

3. DIAGNOSIS OF EXISTING TEXTILE COMPANIES

The Study Team has made an evaluation of 9 companies of Paraguay, including its three leading textile companies, and has visited four ginning and sewing factories. This Section presents the result of the evaluation and visits.

3-1 Overview

Paraguay's textile industry is facing extremely severe environments today such that its market is hooded with high quality products imported from advanced countries and popular products from neighbouring countries. As a result, many companies are forced into reduction of operation because of increasing stock, and cannot afford to renovate their outmoded facilities.

In addition, poor operation control techniques and lack of knowledge and skill in manual workers are retarding the industry below the world's standard level of today in both productivity and quality. Much is left to be improved in education and training of the company executives and middle management as well as workers. Table 3-1 summarizes the evaluation by the investigation team of three industry segments: spinning, weaving, and dyeing and finishing.

The remainder of this subsection outlines the evaluation of the companies and the team's comments on spinning, weaving, and dyeing and finishing in this order.

(1) Spinning

1) Facility

The spinning facilities used in the factories visited are generally outdated; most of the facilities are found to be 20-30 years old. Some large enterprises are in the process of renovating or replacing the manufacturing facilities, but a scale is small.

The world's trend of the industry today is not only to replace the entire machines but also to improve performance through partial enhancements while retaining the machines.

In Paraguay, most of the machines are used in the same construction as they were installed years ago, without even a minimum of necessary renovation being applied. By and large, the machinery is far outmoded. Many of the machines, however, can be expected to be upgraded in performance through partial enhancements. For example, some ring spinning frames are not equipped with pneumafil which is essential today.

2) Productivity

The productivity stays low under the present operation conditions.

The study team do not see a big problem in quality and potentials of manual workers, judging from the situations observed in the ginning mills and the sewing mills, if appropriate training is in place.

Table 3-1 Summary of Evaluation of Textile Industry in Paraguay

Segment Item	Spinning	Weaving	Knitting	Dyeing and Finishing
Facility	Mostly old (20-30 years). Improvement of productivity can be expected through partial embellishments.	Extremely outdated. Spare parts cannot be procured on some machines. Renovation in a great scale is recommended.	More modern than spinning and weaving.	Maintained in good conditions, but low operation speed and operation rate.
Productivity	Low productivity. Education of workers and operation supervisors is needed.	Operation rate of machines is generally as low as 50-70%.	Productivity and quality greatly depends upon raw yarn. The quality of the raw yarn currently supplied may well lower the efficiency of high performance machines; stringent acceptance testing of raw yarn is needed.	Presumed to be well below the standard of the advanced countries, judging from the facilities, head count and production quantity.
Products and Quality	Primarily coarse count yarn. Because of good quality raw cotton, there is a potential for manufacture of high quality count yarn through improvement of operation	Currently not competent in the export market because of defect of yarn and defect of woven frequently observed. Quality control standards should be established.		Review of conditions for dyeing and finishing processes is required, such as employment of a good quality dye catalyzer, and establishment of Standard Operational Procedure.
Cost	Labor cost is nearly as high as in advanced countries. Low cost-competitiveness.	Abundance of manual workers keeps the labor cost per unit product extremely high, which, together with large inter-enterprise differences, results in very low competitiveness in the export market.		Saving, and high-efficiency use of heavy oil, dyestuff and auxiliary materials are urged.

Moreover, great insufficiency is observed in the consciousness and efforts of the operation managers (supervisors) in the maintenance of performance of the current facilities, which results in low speed and low efficiency in operation and in low productivity per facility.

3) Products and Quality

In general, coarse count products account for the majority of production. As the quality of raw cotton is increasing dramatically, it is possible to produce high quality yarn. Raw cotton has a high yield; as a result, short fibers and immature fibers tend to be used, which constitutes one of the negative factors which prevent production of high quality products.

The yarn of Paraguay, as it is now, is not quality-wise competitive in the international market. The use of the current products (counts) is limited, and there is no room for growth in the domestic demand. What is needed is high-level operation control to take advantage of high quality cotton.

4) Cost

Because of old facilities, the cost of depreciation must be low; on the other hand, the oldness makes labor productivity low. As a result, the labor cost is presumed to be as high as in advanced countries.

On the whole, judging from the product menu, the cost-competitiveness is considered to be low in the export market.

(2) Weaving

1) Facility

Although a few leading companies have modern looms, most of the machines used in other companies are notably outmoded: for some machines spare parts cannot be procured any longer, and there are some machines with considerably worn-out metals and shafts. Gradual renovation and improvement are needed.

2) Productivity

In general the operation rate of looms is as low as 50%–70%, although there are factories which keep a loom operation of more than 90% by putting in abundant manpower.

The causes of the low productivity would include, in the area of facility, lack of spare parts, misadjustments and faults of automatic machinery, and in the area of operation, some machines not in well running, shortage of patrol by the workers, defects and the incompletely wound beams.

3) Products and Quality

In small factory, the Study Team found many defects on the thick woven fabric (deck-chair, blanket, mantle, bed-cover, towel and bag etc.). These defects are caused due to lack of sizing process and dropper. Also their products have a lot of fluffs, besides, their quality is poor in general due to lack of the next-process of yarn dyeing.

Big enterprises have sizing machines and, except one company, weave a wide range of products, from thick cloth to thin cloth (denim, working wear, panta-loon, sheeting, shirting, poplin, fancy fabric, etc.)

Quality seems to be at least above a certain level; however, in every factory, defects of vertical yarn are observed such as double pick, lashing-in and filling bar in filling part, and defects of horizontal yarn are also observed such as mis-draw, temple scratches, warp float and yarn defects such as neps and slub yarn. The present quality makes the products hardly acceptable by the domestic sewing companies as well as in the international market.

Worth particular mention is the fact that in every factory, quality standards at every process have not been established and products flow from one process to another, and even are shipped, almost without being inspected. Establishment of quality control standards at every process would be required.

4) Cost

In every enterprise, without exception, so many workers are employed that a huge amount of labor (manhours) is consumed per unit production. As a result, the labor cost per unit production is considered to be high despite the low average wage of workers. Furthermore, the energy costs are even higher than in Japan; reduction of the head count and energy saving will need to be strongly promoted.

(3) Knitting

1) Facility

Generally speaking, compared with spinning and weaving, the facilities for knitting are relatively new.

Since most of the products are processed in cut-and-sew steps, there is no necessity of using low productivity machinery with small diameters and small supply capacity. However, the quality of the yarn supplied today would make the efficiency low even if high performance machinery were to be employed. One would have to be content with maintaining the present status by upgrading the old machinery only to a minor scale.

2) Others

The greatest application of knit products in this country is sports wear; most of them are dyed, and hence defects are not distinct in the eye.

productivity and quality greatly depend upon the quality of raw yarn. Therefore, more stringent acceptance testing of raw yarn is required.

In addition, the knit companies ought to take a positive action toward the spinning companies to have them develop high quality yarn for knit products in view of a higher added value.

(4) Dyeing and Finishing

1) Facility

The two largest enterprises each own a complete set of facilities for bleaching, dyeing, printing, yarn dyeing and finishing. Most of them are from 5 to 10 years old European or American machines and are well maintained. In general, however, the operation speed (30 – 50 m/min) and the operation rate seem to be extremely low.

The other companies own only yarn dyeing equipment and hank dyeing equipment of a small scale, and outmoded; they are more of a home industry than factories. It would be desirable, therefore, that a dyeing factory is operated jointly by a group of companies.

2) Productivity

Even at these two leading enterprises, productivity is way below the standard of the world's advanced nations in textile industry, judging from the facility, head count and production volume. It would be of prime importance to improve productivity through re-organization, rationalization of facility, reinforcement of control and management, review of product menu, etc.

3) Products and Quality

Almost every enterprise should re-set up the process conditions by referencing the data used abroad, it should review dyestuff and (auxiliary stuff), establish formal process conditions and S.O.P. (standard operational procedures) and exercise proper control, thereby striving for improvement in quality of dyeing and finishing.

The low rating of the domestic products by the consumers and sewing industry of this country can be duly attributed to their poor quality and high cost. At all enterprises, both the management and the workers ought to reform their consciousness to strive for better quality.

4) Cost

Starting from reformation of consciousness in pursuit of cost reduction in every possible area, all-round efforts will be essential: reduction of consumption, recycling and high efficiency use of imported goods such as heavy oil, dyestuff and auxiliary stuff.

3-2 Detailed Discussions of Company Evaluation

(1) A Company

A Corporation started as an electric utility company in 1929 and since then has grown to be the largest textile manufacturer in Paraguay. This corporation stays above the country's average in many areas: facility, facility scale and maintenance level. In operation administration, the company has a relatively large number of employees, which itself is causing some problems such as defects by shortage of patrol by the workers. If proper manpower administration becomes in place and quality standards gets established, the corporation will become an excellent company with export competitiveness.

1) Items for Production

The company's products covers a wide range: ginned cotton (for home use), cotton seed oil and soap in the ginning division; cotton yarn (knitting yarn, sewing yarn) and polyester yarn in the spinning division; cloth for woman's clothes, shirt, pantaloons, denim, curtain, sheet and duck in the weaving division; various knit products in the knitting division; bleached product, dyed product, printed product and dyed yarn in the dyeing and finishing division.

2) Location

Located 250 km (direct distance), or 380 km by road, to the south of Asuncion, the country's capital, the company is far from the center of consumption and handicapped in transportation of products; however, in export, it benefits from its location on the bank of Paraguay River, which provides an advantage of sea transportation. Raw cotton comes from its hinterland which includes cotton fields; imported raw materials such as polyester, though small in quantity, are transported via the river. Labor is supplied primarily from the abundant population centered around the Italian colony. Another point to be noticed is that the factory is operated only by men.

3) Energy Source

The energy source for the boilers is imported heavy oil; the remainder is supplied by the domestically procured logs of wood primarily.

All the electricity is supplied by 9 private generators (5,500 kW, 50 cyl) which use heavy oil as fuel. Increases of heavy oil prices are imposing heavy burden. In the future, however, when the dams of Itaipu and Yacyreta are completed, commercial electric power supply will replace the generators, which will greatly contribute to cost reduction as only the boilers will require Diesel oil.

4) Facility

① List of machinery

Table 3-2 summarizes the machinery used.

Table 3-2 List of Machinery

Machinery	Quantity	Maker	Remarks
[Ginning Division]			
Ginning machine	8 F		
[Spinning Division]			
(Use for Open end)			
Blowing machine	1 set		
Carding engine	4 F		
Draw frame	1 set		
Open end	360 sp		
(Ring spinning)	360 sp		
Blowing machine	4 set		
Carding engine	106 F		
Draw frame	32 H		
Combing machine	8 F		
Fly frame	16 F		
Ring spinning frame	33,412 sp		
Ring twisting frame	3,476 sp		
Winder	1 set		
Re-winder	3 F		
(Sewing yarn mill)	1 set		
(Weaving Division)			
Cheese winder	9 F	Cocker West Point	180SP Pim Winder
Warper	3 F	Cocker West Point	40 in-50 in
Sizing machine	4 F		46 in-105 in
Pim winder	5 F	Schweiter	Unifil Leasona
Loom	270 F	Dreper x-2 x-3	Patrones 189 F
Loom	330 F	Picañol	Concuatro Colores
Loom	18 F	Saurer	250cm (98.5 in)
Loom	12 F	Sulzer	336cm (153 in)
(Subtotal of looms)	630 F		
Inspecting machine	10 F		
Ring twisting frame	4 F		

(Con't)

* : Partial enhancement needed

** : Replacement needed

Machinery	Quantity	Maker	Remarks
[Dyeing and Finishing Division]			
(Preparating Process)			
Singeing machine	1 set	Curtisy Marble	2,200mm *
Singeing machine	3 sets		1,100mm
Desizing machine	1 set	Svetema	1,100mm *
Scouring and bleaching machine	1 "	Hunty Moscrop	1,100mm *
"	1 "	Brugman	1,250mm *
Mercerizing machine (chainless) cooling device	1 "	Benninger	1,250mm *
(Bleaching Process)			
4-cistern washing machine	1 "	Svetenna	*
4-cistern Bleaching (Washing) machine	1 "	Svetenna	*
Continuous bleaching machine	1 "	Brugman	1,250mm
Washing machine	1 "	Former-Norton	**
Washing machine (7-tube connected)	1 "	Svetenna	
(Dyeing Process)			
Continuous dyeing machine	1 "	Svetema	1,100mm *
Pad steam continuous dyeing machine	1 "	Pad Steam	
Stainless dyeing jigger	3 sets		2,000mm *
Stainless dyeing jigger	7 "		**
(Yarn dyeing process)			
Hank mercerizing machine	1 set	Mecanotessile	
High pressure cheese dyeing machine	1 "	LIMA	100kg
Cheese bleaching and dyeing machine	1 "	Frankling	100kg **
"	1 "	Gaston. C	100kg **
"	1 "	Mezzera	70kg *
Cheese drying machine	1 "	ATI	*
"	1 "	"	
"	1 "	"	

