentiation of products for the selection of varieties.

Aside from offering lower prices, it is necessary to differentiate the products in order to export Paraguayan chicken to Brazil. As one option, Paraguay can differentiate its products with mixed feeds. It can produce chicken with no fishy smell if the proportion of soybean expeller or husks is increased without mixing fish meal, like Brazil and Chile. Also, it is possible to produce more flavorful meat with less bacteria by adding aromatic mixed herbs, such as mint and *estevia*. Since this is already done in Japan and France, Paraguay could also be more competitive in factors other than price if it exported meat with an official label, something like "chicken from Paraguay fed with aromatic herbs". All of this apply also to pork.

The second option is the differentiation based on the selection of livestock. They should give quality meat or milk without requiring special mixed feeds, rather they could consume local inexpensive feeds. For example, it is common to kill a broiler when it increases 2 or 2.5 kg. in 45 to 50 days of care. However, successful cases of rearing varieties of chickens with differentiated meat occur in France and Japan, even though they are not profitable in consumption of mixed feeds.

For pork, the Landrace and Duroc varieties are usual in the world. They grow fast and reproduce well but the Berkshire variety offers better meat. The pork of this variety, known as "black foot pig", is 20%

more expensive than ordinary pork in Japan. Hence, the possibility of differentiating products by variety should be studied in Paraguay to take advantage of the low cost of mixed feeds.

It is essential to have leaders in private sector activities that can put forward the cluster's strategy. They exist in this country. The principal mission of this strategy is to cover only areas done by public administration and channel the efforts of entrepreneurs.

(2) Vegetable cluster

1) Purpose and current state

For the production of raw materials and processing, it can not be said that a vegetable cluster exist in this country. However, the potential exists to expand the production of raw materials, and the processing can also begin with a relatively small investment. As the cultivation of vegetables is more labor intensive than soybeans or corn, it is an effective means for small-scale farmers, which justifies its selection as a cluster.

With tomatoes as an example of the general structure of the vegetables cluster, local production of 60,000 tons of fresh tomatoes, 4,000 tons of imports and 3,000 tons of local product exports exist presently. Meanwhile, some 2,000 tons of tomato products are imported, partly for reprocessing (of tomato paste) here. This supposes that the total consumption of processed products is about 2,500 tons in the local market. Nevertheless, processed tomato products from local production do not exist.

In Paraguay, there are eight vegetable processing plants for canning, bottling or freezing vegetables. Five of them process buds of palm trees. Only one company processes tomatoes.

2) Bottlenecks and benefits

In terms of processing, the following points are bottlenecks:

- There is no vegetable processing plant in Coronel Oviedo nor Caaguazú.
- There is a large potential of increasing production of raw material vegetables. However, the production of tomatoes is not big enough, even if it is most commonly cultivated at the moment.
- In order to strengthen the competitiveness of canned vegetables, it is necessary to invest in facilities near the processing plant.

On the other hand, the following points are benefits:

- They have established a cultivating method that raise the quality and yield of tomatoes significantly while slashing cultivation cost.
- Since it is relatively easy to acquire processing technologies, such as canning or freezing vegetables, plants can start operation early.
- Domestic demand for tomato-processed products is covered by imports. If tomato-processed products are produced in the country, they can expect not only the export market but also domestic demand.

3) Cluster model

For the production and the processing of raw materials, the appropriate cluster location is near Coronel Oviedo in the Department of Caaguazú. In this zone, the main routes cross from four directions and it is ideal not only for the collection of vegetables but also for the easy international distribution of processed products.

In a simulation of 10,000-ton export of tomato paste per year, exportation would reach US\$ 7 million. This amount of exports requires 30,000 tons of fresh tomatoes. If each farmer cultivated one hectare, some 750 farmers would obtain a gross income of US\$4,800 each. Also, it would generate 500 jobs in the processing plants.

4) Strategy

To strengthen this cluster, the following strategy is necessary:

- Consideration of agricultural cooperatives as the initial promoter of cluster operations and, as such, aid to them for cultivation and processing.
- Government guarantee of the cultivation target and delivery price agreed to between farmers and private companies. This will give incentive to private companies to jointly establish processing plants with cooperatives.
- Market studies by PROPARAGUAY to determine the varieties and the processing methods of market products so as to differentiate the Paraguayan products in a niche of the large processed vegetable markets of the EU and North America. Tomato derivatives are paste, whole cooked tomatoes or ketchup. Further, canned tomatoes come in various sizes. The sugar content, acidity and color are different in tomato varieties and organic cultivation can be a differentiating factor. Also, it is necessary to study the cultivation of tomato varieties with high-licopine content for differentiation.