(Con't)

* : Partial enhancement needed
 ** : Replacement needed

Machinery	Quantity	Maker	Remarks
(Finishing Process)			
Cylinder Dryer	1 set	Taller sall	1,100mm **
Stentering machine	1 "	Artos	1,100mm *
"	1 "	Monforts	2,200mm
Cylinder Dryer	1 "	Mother & Platt	
Rubber compressive shrinking machine (used, without Palmer)	1 "	Morrison	1,100mm *
Calender	1 "	Briem	1,100mm *
Calender	1 "	Former Norton	2,100mm
Baking machine	1 "	Stork	1,200mm *
Perchadora	1 "	Wooden Socket	*
Wire raising machine	1 "	Broma	
(Printing Process)			
Flat screen printing machine (8 colors)	1 "	Stork	1,200mm *
" (8 colors)	1 "	Roggiani	1,300mm
Attachment to the above for engraving and Film making (Sketch)	1 "		*
Washer (wince type)	1 "	Stork	*
Rotary screen printing machine (8 colors)	1 "	Stork	2,200mm
High temperature steamer	1 "	Stork	2,200mm
Engraving and Sketch Equipment	1 "	Stork	
(Finishing and Inspecting Process)			
Packing machine	2 sets		*
Measuring and Plaiting-down machine	2 "	Muzzl	*
Measuring and Doubling, Winding machine	2 "	Monforts	1,600mm *
Measuring and Quating, Winding machine	1 set	Texima	*
Inspecting machine	3 sets		*

(Con't)

Machinery	Quantity	Maker	Remarks
(Test Equipment)			
Uster evenness tester	1 set	Uster	
Uster automatic yarn strength tester	1 "	Uster	
Test and dyeing equipment	1 "	Ahuba	
Steam and thermosol testing machine	1 "	Benz	
(others)			
Sewing machine for Joining	5 sets	Singer	
Mark printing machine (2 colors)	1 set		
(Utility Equipment)			
Boiler	2 sets	Cleaver Brook	10t/hr (estimated)
"	1 set	Cleaver Brook	8t/hr (estimated)
Raw water treatment	1 "		Water is supplied from Paraguay River.
Water softner	1 "		
Generator	9 sets	Gorbe Lahmeyer	Uses Diesel oil as fuel
Air conditioning Equipment	1 "		Spinning and weaving divisions are totally air-conditioned. Dyeing and finishing division is partially air-conditioned.
Maintenance Equipments	1 "		
Electric Maintenance Equipments	1 "		Total head count: 50-60 (estimated)
Building and Civil Maintenance	1 "		
[Building]			
For spinning and weaving divisions			Steel-framed, brics (red bricks) build 2-storied; span size: 3-40m; Ceiling with isolating aluminum plate; High ceiling (5-6m); Wooden plates making up the floor. Wave-shaped plate.

(Con't)

Machinery	Quantity	Maker	Remarks
<p>For dyeing and finishing divisions</p> <p>(Fire prevention facility)</p> <p>Hydrant</p> <p>Fire extinguisher</p> <p>(Lighting)</p> <p>Fluorescent lamp</p>	<p>1 set</p>	<p>Simplex Manchester</p>	<p>Steel-framed, blocks (red bricks: painted white); One-storied; Span size; 15–20m; High ceiling (7–8m) Without heat isolation; Concrete floor; windows provided.</p> <p>Installed in the entire factory (inside; outside) Water type extinguishers installed at major palces.</p> <p>Approx. 150 lx</p>

② Comments on facilities

- a. The OE (Open End) chamber is well maintained, however, because of its too small scale, human efficiency is bad and competitiveness is questionable as a result of high labor cost. A vertical layout (line arrangement by product) of processes, if in a small scale, is never rid of a manpower loss, though this is pretty much a matter of management. In a scale like this corporation it would have to be a horizontal layout to improve human efficiency in which the same machines are placed in the same place.
- b. The factory is equipped with a standard air-conditioning facility which supplies air from the ceiling and draws it from the floor, however, the room temperature was above 30°C probably because it was summer. The floor is made of blocks of wood and is well maintained.
- c. As to the layout, in the preparation process, the warper and the sizing machine are put side by side without a separation screen in one room. This may well cause quality problems. The layouts of the weaving machine and the finishing process are disorderly due to enhancements and additions in the past. This is causing problems in control of air conditioning and transport of half-products.
- d. A variety of looms are used to cover all kinds of weaving: plain loom, twill equipment, Dobby device, predyeing equipment, etc. without jacquard.

Though modern machines are used side by side with outmoded machines, all the machines are of first-class brand; modern machines such as an automatic cop machine, a unifil device and a latest loom sulzer are being introduced. On the whole the level of loom machinery is high.

- e. A fairly complete set of dyeing and finishing machinery is installed, but some of the machines need upgrading or replacement. There is much room for reinforcement in main processing facilities which are found to be rather poor: for example, desizing and scouring equipment (especially for thick cloth), a washing machine after printing, a soft finishing machine and an inspecting machine.
- f. The production volumes of dyeing and finishing are: bleached products 100,000 m/month, dyed products 380,000 m/month, printed products 350,000 m/month, dyed yarn 40,000 m/month, total 870,000 m/month. For the production of about 900,000 m/month, the facilities installed have more than enough capacity. Particularly, the capacities of the printing machines are as follows:

One rotary printing machine	: 700 km/month
Two flat printing machines	: 230 km/month
<hr/>	
Total	930 km/month

Conditions;	$\left(\begin{array}{l} \text{Speed; Rotary} \\ \text{Flat} \\ \text{Hours in operation} \\ \text{Operation rate} \end{array} \right)$: 60 m/min
		: 10 m/min
		: 18 hr/day, 22 days/month
		: 50%

The Present production rate is 350 km/month. Supposing that the production rate except printing process is increased to 900 km/month, under the conditions of 18 hr/day and 22 days/month, then the machine speed only needs to be 48 m/min at an operation rate of 80% or 63 m/min at an operation rate of 60%. Therefore, setting the normal operation rate at 80%, the processing speed only needs to be 48 m/min, which means a wide margin.

5) Raw materials

100% of raw cotton is procured domestically. Polyester for mixed spinning or for yarn, though small in quantity, is imported from the U.S.A., West Germany, Brazil, Japan and other countries.

6) Operation

They operate on 6-hour shifts. 3-shift, 18-hour operation at the spinning division; 4-shift, 24-hour operation at the weaving division; 3-shift, 18-hour operation at the dyeing and finishing division. The working time is 6 hours/day, 5 days/week, 240 days/year.

7) Quality

① Yarn

- a. Throughout the processes there is room for improvement in the quality of rubber and yarn in the rubber covering of the top roller. The ones currently used are similar to those used in other companies in Paraguay, and are unfit to the use in an air-conditioned factory. In this factory where not only humidity but also temperature is controlled, more emphasis on quality should be placed in the choice of machinery and its accessories.
- b. Knotting should be more carefully controlled. Some workers are using universal knot. For better quality, however, fisherman knot or weaver's knot should be used as appropriate. Universal knot should be abolished in this company whose main business is the selling of yarn.
- c. Judging from this compan's yarn which the investigation team observed at the knitting factory, the low quality of yarn seems to be mainly resulting from drafting trouble at the roller part, uneven yarn caused from draft due to a misadjusted roller gauge and drifting cotton. To be checked are: fiber opening during blowing, separation of waste of cotton during carding, parallelism during drawing, clearness of the roller parts in the draw frames, fly frames and ring spinning frames. All the processes should be reviewed as well.
- d. A glance at the roller parts in the fly frames and ring spinning frames poses quality questions. Some sort of cleaning would be necessary at least once a

day. Employment of a roll picker is strongly recommended to this company which is in the position of providing high quality goods to the market, being one of the leading manufacturers.

- e. A recent study has revealed that the number of twists on the fly frame and the roller distance between back and middle roller and back zone draft on the ring spinning frame have a critical effect on inuniformity of yarn (especially on that of combed yarn). The problem, therefore, seems to lie in this area.

As there is a seliplane, it is essential for the factory supervisor to have a yarn appearance standard made every day and checked against the standard. In order to grasp what problem the present yarn has it is always better to check the yarn appearance standard than reading all the test data.

② Weaving

- a. Despite high productivity, little attention is paid to quality control and the quality level is low. What needs to be done first is improvement of quality of primary material yarn for example, elimination of slubbed yarn, uneven yarn and insufficiently twisted yarn and over twisted yarn and yarn strength.

Furthermore, the technical level of weaving should be improved. For example, control must be strengthened in the use of operation tools and part; warp float due to a defective frame belt should be eliminated; more attention must be paid to the temple mark due to non-uniform rotation of a ring temple, and to bad feeling due to mis-set-up when double frames are used.

Actual examples of defects include use of the 3-Lines of dropper and misdrawing due to careless of operators. Often observed were double picks and lashing-ins due to pilot yarn dust stuck around the end cutter.

- b. As for quality control, inspection is said to be inserted in the spinning, weaving, finishing and other processes, however, with no authentic quality standards by application, maintenance standards and packing standards established. Establishment of these standards would be urged.

③ Dyeing and Finishing

- a. It would be recommended that quality and productivity be improved through enhancements of facilities and associated tools, for example, automatic mixing machine, automatic concentration control device, automatic weft bend rectifier, temperature, pressure, flow and other gauges, cloth entrance guider and centering equipment.
- b. In Paraguay, an inspection standard should be adopted based on AATCC (American Association of Textile Chemists and Colorists)'s standard, so that inspection will be made against that standard. Though not necessary today since the products are sold only to the domestic market, this will become essential in the future because of growing competition from foreign companies. In view of this, more stringent inspection should be exercised to improve

quality and cost reduced, to attain competitiveness.

- c. Products are shipped today almost without inspection. According to this company's present standard, the second grade rates are 2% for bleached products, 2% for dyed products, 1% for printed products and 2% for yarn-dyed products. If JIS (Japanese Industrial Standards) were to be applied, they would soar from five to sixty times as high.
- d. Though today Paraguay is the supplier's market thanks to the government's policy of prohibiting import of cotton goods, the buyer's market will arrive sooner or later. What is necessary would be to have consciousness of international competitiveness in quality and cost rooted among the people. To this goal productivity and quality must be improved through (i) review of process conditions, (ii) study of dyestuff, chemicals and auxiliary materials, (iii) study of process control and (iv) review of facilities, manpower and technology.

8) Productivity

① Spinning Division

Throughout the processes, too many people are employed, which constitutes the primary cause of low productivity per person. It seems that the old practice of manpower allocation has been carried over; however, since product quality will grow as the quality of grey cotton grows, the head count should be reduced.

② Weaving division

- a. Here again too many people are employed: about 3 times as many (9–10 persons/1,000 m) as in Japanese factories. Therefore, though the wage level is about one third that of Japan, which is now said to be at the internationally highest level, the total labor cost would be about the same as in Japan, or even higher today.
- b. In machinery management all the processes seem to be taking full advantage of machines of the first class makers. The machines are generally well maintained. As a result, machine operation rate is notably high and few machine stoppages due to poor maintenance are observed.
- c. As for operation, again too many operators (all males) are involved because of low level of education, which seems to be the biggest problem of the company.
- d. The balance between supply and demand appears to be normal since the facilities, except those in the preparatory winding process, are operating in low duty and because of abundant manpower. In the preparatory winding process, the graveyard shift is used to cover the shortage.
- e. A high level (92–94%) of operation efficiency is maintained through increasing

the loom efficiency by limiting the number of looms taking advantage of abundant manpower.

- f. The management/maintenance of operation tools and devices (weaver's beam frame, temple, etc.) is not very orderly.