(3) Fruit cluster

1) Purpose and current state

In this cluster, there are 2 types of products, fresh fruits and processed fruits. Fresh and processed products of the same fruit can be complementary to each other for strengthening competitiveness, since total cost can be curbed and value-added can be raised by carrying both fresh fruits and processed fruits. The most promising product of this cluster is orange juice.

Paraguay produces 393,000 tons of oranges yearly. The main processed product is juice. Of that harvest, 208,000 tons are processed to produce 100,000 tons of juice, exporting 4,000 tons.

2) Bottlenecks and benefits

The following bottlenecks exist:

- The production of oranges as raw materials is not enough to increase exports of processed goods. It is impossible to increase the production of raw materials because it will take a long time between tree planting and harvest.
- Two Itapua companies that export juice cannot operate their plants at full capacity due to lack of raw materials. In order to create and strengthen the cluster in this region, an increase in fruit production is a precondition
- They don't have much experience of exporting frozen concentrated juice, which is a popular form of fruit exporting. Only one company started it in 1999

On the other hand, the following points can be benefits:

- EU countries evaluate the quality of orange juice produced in Paraguay highly.
- There is a large potential of expanding production. In addition to Itapúa, San Pedro, Caaguazú y Boquerón are suitable locations.

3) Cluster model

The best and realistic location for the cluster is the Department of Itapua, where large cultivation and important juice processing plants exist.

For an export simulation of 10,000 tons of frozen orange juice concentrate, the exportation would come to US\$14 million. Some 160,000 tons of oranges and 200 processing workers would be needed.

The largest export market for orange juice concentrate is the EU, followed by the USA and Japan. Brazilian markets for Paraguayan juice in tetrapack could be the State of Parana, the western half of the State of Santa Catarina, Matto Grosso do Sul and Rio Grande do Sul. Also, the big market potential of Uruguay and Argentina can not be forgotten.

4) Strategy

To strengthen this cluster, the following tasks are necessary:

a) To promote fresh fruit exports

- Road maintenance in areas of fresh fruit production with export potential, to permit physical distribution of products at least in rainy conditions.
- Establishment of quality standards for export products (maturation, sugar content, color, marks, shape, size, etc.) , or the application of norms of the import markets, to use official seals of approval on products complying with standards.
- Standardization of the design, material and size of packaging for the products complying with standards.
- Initiative of agricultural stations to investigate organic crop methods and the communication of such information.
- Initiative of PROPARAGUAY to promote the export of fresh oranges and grapefruit to Argentina and Uruguay.

b) To increase the export of processed products

- Establishment of an official financial mechanism for farmers, who cultivate under contract, financing the operating cost from the planting of fruit trees to the harvest. It should permit loans to farmers without land deed when a company offers a guarantee.
- Selection of varieties of other fruit trees by agricultural stations to harvest, process and export out of the orange season and the information-giving to farmers on technical recommendations and to processing plants about the alternatives.
- Recommended cultivation of the *acerola*, together with oranges, since it is harvested six months a year and requires much labor to harvest. The organic cultivation of this product with much vitamin C can offer a healthy product image as a differentiating factor.

(4) Cotton cluster

1) Purpose and current state

The yield of raw cotton, which had been as high as 640,000 tons in 1989, continued declining due to a decrease in soil nutrients and picudo insect. In 1998, production was one-third of the 1989 level. However, cotton is an important cash crop since it has regular buyers.

In Paraguay, 221,000 tons of cotton produced in 1998 were processed in 23 cotton ginning plants, and Paraguay exported 72,000 tons in ginned cotton fibers. The remaining 20,000 tons are processed for cotton yarn in 21 plants, sending 4,200 tons in exports and using 14,000 tons of yarn for locally made cloth. The number of plants is declining because of difficulty in continuing operations due to poor financing at each stage of work.

2) Bottlenecks and benefits

The following are bottlenecks for this cluster:

- The cultivating area per farmer is decreasing. The yield per unit area is falling due to a decrease in fertilizing combined with the spread of picudo insect.
- Except for some plants facing rivers, cotton related plants in Paraguay are landlocked. Therefore, they have to depend on high-cost truck transportation for distribution.
- Their processing technique is low, and the level of the official technical training center is low.

The following points are benefits for this cluster:

- 98 % of the yield is raised on a contract basis, which is advantageous for creating the cluster.
- The quality of Paraguayan cotton with lint is high.