③ Dyeing and Finishing division

- a. Since 100% of processing is cotton, productivity can be and should be improved through upgrading, enhancement or continualization of the machinery so as to achieve an average speed of 80–100 m/min.
- b. There is room for improvement of productivity per person. The following, just for reference, are monthly production volumes per person (bleaching and printing combined, rounded figures) at processing factories by country (unit: km/man-month):

Japan	More than	10
Central America	More than	7
Brazil (without printing)		12
This company		8.7

Considering the production lot and relatively low requirement in technical skill, this company's production rate should be increased to at least 10 km/man-month.

- c. In view of energy saving, reduction of consumption of imported heavy oil for making steam should be pursued. In other words, saving and recycling of steam energy should be vigorously promoted: for example, heat recycling from drainage out of yarn dyeing equipment, recycling of drained heat out of all equipment, heat recycling from drainage of washing machines, continuous blowing of boilers, increase of efficiency, minimization of leakage and heat radiation from machinery and pipes.

9) Personnel management

Under the unique environmental conditions, a unique business administration and management system is employed. Except one female employees, who is the president of the company, all of the approx. 1,800 employees are male. Worth mention are a high age, with the average age presumed to be 40 to 45, and a 6-hour shift system. There is no labor union. All of these facts contribute to the uniqueness in work efficiency, work environment, workers' attitude, safety, etc.

The working time is, as mentioned previously, 6 hr/day, 5 day/week, 240 days/year, which means more days-off than in Western Europe (ref. Table 3-3). The actual wage data is not available and is only to be guessed.

Table 3-3 Comparisons of Wage and Working Hours in the World (1980)

Country	Working Hours (hr/year)	Total Wage (UD\$/hr)	Relation to U.S.A. (%)
U.S.A.	2,217	6.37	100
Belgium	1,920	11.68	186
Germany	1,864	10.65	167
Italy	1,717	9.12	143
Egypt	2,368	0.38	6.1
Argentina	2,100	3.33	52
Brazil	2,077	1.27	20
Japan	2,023	4.35	68
Republic of Korea	2,400	0.78	12
This company	1,440	0.75 – 1.14	11 – 18

Source: Verner International Management, Brussels

10) Maintenance, Miscellaneous

- a. With a full-fledged steel workshop installed inside the premises, the factory's maintenance arrangement appears to be fully equipped. However, it would be further advisable to pursue, through promoting preventive maintenance, the reductions of maintenance personnel, of system down due to a machine trouble and of second grade rate due to equipment trouble.
- b. The building has high ceilings and abundant space, and it well organized and cleaned.
- c. There appears to be room for improvement in layout, though the study team did not have enough time to spend in factory visit and cannot elaborate on it.

(2) B Company

This company has a factory equipped with a full line of work stations from spinning, weaving to dyeing and finishing. In addition, it has a modern ginning factory.

Ranked at Number 2 in size in Paraguay, the company could be considered to be No. 1 in contents. Therefore, a further progress would be expected if management, technology and administration are to be modernized to a level of advanced countries.

In terms of international competition, the facility is small, and the choice of goods in process is key.

1) Items for production

The product menu includes woman's clothes, shirt, pantaloons, sheet, curtain etc. In the second factory which is equipped with two sets of ginning facilities, ginned cotton is produced.

2) Location

The main factory with spinning, weaving, dyeing and finishing facilities is located in the city of Asuncion. The modern ginning factory is located in Cacipe, about 28 km from the capital.

3) Energy Source

Electric power is supplied from ANDE. The electricity charge is as high as 13G/kwh, which is equal to or even higher than the Japanese rate. Heavy oil and Kerosine are imported for the boilers and for the heat catalytic boilers, respectively.

4) Facility

① List of machinery

Table 3-4 summarizes the machinery used.

Table 3-4 List of Machinery

Machinery	Quantity	Maker	Remarks
[Ginning Division]			
Ginning machine	2 F		
[Spinning Division]			
Blowing machine	1 set		Old equipment
Carding engine	70 F		
Combing machine	4 F		Modern equipment
Ring spinning frame	2,928 sp		
"	4,800 sp		
Ring twisting frame	7 F		
(Weaving Division)			
Warper	1 F	Benninger	180cm, 800 ² pick
Sizing machine	1 F	ZC11 One dedicated boiler	10 cyl, High-Pressure cooker 1F, Storage kettle 2F
Tying machine	2 F	Uster	Portable
Pirn winder	1 F	Schweiter	60 SP, magazine type
"	10 F	Hacoba	4 SP
Loom	77 F	Ruti	100cm, with 1/2 Dobby, multiple shuttle loom with dobbie device
"	103 F	Saurer	150cm, 4 x 1 shuttle box 100m 4 sets
(Loom total)	180 F		
Inspecting machine	1 F		
[Dyeing and Finishing Division]			
(Preparation, Bleaching Process)			
Singeing machine (gas)	1 set	Osthoffe	1,800mm
Desizing washer (3-cistern)	1 "	Kleine Weffeis	2,000mm
Mercerizing machine (chainless)	1 "	Kleine Weffeis	2,000mm
Chiller, recirculation type, no recovery device			
Cooling device, no recovery system, counter flow system			
Stainless Wince dyeing machine	5 sets		3,000mm
(for bleaching and after print washing)	1 set		1,000mm

(Con't)

Machinery	Quantity	Maker	Remarks
(Dyeing Process)			
High pressure jigger	2 sets	Benninger	2,000mm
Open jigger	3 "	Benteler Werke	2,000mm, Partial enhancement needed
(Yarn Dyeing Process)			
High pressure cheese dyeing machine	1 set	Thies Coesfeld	100kg
High pressure cheese breaching and dyeing machine	2 sets	"	80kg, Partial enhancement needed
Cheese drying machine	1 set	"	100kg, "
Cheese drying machine (box type)	1 "		Replacement needed
(Printing Process)			
Flat screen printing machine (8 colors)	1 set	Bzer	2,000mm
Engraving equipment			On order from Brazil
Color shop equipment	1 set		
(Finishing Process)			
Heat setter (pin and clip type)	1 set	Kranze	2,000mm
Hotoil, 5 chambers with padder			
Stenter (clip 15m)	1 "	Farmatex	2,000mm, Replacement needed
Steam, with padder	1 "	Briem	
Palmer, with padder	1 "	Meccanotessile	2,000mm, Partial enhancement needed
Baking machine, with padder	1 "	Friedrich Hoas	2,000mm, "
3-cotton bowls calender	1 "	Ramisch	1,200mm, "
3-cotton bowls calender	1 "	Ramisch	2,000mm, "
Wire raising machine	1 "	Franz Müller	2,300mm, "
(Inspection process)			
Inspection machine			
Doubling and winding machine	1 set	Menschner	Partial enhancement needed

(Con't)

Machinery	Quantity	Maker	Remarks
(Laboratory machine)			
Laundry tester	1 set		
Color rubbing tester	1 "		
Test printing machine	1 "		
Shrinkage tester	1 "		
Cloth strength tester	1 "		
Tear strength tester	1 "		
Recovery tester	1 "		
Cloth weight measuring balance	1 "		
Test baking machine	1 "		
Water analyzing device	1 "		
[Utility equipments]			
Boiler (heavy oil)	2 sets	Cleaver Brooks	5 t/hr (presumption); 1 set is a spare set for H.S.
Hot oil boiler (kerosine)	1 set		
Water			4-5 t/hr; supplied from city's water facility. Only sprinkler type at spinning and weaving divisions. None at dyeing and finishing division 12-15 mainte- nance engineers.
Air-conditioning equipment	1 "		
Maintenance equipment	1 "		
[Building]			
For spinning and weaving divisions			Steel-framed, bricks, concrete floor.
For dyeing and finishing division			Steel-framed, bricks, with windows, concrete floor.
[Fire Prevention Facility]			Provided.
[Lighting]			
Fluorescent light			Approx. 150 lx

② Comments on facilities

- a. The usage of raw cotton in 3 grades separately is a wise method.
- b. The newly installed carding engine operates effectively. But the old one is too bad. The cylinder and doffer are regarded as bad as above. Both flexible card clothings of cylinder and doffer are required renew immediately for thier needless draffed off.
- c. Cleaning the rober part of the draw frame, fly fráme and ring spinning frame is good compared with other companies.
- d. Except for the finishing equipment, each machine of preparatory process and the loom are those made by the leading manufacturers, which give us the impression that the plant is small but well arranged. However, the plant has no air conditioning system, and the temperature adjustment is only by the spray system. However its power is not sufficient and, therefore, the room temperature is high and the humidity is also not sufficiently adjusted.
- e. The number of looms is 180F, and they are small in size. This mill is in the city, therefore, it has no space for enlargement. Consequently, it is desirable that the plant manufactures specific textiles with strong competitive power of expart.

As the kinds of the loom, except a jacquard machine, they have broad weaving facilities such as a plain weaving machine twill equipment, doobby device, multiple shuttle loom for yarn dyeing.

- f. Regarding lay out, the take-up motion of warper of the preparatory process is located next to the size box of the sizing machine, which make it difficult for them to take countermeasure against cotton fly. There are welding, milling equipment of iron works located close to a warping room, also a boiler for sizing is next to the warping room. Such a layout is not good in view of fire prevention.
- g. The floor is of concrete mortar finished, and not good.
- h. The dyeing and finishing division was presumably established approx. 15 years ago. Consequently, the main machines are comparatively new 5–10 years old and are well maintained.
- i. The test room and its equipment are all European made, which are substantially good compared with other companies. Yet, introduction of a testing machine for color fastness and a test dyeing machine is desired.

Regarding cotton processing, even with the present production, introduction of a rubber compressive shrinking machine and a inspecting machine is recommended.

- j. It is desirable to raise the quality and productivity of the product by extending

supplementary equipment. For example, an automatic mixing machine, automatic concentration control device, automatic weft bend rectifier, temperature, pressure and flow and other gauges, cloth entrance guider and centering equipment are recommended to be installed.

- k. We heard that the company ordered engraving for printing to Brazil, we think it is wise to do so with the present production. Yet, at least the screen should be prepared domestically in the future.

5) Material

One hundred % domestically produced cotton is used.

6) Operation

Operation in 2 shifts of 6–14 hrs., and 14–22 hrs., that is, 16 hrs/day operations are carried out.

7) Quality

① Thread, yarn

- a. Delay in taking out waste cotton under the taker-in-roller of the carding engine is noticed. Accumulated waste cotton reaching a mote knife and under casing interrupts the separation of waste cotton.
- b. Noil percentage must be adjusted precisely. Since comber production is considerably large in quantity, it is necessary to set the range of variation rather large, yet it should be controlled with the noil percentage $\pm 1\%$.
- c. The noil percentage is 15–20%, which is rather too much in view of usage.

As counter measures,

- Noil percentage variation between each machine is suppressed.
- Wastes of the carding engine are analyzed (particularly under taker-in), and if necessary, the percentage is raised.
- After making the above arrangement, its Noil standard percentage is decreased gradually.

It is considered in view of the content of cotton used that even its percentage is decreased, and raw material cost is reduced, no problem will arise in the process following.

② Woven fabric

- a. Although the quality standard is set up depending on the kind of product, the quality level of the product is low.

- b. As problems of primary material yarn, slubbed yarn uneven yarn strength of yarn, etc. are pointed out.
- c. As technical problems the following can be pointed out: weaving, broken pattern of yarn dyed fabric due to warping, warp, float mis-draw due to wire cutting resulting from the poor management of operational items, temple mark caused by the insufficient rotation of the rising temple. In addition, start-up mark, double pick, lashing-in due to insufficient maintenance are sometimes observed.
- d. This mill is the only one whose product quality standard is displayed clearly. Yet, it is not sufficient. We hope standard corresponding to the international level, will be set up.

③ Dyeing and finishing

- a. At present, there is no inspecting machine and each operator checks the dyeing at plating-down device of each machine. The second grade rates of bleached cotton, dyeing, yarn dyed products is 5%, and that of the printing product is 8%.
- b. The manager of dyeing and finishing division is a graduate of its chemical faculty of Asuncion University.

He manages to department enthusiastically.