3) Strategy

To strengthen this cluster, the following strategy is recommended:

- Increase in sector's productivity by introducing more disease-resistant varieties.
- Reduction of production costs, for which the use of harvesters is essential.
- It is necessary to introduce direct planting and green manure in order to recover soil nutrients.
- It is necessary to introduce quality control so as to make products that meet international standards.
- Revitalization program in the sector to address the need for restructuring the textile industry.

(5) Wood cluster

1) Purpose and current state

In 1991, the forest area in the western district declined to one-third of the area covered in the mid-1970s. The main useful tree species are Cedro, Lapacho, Incienso and Paraiso Gigante.

About 10 million m³ of wood is cut yearly, to produce in part 4 million m³ of timber. The export of logs is near 320,000 tons. Most trees are exported to MERCOSUR countries. 94% of wood products are exported as primary processed products. The ratio of secondary processed products and finished products to entire exports is falling. The rest is used in wood products, woodworking and simple furniture in the country. Since the level of design and processing method in domestic companies is low, high-class furniture is imported from Europe and the United States.

2) Bottleneck

The following points are bottlenecks for this cluster:

Since the forest area is declining, the largest challenge is how to promote planting for wooden processing. The level of processing technique and design is low. Not enough technical training is provided.

3) Cluster model

The area surrounded by the cities of Coronel Oviedo and Ciudad de Este, and Alto Paraná department seems to be most suitable for this cluster.

A "Program of reforestation and wood production with Paraíso Gigante" is proposed for the wood cluster model. The Paraíso Gigante is a species that easily has added value and grows fast. The planting of Paraíso Gigante in one hectare for ten years produces 40 m³ of logs, generating a total income of US\$7,700 to US\$10,000 for producers. Also, firewood is a by-product, adding an additional US\$2,400 to estimated income. Further, it is possible to cultivate other products, like corn and mandioc, during the first three years of plantation. This takes advantage of the planted area.

If they plant 10,000ha of trees annually for 10 years, they would be able to produce 400,000 m³ of sawing lumber annually from the 11th year, which would enable planting farmers to earn US\$60 million.

It is necessary to establish a cooperative association of small farmers that integrates planting promotion,

logging, cutting, drying and lumber sales of Paraíso Gigante. Such an association can increase earnings of small farmers. To that end, it is necessary for an official organization, like SEDEFO, to offer education of management methods and techniques.

In the cases of secondary processing and tertiary processing, companies in the lead can take leadership in organizing companies in the same industry and ensuring a certain degree of productivity with technology that can meet the demand of the export market. Argentina, Germany and the USA can be markets for the finished products.

4) Strategy

To strengthen this cluster, the sustainable supply of wood is the priority. The Government should promote the planting of Paraíso Gigante. It is important to improve the processing design and technology for wood products.

(6) Metalworking cluster

1) Purpose and current state

The metalworking industry accounts for only 1.8% of GDP in the industrial sector. However, this cluster is important since it supports the development of other clusters.

This cluster includes various sub-sectors, with three important ones: iron and steel; metal products with exception of machinery and accessories; and transport equipment. The export of metalworking products of Paraguay is US\$21 million while the imports are US\$1,319 million - 62 times greater than exports.

Iron and steel represent 45% of the exports 21% comes from metal products.

Most raw materials for the metal processing industry, such as iron plates, steel bars and pipes, are imported from Brazil and Argentina. Even major processing companies purchase only 5,000 to 6,000 tons of them a year. As a result, they cannot get scale merit and are forced to purchase through brokers at a high price.

2) The current state of major metalworking industry

The location of the automobile industry in Brazil is shifting to the southwest district, which gives Paraguay more opportunities to process automotive components. Paraguay has the advantages of low

fuel prices and low wages for skilled metal processing workers (which are about one-third of the wages in Brazil).

As for agricultural machines, there are 9 manufacturers in Paraguay. However, they are supplied mostly from Brazil. Brazilian manufacturers also provide maintenance service for agricultural machines in Paraguay. Paraguayan companies have opportunities to enter into fields of service parts and maintenance. Some districts are promoting projects for agricultural mechanization, which may give impetus to this sector.

3) Strategy

To strengthen this cluster, the following strategy is needed:

- Technological specialization.
- Training in processing techniques.
- Promotion of the related activities of marketing and materials' purchasing.

A project of iron meltdown with an electric furnace is proposed to take advantage of junk metal in the production of import substitutes.