8) Productivity

① Spinning Division

- a. Ring spinning is operated by 2 groups of the old equipment of 2,928 SP and the new equipment of 4,800 SP. The difference between the two groups, however, is extremely great. Considering that old machines are operated at low speed with many workers, I recommend you to discontinue the operation of the old machines, and operate the new machines for a long time, because it is more profitable in view of quality, worker and cost. That is to say, at present,

Old machines:

$$8,500 \text{ rpm} \times 2,928 \text{ SP} \times 16 \text{ hrs/day} \times 0.85 \text{ (efficacy)} = 388,477,000$$

New machines:

$$12,000 \text{ rpm} \times 4,800 \text{ SP} \times 16 \text{ hrs/day} \times 0.90 \text{ (efficacy)} = 829,440,000$$

Total	1,217,917,000
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However, if these old machines are disused immediately, new machines, 12,000 rpm x 4,800 SP x 24 hrs/day x 0.90 (efficacy) = 1,244,160,000

When the old machines are operated continuously, pneumafil is required that in turn requires funds. Therefore, we suggest not to operate the machines

in 2 shifts, but only new machines in 24 hour operation shifts moreover, in places not perfectly air conditioned, it is more advantageous to have midnight operations in view of good spinning condition, and efficiency can be improved. Furthermore, non-stop operation is desirable in view of the quality of yarn.

- b. Pre-spinning process consists mainly of transporting heavy articles. Therefore its present floor finishing cannot be accepted, because it requires a number of unnecessary workers.
- c. With respect to winding yarn, SDW (split drum winder) should be replaced with RTW as soon as possible.

② Weaving Division

- a. With respect to labor unit, it becomes worse by low operational efficiency, and 4 fold workers are used compared with Japan.
- b. Cop-change-function is not fully utilized, and partial change stop is observed. In additions, mechanical troubles often occur which lowers productivity. Therefore, management has to be improved.
- c. The number of looms operated by an operator is 6–8 F/man which is the highest in Paraguay, but in view of the international level, it is still low.
- d. Training employees is not sufficient, and an employee often leaves his working place resulting in all the machines not operating under his supervision.
- e. With respect to demand and supply balance, warp relation of the preparatory process is sufficient, but weft relation is difficult, when yarn supply is not sufficiently made. Thus, machines not operating are unprofitable. Furthermore, despite the few machines not operating, approx. 60 workers are responsible for the machines. Thus, loom operating efficiency is low. Warpings are Beninger's made, one of the leading manufacturers, but they are a warp knitting system, so very inconvenient as beam warping for yarn dyed, and disadvantages such as time loss and broken pattern arise.
- f. The management of operational articles (weavers beam frame, temple etc.) is very bad which lowers productivity.

③ Dyeing and Finishing Division

- a. The production of bleaching, dyeing and yarn dyeing is 140,000 m/month, printing, 60,000 m/month, as a total 200,000 m/month, which are small in volume. Thus it is considered, there is sufficient room to raise production in view of the equipment. Additionally, because of small production, no continuous equipment is set and, therefore, both of preparing and finishing processes are mainly on the batch system.
- b. Monthly production per worker is 5,000–6,000 m/man-month, which is

low in view of lot of the product and difficulty in production.

- c. As economic equipment, its production of 500,000–600,000 m/shift maker 1 series of equipment structure. Consequently, upon introducing a continuous desizing machine, scouring and bleaching machine, continuous dyeing machine, rotary printing machine, sanforizing machine, inspecting machine, it will become a modern processing plant to compete with other companies' products or imports.

9) Personnel management

Employees: Approx. 400

They have a labor union named Asociacion de Operarios y Empleados de America Textil.

10) Maintenance and others

Maintenance members are 12–15 in number. In view of damage to pirn winder and some machines not running well, the maintenance level is not sufficient. The maintenance equipment of the dyeing processing section is located with those of other section. However, the members of the dyeing processing section presumably have sufficient time to do maintenance, inspection, cleaning, etc. of the machines and tools can be accelerated, we believe.

(3) C Company

The company runs a consistent plant ranging from cotton ginning to dyeing and finishing, but equipment is worn out, and the operating conditions are at a low level. Even though, investment is made on the presently owned equipment, improvement can hardly expected. So, replacing all the equipment with new ones, utilizing the presently owned buildings so as to have looms 50F, it can become a good modern factory.

1) Items for production

Cotton ginning section produces ginned cotton, cotton-seed-oil coconut oil. The spinning section produces various kinds of cotton yarn, kite-string, and the weaving section produces deck-chair duck, floor sweeping rags, gauze, sugar bag, towel, sheet, poplin, serge, pantaloons etc.

2) Location

All the sections are located in the city of Asuncion.

3) Energy source

Power source is from ANDE, and power cost is 13.73 G/kWh. Daily power consumption is 3,000 kWh. Coconut shells are used as fuel for the boiler.

4) Facility

① List of machinery

The outline of the equipment is shown in Table 3-5.

Table 3-5 List of Machinery

Machinery	Quantity	Maker	Remarks
[Ginning division]			
Ginning machine	1 F		
[Spinning division]			
Blowing machine	2 F		
Carding engine	40 F		
Draw frame	3 F		
Fly frame	10 F		
Ring spinning frame	19 F		4,400 rpm, 57 mmφ
Cheese winder	3 F		
Ring twisting frame	5 F		
[Weaving division]			
Warper	1 F	Holt	
"	1 F	Howard	
Sizing machine	1 F	Howard	Hot air
"	1 F	G. Hibbert	Slusher, open size cooker 2 units
Tying machine	2 F	Dinamarca	Portable
Pirn winder	4 F	Hacoba	4 SP
Loom	104 F	Northrop	with Dobby, 2 F, 44"
Loom	60 F	Liversey	Over pick
(Total number of looms)	164 F		
Shearing machine			No use
[Dyeing and Finishing division]			
(Overall Processing Machines)			
Open stainless jigger	4 sets	Talleres JUSTO	1,680mm 1,720mm, not used
Obermaier bleaching, and dyeing machine	1 set		100kg, To be discarded.
Hydro-extractor	1 "		5 hp, To be replaced. To be discarded. To be disused.
Box dryer for cheese	3 sets		

(Con't)

Machinery	Quantity	Maker	Remarks
Obermaier dyeing machine	1 set		
Sizing, open stenter (clip)	1 "	Long Bridge	1,800mm x 10m, To be disused.
Cylinder dryer (10 units)		Gruschwitz	1,800mm, "
3-rolls mangle	1 set		1,500mm, "
3-rolls mangel	1 "		1,250mm, "
Stenter (clip, hard type)	1 "	Talleres JUSTO SIR James	1,800mm x 15m, "
Stenter (clip, pin)	1 "	Former Norton	1,250mm x 15m, "
Steam, with temperature adjuster attached, 4 rooms	1 "		1,200mm, To be replaced.
Doubling, winding machine	1 "	Talleres JUSTO SIR James	To be replaced.
Calender	1 "	Former Norton	To be disused.
[Utility equipments]			
Boiler	1 set	Rua Gomes de Corvalha	1 t/hr (estimate)
Bolser	1 "		4 t/hr (1979 new model, with auto-feeding device.)
Water	1 "		Deep well with water tank attached. (250m)
Air conditioner	1 "		To be installed on the roof
Maintenance facilities	1 "		Small size
[Building]	1 set		Consistant plant from spinning, to finishing through spinning, cloth weaving, dyeing. Reinforced red brick building with windows and concrete floor.
[Extinguishers]	1 set		Furnished, water extinguisher.
[Electric Lights]	1 set		Fluorescent light, No. of lights is reduced; 50-100 lx (estimate)

② Comments on facilities

- a. A consistent factory of spinning, weaving dyeing and cotton ginning, cotton seed plant are located in the same building. Since the building was built substantially, it will be a good idea if all the machines installed are renewed.
- b. The building has a high ceiling and thick walls, and each process is blocked perfectly. Consequently, it is used conveniently, and suited for spinning. The spinning section was presumably splended with its layout, selected machines, etc. when it was built, but since then no new technique has been adopted and, therefore, it is already deteriorated with no competitive power at present from the standpoint of modern spinning knwo how.
- c. Wire clothing of the carding engine must be replaced, the cylinder, doffer, flat and probably taker-in. If investments can be made at regular intervals, ① taker-in, ② cylinder, ③ flat, ④ doffer may be replaced in that order.
- d. Many carding engines' flat chains were worn cut and lengthened thats have to be replaced.
- e. Many carding engines were being overhauled and being left as they dismantled, which interrupted the smooth operations of the plant operation. It is apparently clear that overhauled machines should be reassembled as soon as possible to raise the operational efficiency. If there are a sufficient number of machines, the operation of some of them can be stopped simultaneously for a certain number of hours maintenance, which will surely eliminate waste of time.
- f. The type of top roller of the fly frame is common roller. It should at least be replaced with a loose boss roller.
- g. If the ring spinning frame is operated for a certain period continuously, the attachment of the pheumafil with the frame can absolutely not be disregarded.
- h. Inferiority of the spindle and bobbin of the ring spinning is noticed remarkably. If the spindle sway heavily, it is better to be vacant rather than produce inferior products (with a lot of fluff). Bobbin also includes 20 or 30 percent inferior products that are to be discarded.
- i. It is necessary to thoroughly clean the roller part of the draw frame, fly frame and ring spinning frame. It is the fundamental requirements of operational management to provide the cleaning tool, cleaning method, interval of cleaning, persons in charge of cleaning, the person in charge of inspecting the result of cleaning, however, the factory lacks these somewhat.
- j. The looms 170F are small in size, and the present facilities do not have either international nor domestic competitive powers. The installations of each process are very old, and are on the verge of being scrapped.
- k. There is no problems on the layout of the factory. New machines can be

installed with this layout without any modification.

- l. Approx. 20 years ago, they were seemingly engaged in dyeing finishing somewhat, but currently they dye yarn of a deck chair with a old-fashioned obermaier bleaching dyeing machine.
- m. There were several tens of dyeing finishing machines (British made) which were not in use. Clip tenters installed are left as they are.
- n. There is a building as a dyeing finishing factory. There is a possibility that the building, upon introducing modern installations and technique, will become a small-size-processing plant.
- o. Water is drawn from a deep well with a compressed pumping system. However, if an underwater pump is used, it is expected to be a 10 t/hr well. If the water is drawn from more than 200 m depth, it is no problem on the water quality.

5) Raw material

Domestic cotton is used on raw material at 100%.

6) Operation

They work 8 hours a day with a 2-shift system, 6 days a week and 300 days a year.

7) Product and quality

① Grey yarn

- a. Fault of roving is markedly noticed. The best way to reduce end down of ring spinning is to put emphasis on the operation of the fly frame, thus preventing fault of roving.
- b. In the yarn winding process, the universal knot is adopted, but it is necessary to advise them to use a hand knotter of weaver's knot by hand. In the case of knotting by hand, an operator should have scissors, and yarn and should be regulated for a certain length.

② Woven fabric

- a. Defect of yarn and woven are frequently found, but currently they do not raise problems on account of goods in process.
- b. The standard of quality isn't established at present.

③ Dyeing and finishing

Those where dyeing and finishing is performed are only yarn dyed for deck chairs, and they do bleach, dye and wash fabrics with a cheese dyeing machine. Dyestuff is direct dyestuff and is substantially bad, but they are not for cloth-

ing but for low class furniture. So, currently, it is not a problem.

8) Productivity

① Spinning division

If the rate of reusing waste cotton is reduced a little, and the mixture of waste is reduced, with the present spin yarn number count, the rate of cotton mixing will probably be possible. Which is more economical, "low grade cotton mixture x low yield rate" and "high grade cotton mixture x high yield rate"? It is necessary to inspect in detail the waste cotton rate in the process and the content of waste cotton.

② Weaving division

- a. Concerning the management of machines, this is a shortage of technicians, and at least 20% of the machine are not running.
- b. Because there is no operational manager, no management of training workers nor of expendables for operation are made. Loom operating efficiency is 50–60%, and approx. half of the machines are not running.
- c. Raw yarn cost is somewhat low, in view of the operating state of the looms labor cost and energy cost are high. Therefore, no cost competition can be expected.

③ Dyeing and finishing division

Yarn dyeing such as 5 t/month (estimate) is performed at need, and production is not made so that the second grade rate is questionable.

9) Personnel management

All the workers total approx. 300, with many aged workers, so they are not active.

10) Maintenance and others

Generally, the installations are old with no supply parts, so part of the looms are not running due to lack of parts. In addition, with respect to machines running, with damage to electrical warp stop motion of working, squeezing roller of the sizing machine and the cop-change function of the loom, etc. they are at the lowest level.

(4) D Company

Thus company runs a consistent factory of spinning (Cotton and woolen), weaving, dyeing and finishing, 60% of which is for military purposes. The company introduce the latest equipment such as open end process, loom process rapier loom (12 units), thus showing a positive management policy. However, in view of the content and size of the equipment, it is the best way to manage the plant for thick-woven fabric and domestic market.

1) Item for production

The spinning division produces cotton yarn (yarn for sale and domestic use), the weaving division produces military uniform (wood fabric), mantles, (wool), blankets (wool, acryl) sheets, decks, bags, rags to sweep the floor, etc. The dyeing and finishing as well as sewing sections estimatedly produces blankets, military uniforms, mantles (only loose hank dyeing) 20 tons monthly, 60% of which are uniforms, mantles, blankets for military forces, thus forming specific features.

2) Location

It is located in the city of Asuncion

3) Energy source

Power source is from ANDE, and fire wood is used as fuel for the boiler.

4) Facility

① List of machinery

The outline of the facility is shown in Table 3-6.

Table 3-6 List of Machinery

Machinery	Quantity	Maker	Remarks
[Spinning division]			
(Cotton spinning OE apparatus)			
Carding engine	2 F	San Giorgio, CCG Type	Newly installed.
Draw frame	1 F	Vock	
Open end frame	2 F, 336	San Giorgio, OEG Type	
(Ring spinning frame)			
Blowing machine	1 F		With woolen fabric
Flat carding machine	2 F	Marzoli	
Draw frame	1 F	Marzoli	
Fly frame	1 F, 60 SP	Marzoli	
Ring spinning frame	2 F, 816 SP		Approx. 10,000 rpm.
Doubling winder	1 F	Franz Muller	
Cheese winder	1 F	Nkmc	
Ring Twisting frame	1 F	Marzoli	
(Woolen spinning)			
Wool scouring machine	1 set		1 tank syoku
Woolen card	2	Andelenet	60 in, 80 in
Mule spinning frame	3 F, 1350 SP	Chaine	
Cap spinning frame	4 F, 150 SP	A. Rivero	Bobbin without core for coarse yarn
[Loom division]			
Warper	1 F	Gusken	90", Sectional warper
Warper	3 F		90", Sectional warper
Pirn winder	1 F	Sheller	5 SP
Cheese winder	2 F		Rewinder for cop, Reeling machine for yarn dyeing
Loom	4 F	Ribeiro	90 in Rapier renovated loom
"	13 F		90 in With cap change type, renewal required. Woolen fabric 45. renewal required. Jacquard
"	15 F		

(Con't)

Machinery	Quantity	Maker	Remarks
Loom	2 F		
(Toral looms)	34 F		
Inspecting machine	8 F		
[Dyeing and finishing division]			
(Preparatory room)			
Wooden wince washer	2 sets		2,000mm, Renewal required.
Beat and Scutcher	1 set		1,000mm, "
Rotary back	1 "		1,500mm, ϕ "
Wood willing machine	2 sets		1,500 x 2,000mm, "
(Dyeing room)			
Wood cistern for stock dyeing	1 set		180kg, Discard required.
Wooden wince	1 "		1,800mm, Disused.
Stainless wince	1 "		2,500mm, Disused.
Stainless small wince	1 "		1,500mm, Disused.
Hydroextractor	1 "		Renewal required.
Obermaier dyeing machine	1 "		100kg, Disused.
Bleaching, washing wince	1 "		3,000mm, Renewal required.
"	1 "		Disused.
(Finishing room)			
Sizing mangle (2 rolls, manual pressure)	1 "		1,900mm, Renewal required.
Stentering machine (warp type, pin, steam)	1 "	Schio SMIT (Italia)	2,000mm x 15 m, Improvement required.
Baking machine	1 "	H. Krantz Aohne	2,300mm x 30m, "
(Finishing, Sewing room)			
Raising, Piling and steaming machine	1 set	R. Center Fils	2,000mm, Improvement required.
Calender (cotton)	1 "	DC. Ramischt	2,000 mm, "
Sewing machines, cutters	15 sets		
(Motive Power Facilities)			
Boiler	1 set		5 t/hr (estimate), 6.5 kg/cm ²
"	1 "		5 t/hr (estimate), Disused

(Con't)

Machinery	Quantity	Maker	Remarks
Boiler Water	1 set		1 t/hr (estimate), Disused Deep well (160m) underground Water tank, 8 t. 1 unit, 300 t. 1 unit, Elevated tank, 10 t. 1 unit
Air conditioners			An estimate is now being requested.
(Building)	1 set		A consistent building of spinning, weaving, dyeing and finishing, sewing mills. Rainforced brick build- ing painted in white with windows, ceiling of 5-6 m high and concrete floor.
(Fir Extinguisher)	1 set		A sort of an extinguisher is furnished
(Electric lights)			Fluorescent light, 100 x 150 lx (estimate)

② Comments on facilities

- a. Cotton fibers are not opened sufficiently in the blowing machine. One more pincylinder beaten is required.
- b. Card clothing of the cylinder and doffer are required to renew.
- c. The ring spinning frame was set to the ring with a diameter of 49mm ϕ , and cop 42mm ϕ , but this is not appropriate. If a ring with a diameter of 49mm ϕ is used, an antiballoon, 51mm ϕ and cop, 46–46.5mm ϕ should be used. Even though the ring, 49mm ϕ is used, if cop is prepared with a small package, a small ring is better to be used because of little end breakage and low power consumptions.
- d. The same thing can be said about twisting too. Currently, a ring of 54 ϕ and antiballoon of 51 ϕ and cop of 44–45 ϕ are used, but they should be changed to a ring, 54 ϕ , antiballoon, 56 ϕ and cop, 51–51.5 ϕ .
- e. For both spinning and twisting, the shape of cop should be adjusted, and wound on the largest package, because it is better for the next process.
- f. It is better to give more consideration to selecting a traveller. A flange with the width of 3.2mm is used for spinning and twisting, and a traveller for a flange No. 1 is used for spinning and that for a flange No. 2 for twisting. In either case, the flange is No. 1, so in the case of twisting it is better to change the shape of the traveller.
- g. Rubber covering of the ring spinning frame should be reshaved again as soon as possible to remove surface wear, scratches and unevenness.
- h. The fabric weaving section uses very small loom 34Fs about half of which are woolen relating looms cotton relating cop change looms are being partially replaced by repier type renovatory looms. Currently 4 F are being replaced, which will be extended to 12 F in the future. With such mechanical stuffs to be arranged, production will be improved greatly which is not, however, large enough in scale for international competition. It may be advantageous to find a way with thick-woven fabric for domestic purposes.
- i. Following the introduction of OE spinning machines of the spinning section and Rapier type looms of the weaving section, the company is now considering to renew woolen facilities, thus showing a positive attitude. However, the present facilities do not have sizing machines for the preparatory process, and also old looms which are restricted to thick - woven fabric using coarse count or double yarn are worn out, and suggested to be replaced.
- j. Regarding layout, since the preparatory process is scattered into 3 places, and looms are installed at different 90° angles in the same room. Consequently, it is advised to check it again.
- k. As dyeing, only loose hank dyeing of wool and acrylic is performed in a wood-

en loose hank dyeing tank.

1. Dyeing and finishing installations, except finishing card sewing machines, are all very old installations.

5) Raw material

Fifteen % of raw material is acrylic, and acrylan (16.3 d 50%, 5d 50%, via cut cotton) made by Monsanto. The U.S.A. is imported, and the rest 85% is wool for which domestic wool is used or 100%. Raw material for a mantle is made of domestic material for 1/3 cotton for another 1/3 and recovered wool for the balance 1/3 imported from Argentina and Uruguay.

Military blankets are made of domestic wool, 70% and cotton 30%. Yarn is cotton card yarn 8s, 10s, 12s, 14s, 18s, 20s and woolen yarn 1.2 Nm, 12 Nm.

6) Operation

A shift system is employed, and the spinning section operates with 3 shifts and the weaving section and dyeing and finishing section operate with 2 shifts.

7) Quality

① Grey yarn

- a. Since a present spinning ending method as instructed by a machine manufacturer makes trouble with the processed that follows spinning, it should be replaced with some other methods.
- b. It is necessary to use a hand knocker at the yarn winding process. The unification of knots largest influences the process come after.
- c. It is necessary to change the slit gauge of winding yarn each time it is transferred to the next process without removing yarn defect.

② Woven fabric

- a. The quality of primary material yarn is very bad (slub yarn, neps, etc.). The quality standard is low, and warp float, start-up mark, temple mark, wale streak feeling are often found.
- b. It is desirable to set up a quality standard according to the items and use the workers train but the standard does not have to be so high in view of product level.

③ Dyeing and finishing

- a. Sixty % of the products are delivered to the military force, and they are not on the market, so we could not obtain them. Consequently. We cannot comment on the quality of dyeing.

- b. Objects of dyeing are mainly wool and acrylic products which are not included in the present survey. Therefore, this item is excluded.

8) Productivity

① Spinning division

Many spindles are vacant waiting for importing spinning aprons, which causes the lowering of production efficiency. If they are obtained domestically or from a neighboring country through very careful selection, some of oxhides for clothing and bags, etc. can be utilized. Even though domestic oxhide aprons are inferior products, they should be used rather than keeping the machines idle.

② Weaving division

- a. The rotation of looms is generally low 100 – 120 rpm, except for 178 rpm of Repier. In addition, many machines are out of order and also machines with poor change function are impressive.
- b. Sugar bags are woven with renovatory looms, and sheetings are woven in old fashioned machines. But they should be replaced so that the productivity and quality are improved.
- c. In general, maintenance work is not performed effectively, and manpower loss or carriage loss due to the improper layout raise problems.
- d. Maintenance of articles for operation is not good which partially causes low operational efficiency of looms, that is, 60%.
- e. Production scale is small and production cost is pretty high. Therefore, the work is not profitable unless articles of high added value are produced.

③ Dyeing and finishing division

Only loose hank dyeing for private use is performed with low productivity, thus it is not worth an evaluation.

- a. Personnel management

The company has a total of 200 employees.

10) Maintenance, others

As maintenance equipment, there are milling machines, drilling machines, welders, gas cutting machines, electric saw, etc., but they are all old fashioned, and perhaps made 30–40 years ago. Only 3 maintenance workers. The maintenance level, for example, of looms is somewhat better than its spinning sections level, but parts are not sufficiently provided. Consequently, machines not fully fitted with parts, machines with poorly maintained cop changes and shuttle changes and machines not running are several, and generally, maintenance work is low.

(5) E Company

This is a mill of consistent spinning, weaving, dyeing and finishing processes. The mill was established in 1928, but is small and timeworn. Therefore, it cannot be recovered. The work is mainly thick-woven fabric which depends chiefly on domestic demand. However, the market is dull, and therefore, it is the time to decide better to continue or not. If the mill continues, the spinning, dyeing and finishing sections will have to be done away with, and only the weaving section may be enlarged. The owner wants to put the facilities and site for sale.

1) Items for production

Mainly fabric for a deck chair, fabric for pantaloons, jeans, towel, duck etc., which are thick-woven fabric.

2) Location

It is located in the city of Asuncion.

3) Energy source

Power source is from ANDE. It has no boiler, and firewood is used as fuel for a dyeing kier.

4) Facility

① List of machinery

Table 3-7 summarizes the machinery used.

Table 3-7 List of Machinery

Machinery	Quantity	Maker	Remarks
[Spinning Section]			
Blowing machine	1 F		
Flat card	6 F	Marzoni	
Draw frame	2 F	"	4 heds
Fly frame	2 F	"	
Ring spinning frame	2 F, 800 SP	"	800 rpm, cotton ginning 8S, 16S, thick fabric
Ring twisting frame	2 F		
[Weaving Fabric Section]			
Sectional warper	2 F		Wooden.
Warper	1 F		Wooden.
Tube winding machine	2 F		
Reeling machine	2 F	Home product	
Loom	20 F	Draper	36" Small width loom
"	8 F	Dickinson	5 mahcines have no dobbies.
"	4 F	Hatterly	will 40 in dobbies
(Total looms)	32 F		
[Dyeing and Finishing Section]			
Hank dyeing steel bath	1 set		28 kg, To be discarded.
Washing kier, washing tank	2 sets		28 kg, One tank is not used
Centrifugal hydro-extractor	1 set	H. Krantz	120 kg
Jigger			Not used.
Dyeing bath, washing tank	2 sets		Not used.
[Motive Facilities]			
Dyeing bath	1 set		Fire wood.
Water			City water.
[Building]			
			Rainforced brick bilding with windows and con- crete floor.

② Comments on facilities

- a. All installations are outworn, but some of them are still work as spinning installations as follows.

Blowing machine – One more cleaning point like SC. GO. etc. must be established more automatic rap scaler.

Carding engine – Only its frame can be used. Consuming items such as card clothing, flat chain have to be replaced.

Ring spinning frame – Only its frame can be used. A creel, roller part, building motion, spindle, jocky pulley way be replaced. However, if the whole machine is replaced with a new one, it may be economical. Other all installations and cans and bobbins cannot be used.

- b. Rings of the ring spinning frame and twisting machines must be replaced with new ones. The service life of the high quality ring of the ring spinning frame when operating at high speed (approx. 15,000 r/min), is considered to be 18,000–20,000 hrs. From other standpoints too, it is economical to replace it with new one at an interval of approx. 5 years. The service life of twisting way be 20–40% longer than this. Interval of replacement of the traveller must also be considered.

The diameter of the ring of the twisting frame is too large. It should be smaller to fit cop, so that end breakage may be decreased and power consumption also reduced. The traveller is also too wide. It is necessary to change the traveller type. Because it does not fit the ring diameter and yarn count, and breakage caused by the traveller often occurs.

- c. Due to worn out surface of top roller rubber covering, over hardness and scratches of the draw frame, fly frame and ring spinning frame. They should be replaced or reslaved.
- d. Regarding the weaving section, 32 Flats of loom are installed at 2 places in a small room, and it is difficult to enlarge its scale. The installations are worn-out. The looms are operated in a mess. Some of them are not fully running due to part shortage. Main parts such as crank metal race, etc. are wornout and just before scraps.
- e. 1F among 5Fs of dobby equipment is a part base, and only 4Fs are running. 6Fs out of 20Fs of Drapet are running, and it is unknown how many machines should run as a normal standard. All cop changes are taken off for replacement.
- f. Manual hank dyeing of denim, deck chair cloth, towel, jeans etc. is performed (monthly 3 for estimated). They are dyed directly in a dyeing bath with dyestuff. It is a household industry type and small in scale, and old fashioned. Consequently, it is advised that it be werged with other companies or operations be stopped. This section is excluded from our comment.

5) Raw material

Hundred % of the raw material is domestically produced cotton.

6) Operation

The mill operates 8 hours a day in 2 shifts, 5.5 days/week, 270 days/year. At some workshops, they work in a shift plus overtime. At the dyeing section, two men work 8–12 hrs/day.

7) Quality

① Grey yarn

- a. Generally, the quality of yarn is low, which required process management. At present, only measuring rap weight of blowing machine is performed. Daily measurement of rovings unit weight delivered of draw frame are the minimum requirement. It is necessary to fit yarn spinning to nominal count. That is, if yarn is thin, it make relatively soft twisting, thus the yarn strength is lowered. On the other hand, if it is thick, too much raw cotton is used, which makes unit-weight of a product heavy, thus raising the cost.
- b. It is necessary to pay more attention to yarn ending for processes then come after. A hand knocter must be introduced to the minding and twisting process.

② Woven fabric

- a. The quality is low. The machine is wornout, and does not have sizing process and dropper. Weaving defect due to fluff, start-up mark, double pick up, lashing in, slub yarn and other defects are impressive.
- b. Improvement in the installations is required before setting up the quality standard.

8) Productivity

① Spinning Section

- a. With only 2 Flats of ring spinning frame, the plant can hardly set up economical production level. General management applied for this mill cannot put it to a spinning mill. The only way left open is to reduce labor cost by elevating man power through thoroughly planned operation. When every worker can operate more than 2 kinds of machines, workers can be reduced by 1/3. With a group of workers capable of only, operating a single kind of machine, the plant can hardly have a place among large-scale plants. Only feeding the same yarn quantity to weaving section, buying yarn will be cheaper with higher probability.
- b. A supervisor at the plant pays attention to only the maintenance of the installations, but not to the improvement of the productivity.

② Woven fabric section

- a. Besides problems in managing machines, workers are aged, thus productivity is low.
- b. The maintenance of operational equipment is delayed which results in wornout machines, and the number of machines that a worker is responsible is small or 2Fs men. Consequently, only 14Fs out of 32Fs looms are operating, and with the system of a man responsible for 2Fs, the production cost is very high. The owner also complains of high labor and power consumption costs.

9) Personnel management

The number of workers is 70, which consists of 40–50 year-old women. The age constitution of the workers is high. They are not so active, nor do they have a labor union.

10) Maintenance

There is almost no maintenance equipment available.

(6) F Company

The owner and his family consisting of 3 members manage a plant. He makes the round of the mill properly, and the mill operation is managed appropriately, thus it is a company with full of management spirit.

1) Items for production

The company produces sportswears, nylon under wear, short panties, socks. However, competition is keen in a small worker of sportwear in Paraguay. This company can hardly be expected to expand. It is recommended to develop the field of intermediate garment, i.e. cotton T shirts and others.

2) Location

It is located in the city of Asuncion.

3) Energy source

Mainly electric power is used, and the power source is from ANDE.

4) Facility

① List of machinery

A list of machinery is shown in table 3-8.

Table 3-8 List of Machinery

Sorts of machines	No. of machines	Manufacturers	Remarks
Circular knitting machine		Bentrey	
Circular knitting machine	28F	Mayer	
Circular knitting machine	1F		positive yarn feeding equipment and stop motion
Weft knitting machine	Some		
Full fashioned hosiery knitting machine	"		
Toricot	"		
Sewing machine	26-30F	Juki	

② Comments on facilities

- a. The building and facilities are compact and well arranged.
- b. The working conditions are good with back ground music and well designed illumination. It is the best of all that we observed this time.

5) Raw material

As supplied yarn, Nylon Textured Yarn (24 Fil, 70 o/2) is imported from Taiwan (OASIS First Textile Indust). As cotton yarn, colored yarn of Pilar made 14S, as cotton yarn, Pilar made (after processing and finishing) ones, and as rubber yarn, BADA made ones (Barcelona, Spain) are supplied.

6) Quality

- a. The quality of the product depends entirely on the quality of yarn (cotton yarn), and the improvement of yarn is a vital necessity to improve the quality. Complaints against domesite yarn is high.
- b. In Paraguay, knitting does not spread in the field of general clothing yet, and therefore, there is much room for future development. However, good quality of cloth and sewing technique which can compete with other companies' products are required. It is also necessary to collect information in view of design.

7) Productivity

Cotton yarn is used on wax rewind, and its knitting efficiency is not good, but it is done following the requirements of the sewing section. Therefore, no problem arise.

A female chief makes the round of the working shop of sewing while she is performing cutting, and it is comparatively well managed.

(7) G Company

The company is a comparatively new company established in 1968, and mainly engaged in knitting and sewing. The owner of the company is positive towards the business. At present, it is in a form of a small enterprise, but there is room for improving the productivity and quality of the products by specializing in knitting, processing and sewing sections respectively. Currently, the company's products are dull in the market, and outrivalled by imports, resulting in a huge stock.

1) Items for production

The major products are cotton knitted products (sport wears, general underwears) polyester knitted products (sportwears, trousers), wool knitted (sweater, cardigan), etc.

2) Location

It is located in the city of Asuncion.

3) Energy source

The power source is from ANDE. Firewood is used as fuel for the boiler.

4) Facility

① List of machinery

A list of machinery is shown in Table 3-9.

Table 3-9 List of Machinery

Sort of machines	No. of machines	Manufacturers	Remarks
<p>[Knitting Section]</p> <p>Circular knitting machine (used machine)</p>	9F	<p>Wildth Mellor Bentley Mellor Bromley</p>	Repair required
<p>[Bleaching Section]</p> <p>Stainless wince</p> <p>Tile-open wince</p> <p>Hydroextractor</p>	<p>1F</p> <p>1F</p> <p>1F</p>		<p>2,000mm x 1,500 l (Renewal required)</p> <p>2,000mm x 1,500 l (Renewal required)</p> <p>1,200mmφ (Repair required)</p>
<p>[Sewing Section]</p> <p>Pantex</p> <p>Opener with steaming attached</p> <p>Coolar sewing machine</p> <p>Overlock sewing machine</p> <p>Recta</p> <p>Button hole sewing machine</p> <p>Button sewing machine</p>	<p>1F</p> <p>1F</p> <p>2F</p> <p>16F</p> <p>4F</p> <p>2F</p> <p>2F</p>		<p>Renewal required</p> <p>Renewal required</p> <p>Repair required</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p>
<p>(Motive Power Equipment)</p> <p>Boiler</p>	1 unit		2,001/hr (estimate) fire wood fuel
<p>(Building)</p>			A small factory building in the city

② Comments of facilities

- a. The owner has an idea to enlarge the mill, particularly the renewal of the processing facilities. However, the enlargement is not required in view of installations at the present production level.
- b. The mill processes washing and bleaching with winces after knitting in the scale of a household industry.
- c. Dyeing is done in the sun, therefore, the introduction of a dryer is desired. In the present production scale, a smallsize steam or electric dryer is adoptable.

5) Raw material

Regarding cotton yarn, dyed yarn is purchased from Pilar, and gray yarn, from Forno (8s, 12s, 14s, 18s, 20s, 24s). Polyester yarn is imported from Polyenka in Brazil. Lana (wool) yarn is imported from Uruguay. Sewing thread and textured nylon are imported from Brazil. The owner seemed not be satisfied with domestically made cotton yarn in view of its quality and terms of delivery.

6) Operation

9 Flats of circular knitting machines are operating 24 hours.

7) Quality

With the present quality, the products cannot be expected to be exported, but only used domestically. There is competition between companies on the same line, therefore, unless they have some coordination between them, they can hardly be expanded in the future. It is necessary to switch the products to those for general clothing or to develop sales root to export them to Argentina or Bolivia, requesting forcedly the spinning side to improve the quality of gray yarn while improving their sewing technique.

8) Productivity

- a. The sewing section is capable of producing 300,000 – 400,000 units/year, but at present, produces 180,000 – 200,000 units/year. The sales results is 40,000,000 G/year. In addition, in the case of wool, synthetic, cotton, the company is capable of producing 15,000 units/month, and in the case of cotton only, 33,000 units/month.
- b. Wax winder is a very old type, but it is suitable for knitting, and this helps increasing the efficiency of knitting. At present, knitting and sewing have accumulated of stocks, and exceeding the present production level will raise a problem.

9) Personnel management

The total number of workers is approx. 30, and those for the sewing process are mainly female workers. Three to four male worker are assigned to the bleaching process.

(8) H Company

This company is mainly engaged in knitting and sewing. It is a specific company that 80% of the products are delivered to the military force.

1) Items for production

Around neck shirt, socks, foot-ball jersey, raised winter wear, etc. are manufactured, 80% of which are delivered to the military force.

2) Location

It is located in the city of Asuncion.

3) Energy source

Power source is from ANDE.

4) Facility

① List of machinery

The outline of equipment is shown in Table 3-10.

Table 3-10 List of Machinery

Sorts of machines	No. of machines	Manufactures	Remarks
Circular knitting machine	1F		30"φ x 14 ^s , 40 units are fed. (One with the largest diameter among those we observed in Paraguay)
Interlock	2F		20"φ x 14's
V Welf knitting machine	8F		
Finishing calender	1F		
Raising machine	1F		
Toricot	1F	LIBA	40s combed yarn

② Comments on facilities

- a. Socks knitting machines were installed 25 years ago, and the owner wants to replace them.
- b. Installations are scattered in a large building-like warehouse with a concrete floor. Electric lamps hang down from the ceiling and the working conditions must be improved. The circumstances must be improved in such a way that the floor is maintained, workers are made to wear scuffles to prevent the products from getting dirty, so that workers are made to have an interest in the products positively.

5) Raw material

Pilar made (5s, 14s, 24s) colored yarn and sewing yarn are used for cotton yarn.

Nylon textured yarn is imported from First Textile Industry in Taiwan.

6) Quality

Sewing is rough compared with other companies. Since final users are the military force, no strict comment may be made on the products.

7) Productivity

Eighty percent of the products are delivered to the military force, which enables the company to set up an exact production plan. Consequently, there is no production schedule. Yarn consuming schedule for one year's use is ordered at a time from Pilar Co., Ltd., and no problems on the term of delivery, etc.

(9) I Company

This company runs a knitting, sewing mill whose equipment is wornout and the building is small. Therefore, the company is planning to move to the suburb in near future. The president is chairman of a business organization, Camara de la Industrial Textil del Paraguay. (This organization is engaged in exchanging information, but seemingly it has no function as a business organization).

1) Items for production

Children's wear such as knitted shirt, sewed products, etc.

2) Location

It is located in the city of Asuncion.

3) Energy source

Power source from ANDE.

4) Facility

Flat knitting 10Fs, Swiss-made full fashion 2Fs and sewing machines. The mill is narrow, not maintained well.

5) Raw material

Regarding yarn, besides domestic cotton yarn, high class cotton yarn is imported from foreign countries. Mercerized yarn of 30/2 is imported from Dixie Yarns (NC, TEUNESSEE in the M.S.). Also acrylic yarn is used. Cotton sewing yarn (50/3) is imported from Corrente of Brazil. The import business for these is taken care of by the company. Also, since yarn used is small in quantity, following procurement of yarn is not made sufficiently. (It once purchased Vonnel 2/40, but continuous yarn supply after that was not made.)

6) Operation

In general, the market is small, and there is seasonal changes in purchasing power in farming villeges. Therefore, it is difficult to operate constantly. Embroidery for infants' wear depends on an outside order. (Manual sewing of household side job by approx. 10 persons).

7) Quality

Sewing technique is low, and there is much room for improving the quality of the products.

8) Productivity

When visiting the mill, only about 40% of the equipment were operating, thus the productivity is low.

4. THE POSSIBILITY OF EXPORTS

4-1 The Possibility of Exports in the Present Situation

As has already become clear in the description of the present state of the textile industry and in the diagnosis of the companies, it would appear that in terms of price, and in terms of quality and other aspects apart from price, the Paraguayan textile industry will have a difficult time trying to export its produce under the present circumstances. While there may be possibilities for some cotton yarns in terms of cost, the quality of these yarns presents problems.

Consequently, if the textile industry is to be developed into one of Paraguay's leading industries in the future, there will have to be some pretty drastic structural improvements made. Particularly conspicuous during our visit was that much of the machinery and equipment was decrepit and absolute and that productivity was very low with large numbers of people engaged in the work. To solve these problems not only will the companies have to be reorganized internally, but also reorganization of the industry itself is unavoidable. Going further, if it is to be developed into an exporting industry, then in view of the fact that there are already many countries which have a head-start in this field, the establishment of new integrated factories ought to be considered.

4-2 Basic Development Plan and the Possibility of Exports

The "Basic Development Plan" suggested in this report is described in detail in chapter 6 and is a practical strategy resulting from studies in which full allowance was made for the present state of the Paraguayan textile industry described above. The basic idea behind this plan is to center development around export, constructing a new factory for the exclusive production of export products and utilizing the strength of this factory to rehabilitate and promote the existing textile industry.

In what follows we shall examine the possibility of exports after realization of this "Plan" centered on the establishment of new factories.

(1) Spinning

1) Price

A future picture of the spinning process based on the "Basic Development Plan" is given in table 4-1. Table 4-2 shows the estimated processing costs when the new export oriented factories are in operation.

Processing costs at the new factories are not necessarily low for the G85,290 per bale, converted to carded 40, is higher than the manufacturing cost at an existing Paraguayan textile enterprise, the Pilar Company. However, there is no doubt that quality at the new factory will be in a different class. Assuming raw materials can be obtained at the same price as Pilar Company pays, a slight rise in manufacturing costs will not be a problem.

A look at the breakdown of the manufacturing costs shows that depreciation ac-

Table 4-1 Outline of "Basic Development Plan" for Spinning Process

Item Name of enterprise		At Present		After implementation of plan	
		No. of spindles	Output (Kg/Month)	No. of spindles	Output (Kg/Month)
New factory		—	—	20,000	205,875
Processing costs	Pilar	33,772	310,000	33,772	340,000
	America Textil	7,728	100,000	7,728	120,000
	I.T.A.S.A.	7,440	55,000	10,000	187,610
	Forno Y Valle	1,152	5,000	0	0
	Pedro Genovese	800	5,500	0	0
	Sub-total	50,892	475,500	51,500	647,610
Total		50,892	475,500	71,500	853,485

Table 4-2 Manufacturing Costs for Spinning Process at New Factory

(Unit: G)

Item		Manufacturing cost per kg	Manufacturing cost per bale
Cost			
Cost of gray yarn		407.4	79,443.0
Processing costs	Power and baling materials	93.0	16,866.7
	Labour costs	58.7	10,654.2
	Maintenance costs	31.0	5,631.9
	Depreciation	168.8	30,627.1
	Others	101.9	18,492.4
	Total	453.4	82,272.3
Total manufacturing cost		860.8	161,715.3

(Note) Raw cotton is computed based on 1 bale = 195 kg and cotton yarn, on 1 bale = 181.44 kg.

counts for a large proportion (37.2% of the total) and since this is a fixed cost it is possible to cover this by increasing production. In the proposed plans operation is scheduled at 25 days a month and 300 days a year, but if this is increased to the same 360 days a year level found in Taiwan and S. Korea, depreciation could be brought down by around G8,000 per bale. If the cost per bale could be reduced by G8,000, then exports would be come possible not only to Argentina, Bolivia and other neighbouring countries but also to the United States and Europe.

In addition, while power costs will rise abroad in countires, they are expected to decrease in Paraguay due to the completion of the Itaipú hydroelectric power station, so making Paraguayan products even more competitive. For example, Brazil's dominant industrial position in recent years owes much to the cheap cost of power it enjoys. Another factor which supports the competitiveness of spinning thread in Paraguay is the cost of freight for the raw cotton.

Table 4-3 gives the latest market prices for domestically produced yarn in various countires. If the manufacturing cost per kilogram of Paraguayan yarn is converted into U.S.\$, it works out at \$2.65 and if interest, selling expenses and other costs are included, then it would be possible to put Paraguayan yarn on the market at almost the same price as Taiwan yarn. What's more if the operating rate were increased as described above, a certain level of profit could be expected.

Table 4-3 Market Price of Domestically Produced Yarn

(Unit: US\$/kg)

Country Count	Taiwan	S. Korea	China	W. Germany	U.S.
30	2.97	3.05	—	3.73	4.05
40	3.63	3.52	3.25	—	4.55

Note: The price for China is the C & F price for exports to Japan.

2) Quality

The quality of Paraguayan raw cotton is quite satisfactory for middle count use and the quality of the workforce is not considered to be inferior to that engaged in spinning in other countries. Moreover, since a new factory is to be constructed and new machinery and equipment introduced, there is no reason for the Paraguayan textile industry to be inferior to any other in the world. What remains are the questions of operating the factories and management of the machinery and equipment.

The attitude of senior management is the most important factor in connection with factory operation and machinery and equipment management, but judging from the present situation in Paraguay, it would seem that the controlling factor in quality competitiveness is the success or failure of education aimed at the middle management layer. What's more, arrange-

ments with the repair industry and ironsmiths must be made and routes for the supply of parts established to maintain the new machiner and equipment, otherwise operating rate and competitiveness will decrease immediately.

(2) Weaving

1) Price

As described in chapter 2, the present situation is that management costs in Paraguay are almost the same as in Japan and that fabric is just not competitive in international markets.

When considering exports under the "Basic Development Plan", there is a limit to what can be done just by rehabilitating the existing textile companies and so we are considering the construction of a new factory equipped with 200 looms. We would also rehabilitate existing factories chiefly by replacing all the machinery and equipment at I.T.A.S.A. As with the spinning, the basic idea would be for production at the new factory to be exclusively for export (after processing) and for products manufactured by the existing enterprises to be for the domestic market, though these is the possibility that some of these too may be exported. Table 4-4 gives an outline of the manufacturing process for fabric as considered under the "Basic Development Plan".

Table 4-4 Outline of "Basic Development Plan" for Fabric Manufacturing Process

Item Name of enterprise		At present			After implementation of plan		
		Looms	Output (1,000m)	Personnel	Looms	Output (1,000m)	Personnel
Name of factory		—	—	—	200	577	125
	Pilar	630	935	467	630	935	340
	America Textil	180	200	136	180	300	134
	I.T.A.S.A.	164	136	123	48	402	80
	Forno Y Valle	34	38	30	27	45	14
	Pedro Genovese	32	19	30	50	82	33
	Sub-total	1,040	1,328	786	935	1,764	601
Total		1,040	1,328	786	1,135	2,341	726

The estimated manufacturing cost when the new factory has been built and shifts into full operation is shown in table 4-5. This has been calculated by adding up the cost of raw materials, power costs, labour costs, depreciation etc. and at G225.9 per meter of roll is only slightly less than at present, and still considerably greater than for Brazil (table 2-19). At this level it will be at quite a disadvantage compared with the competition from the newly industrializing countries of Asia because of the transportation handicap it has, and will be difficult to export for some time to come.

Table 4-5 Manufacturing Cost for Fabric at New Factory

	(Unit: G/m)
Cost of raw material	130.1
Processing cost	95.8
Variable costs	20.0
Fixed costs	75.8
Total	225.9

Table 4-6 gives the latest market prices for cotton fabrics in various countries but because adjustments have been made for the different standards applicable in each country, one must be prepared for slight changes. When the manufacturing cost of rolls of cloth produced at the new factory to be established under the "Basic Development Plan" is converted into U.S.\$ and revised so that it may be compared with that of other countries it is expected to work out at about US\$0.70 per meter. This would increase by more than 20% when interest and selling expenses are included and if transport costs were added would be impossible to export and so the idea under the plan would be to forget about exports for the time being and to put all the cloth produced at the new factory through that factory's dying process.

However, as for the prospects for the future. What was said about spinning also applies to weaving and so by increasing the number of days of operation from that given in our proposal (i.e., to 30 days a month, 360 days a year) a decrease in costs of approximately 3.7% would be possible. If, on top of this, power costs come down in the future, then the difference between the manufacturing cost in Paraguay and Brazil will disappear, in which case it would be possible to export to neighbouring countries and to Europe.

2) Quality

As stated in the "diagnosis of companies", the quality of cloth produced at the various companies fails, with the exception of some of the Pilar Company's products, to reach an acceptable level for exports. Products to be exported under the "Basic Development Plan" will all, as a rule, be made at the new factory and so these should be no problems as far as quality is concerned.

Table 4-6 Comparison of Market Prices of Domestically Produced Fabrics in Various Countries

Item	Country		Japan	Taiwan	S. Korea	China	W. Germany	U.S.A.
	Brazil	U.S.A.						
Standard	Count	40 x 40	40 x 40	32 x 32	30 x 30	30 x 36	30 x 30	35 x 35
	Density	133 x 71	133 x 71	68 x 68	75 x 75	72 x 69	75 x 75	78 x 54
	Width (in.)	38	38	50	48	38	63	48
Price/meter	Actual price (US\$)	59.0	72.0	58.0	62.0	40.5	110.0	53.0
	Conversion price (US\$)	59.0	72.0	66.8	70.4	51.4	105.9	66.3
Quality comparison	B	A	B	B	B	B	A	A
Remarks						C & F Export price to Japan		

(3) Dyeing and Finishing

1) Price

The "dyeing process manufacturing cost at the new factory" under the production volume conditions in table 4-7 are as given in table 4-8.

Table 4-7 Output of Products Processed at New Factory

(Unit: 1,000m/Month)

Classification	Input volume	Shrinkage	Waste percentage	Finished output
Bleached, dyed products	290	6%	3%	264.4
Printed, yarn-dyed products	310	6%	5%	276.8
Total	600	—	—	541.2

Note: The width of the gray cloth will be 47 in. and that of the finished cloth 45 in.

Table 4-8 Dyeing Manufacturing Costs

(Unit: G/m)

Item	Cost	
	Bleached, dyed products	Printed, yarn-dyed products
Cost of grey cloth	225.9	225.9
Processing costs	117.1	225.0
Fixed costs	63.7	88.0
Variables	46.4	101.8
Others	7.0	35.2
Total	343.0	450.9

A comparison of prices of dyed products in various countries is given in table 4-9.

Table 4-9 Comparison of Prices of Dyed Products in Various Countries

(Unit: G/m)

Classification	Japan (EX-GO)	Brazil (Manufacturing cost)	New Paraguayan factory (Manufacturing cost)
Bleached, dyed products	277.3	331.5	343.0
Printed products	520.0	427.2	450.9

Note: 1) Cloth width converted to 47 in.

2) Current price for bleached and dyed products in Japan is less than manufacturing cost.

Under the "Basic Development Plan" we are thinking in terms of a new factory with a monthly production capacity of 600,000 meters (see chapter 6-14) "Establishment of new factory for production of textiles for export" for detail. According to this, the cost of Japanese printed products is considerably higher than for other countries but this is due to the difference in added value and so these are problems in making comparisons from the table as it is. At present, printed products are being traded at about G80/m less than this figure.

Paraguayan products are, in any case, not very competitive internationally, either in price or quality, though being only slightly higher in manufacturing cost than Brazilian products they could be viewed as competitions.

The manufacturing cost for products from the new factory was calculated using jointly conservative values for the estimated-basic units and so there is almost certainly room, depending on the results of a future feasibility study, to reduce this estimate. If, for example working hours, wages, depreciation costs from investment in plant, oil costs etc., and the advantage of high quality products due to the latest machinery and equipment are taken into consideration, then the possibility of exports to neighbouring countries in particular becomes quite feasible.

2) Quality

With the introduction of the latest machinery and equipment there should be no problems concerning product quality, though it naturally goes without saying that a sufficient level of control and operational technology is required for each process.

(4) Transportation Cost

When it comes to exports, Paraguay has the handicap of being a landlocked country. This may not be any great problem when exporting to neighbouring countries but is a dis-

advantage when exporting to Europe and the United States.

At present 80% of goods are transported by riverboat down the la Plata river from Asuncion harbour and it is thought that this will probably be the method employed for cotton goods in the future. In this case, the goods would be carried to Buenos Aires in Argentina and there reloaded an ocean-going ship. The time taken by river-boat for this journey is about 6 days. In recent years the harbour conditions at Buenos Aires have not been good with Argentinian goods being given preference. Monte Video in Uruguay further downstream is being used more and more, but there is the problem here that it means navigating the open seas which is not easy for a river-boat.

Since November 1980, the transportation costs from Asuncion to Buenos Aires on a raw cotton base has been U.S.\$50/ton (excluding cost of loading at Asuncion harbour). Since the manufacturing cost of the yarn (40s) to be produced at the new factory will, as stated previously, be approximately U.S.\$2.6/kg, assuming the transport costs are the same as for raw cotton then it is reckoned the additional amount will be round about 2%.

Looking next at rolls of cloth the transport costs from Asuncion to Buenos Aires is approximately G2.0/m and so about 1.0% will be added to the manufactuirng cost (G225.9/m) of the fabrics to be produced at the new factory.

When the transport costs to Buenos Aires are added to the manufacturing ocst of dyed products, they come out at about G345/m of bleached cloth and G453/m of printed cloth.

However, in terms of the overall cost the affect of cost-raising factors arising from the fact that Paraguay is a landlocked country is comparatively small and is less of a problem that the question of delivery time.

5. DIRECTION IN WHICH THE COTTON BASED TEXTILE INDUSTRY IS DEVELOPING

5-1 Experience of Development of Textile Industry in Brazil and Central America

(1) Comparison with the Possibility of the Development of the Paraguayan Textile Industry

When a comparison is made with the conditions present at the time the textile industries of the leading textile countries, including those in Europe and the U.S. developed, Paraguay's relative position may be summarised as follows.

1) It is self-sufficient in raw material which is of superior quality, but the present volume produced is less than by the major raw cotton producing countries.

2) There is little accumulation of textile industry technology and the technological gap with the leading textile producing countries is widening. The transfer of technology is, therefore, a matter of the utmost importance.

3) The domestic market is limited and exports will become necessary.

4) From the export angle, Paraguay's present situation resembles that of the United States in the 1830's with raw cotton accounting for more than 50%, the rest being primary industrial produce. However, in the case of the U.S., there existed export markets to absorb the expansion in production of raw cotton and since the iron and steel industry became, together with the textile industry, a leading industry a 'backward-related-effect' was produced and since there also existed a domestic market the 'forward-related-effect' expanded. The conditions in Paraguay are different and it is unlikely that it will follow the same course of development.

5) Paraguay is a long way behind in such economic factors as accumulation of capital, inflation regulation, commercial capital and the inflow of foreign capital.

(2) The Circumstances Behind the Establishment of Japanese Related Textile Enterprises in Brazil and Central America

Example of Japanese related textile enterprises in Brazil and two Central American countries (referred to as country A and country B below) are shown in table 5-1.

**Table 5-1 Examples of the Details of Establishment of Textile Enterprises
in Central and South America**

No.	Item	Brazil	Country (A)	Country (B)
1	Established	1955	1955	1964
2	Route of entry	Japanese company → Local company	Japanese company → Local company	Local mission → Japan
3	Investing company	Japanese 100%	Japanese 89% Local 11%	Japanese 40% Local 60%
4	Sales company		New local company 50% Japanese 50%	Local 40% Japanese 60%
5	First dividend	15 years later	6 years later	11 years later
6	Capital details	1853.33 fold increase in capital over 25 years	4.66 fold increase in capital over 25 years	5.4 fold increase in capital over 15 years
7	Inflation rate	939.6%		
8	Scale of production setup	(S) 72,400 SP (W) 200F (D) Short and long tex- tiles, woven goods, knits 800,000 m/month bleaching, yarn dyeing (SW) Sewing machines 120F	(S) 54,856 SP (W) 939F (D) Short textiles 1.5 million m/month bleaching, printing, yarn dyeing	(S) 16,080 SP (W) 423F (D) Short textiles 650,000 m/month bleaching, dyeing, printing
9	History	Starting from the purchase of (S) (W) factories has expanded over many years increasing facilities and merging. Later extended to (D), (K), and (SW).	Started from (S), (W) later expanded facilities from bleaching and dyeing to printing and yarn dyeing in response to expansion of market and demand.	Started from (S) and (W) Purchases yarn from country A. Later increased facilities to printing.
10	Change to synthetic fiber	1970	1970	
11	Privileges	Tax exemption on imported machinery, machinery parts and materials. Under obli- gation to export.	Ditto No obligation to export	Ditto Ditto
12	Education, training, guidance	Dispatch of personnel from Japan	Ditto Dispatch of middle manage- ment to Japan for education.	Ditto

Note: (S) – Spinning (W) – Weaving (D) – Dyeing (SW) – Sewing (K) – Knitting

Touching on our experience in Brazil from among these examples of enterprises in Central and South America, in the 5 years between 1955 to 1960 5 Japanese companies, beginning with the one shown in table 5-1, started operations in Brazil. They went about this in two ways, of which company C and company D are typical examples.

C Co. was the first of Japanese companies to start operations in Brazil, doing so by buying up an existing company. At the time (1955) Brazil had passed through an export boom period for the cotton industry taking advantage of shortages in cotton fabric during World War II and much of the machinery and equipment was decrepit, there was a drop in quality and a conspicuous decrease in competitiveness.

The Japanese spinning industry, which stood in a superior position in terms of such management resources as capital, technology and management on learning of this situation in Brazil immediately decided to set up operations locally in anticipation of the country's future.

C Co. took the initiative but judging that it would be too provocative for it to establish an enterprise locally under its own name and also from the viewpoints of local product sales, material procurement, labour management, its credit standing with banks etc. decided to start operations in Brazil by purchasing an existing company.

Two years later in 1957, D Co. extended its business to Brazil, establishing a new enterprise as a joint venture with local capital. It constructed a new factory with funds from Japan and started operation. The difference in the manner in which these two companies set up operations in Brazil later showed itself in the difference in their business results.

C Co. which had taken over an existing factory needed to spend a considerable amount of capital on its rehabilitation and while this produced some results it eventually came up against the limit of decrepit facilities. In addition because it took over the workforce of the existing factory almost as it was the wages and retirement allowance for long service workers became a burden and business continued at a low level.

In contrast to this, D Co. which, although it had started later, had the advantage of a newly constructed factory and had adopted a sound management policy, got off to a smooth start. C Co. was eventually able to free itself from its business doldrums and get over its awkward situation only after it constructed a new spinning factory, rationalised the workforce from the old factory and sold off the old factory. Assisted by Brazilian government's policy of industrialization and with the modernization of its industry and the entering of a period of high economic growth, this company, as a result of adopting a positive expansionist policy under which it launched into synthetic fiber spinning, increased the number of looms, brought in knitting machines and set up a sewing division, is at last made up the ground cost at the beginning, with the trust and management know-how it has cultivated since its entry into Brazil bearing print.

The two companies' policies regarding the location of factories were also quite different. While C Co. chose a location in the heart of the cotton woven goods district and built a new factory there, D Co. established its factory seeking a high quality workforce (i.e., an area in which there was a relative concentration of people of Japanese origin). D Co's management policy is also in contrast to that of C. Co's, firmly adopting a position of concentrating on spinning with priority given to exports.

When seeking to promote Paraguay's textile industry, the examples described above

of Japanese companies setting up operations in Brazil provide several useful lessons.

- ① The approach adopted by C Co. of buying up and taking over an existing factory may have the advantage of requiring only a relatively small amount of investment, but makes it very difficult to break away from the setup which up to now has only been aimed at the domestic market.
- ② On the other hand, if, as in the case of D Co., a new factory is built then while requiring a greater investment of capital than acquiring an existing factory, the fact that its future prospects are better is well illustrated by the experience in Brazil. While circumstances will depend on the scale of the factory, another idea would be to set up several small factories, in which case the transfer of a specific technology becomes possible as does the spreading or diffusion of technology. What's more, this would also act as a warning bell to those enterprises where quality control is unsatisfactory. However, if the objective is to work toward a sound and steady development then such an approach would require at each development stage of the factories a completed structure with an appropriate layout and control setup. Therefore, in the idea that would be to set up several small factories there is the possibility that this would result in the kind of bit-by-bit factory which can be seen among minor factories in Japan. Furthermore this approach can lead to loss of economies when a certain scale is reached, as may be seen in the Pilar Company's factories at present.
- ③ The circumstances are somewhat different in the case of the construction of a large scale integrated factory where the merits of scale and control are being sought. Should a large scale factory be constructed then naturally the small domestic market in Paraguay will become saturated and the existing weak domestic enterprises will become a problem. Meanwhile, the new factory would have to bear the hardships of being Paraguay's trailblazer as far as external competition goes. However, despite such problems, the overall judgement is that it is desirable that the factory should be started all at once, with the optimum layout for the factory site and the greatest consideration being given to the merits of scale (with no thought to be given to future plans for expansion). Of course, judging from other Central and South American countries 5 to 10 years must be allowed for this kind of large scale factory to really make headway and for commercial rights to permeate and get established. However, if the foundations for the industry can be laid by adopting this type of positive policy then the prospects for Paraguay's textile industry will be encouraging.

5-2 The Future Shape of Paraguay's Textile Industry

(1) Basic Conception

In order to consider the future shape of Paraguay's textile industry both the objectives of development and the actual possibility of development must be examined. The objectives of development may be judged from the viewpoint of the textile industry itself and from the viewpoint of the national economy. The actual possibility of development may be judged, based on the details of the development of the textile industries of the various countries described above, from the present state of the textile industry and the means available for development.

The objective of development is the promotion of the textile industry, which involved the establishment of an export substitute-type industry (referred to as 'export substitution' below) in order to increase the added value of export, and the encouragement of import substitution (referred to as 'import substitution' below) in the domestic market.

In other words, whereas normally it would be desirable to encourage import substitution first by improving the existing textile industry and then to develop it towards export-substitution, because from the present state of the textile industry it cannot be judged beforehand that that process is the best way, these will be split up and examined as separate objectives and then adjusted later in this study.

The possibility of bringing about development may be understood in terms of a substitute proposal for the form of development which takes into consideration basic economic policy, technological and financial aspects etc. and since we have here the two development objectives of export substitution and import substitution, the alternative may be considered in terms of these. In other words, in connection with the former may be considered the alternative which proposes the maintenance of the present situation, increasing the existing textile factories and constructing new factories for exports, while in connection with the latter may be considered the alternative which proposes the maintenance of the present situation, the rehabilitation of existing factories and improving the structure of the textile industry.

The alternatives related to these two objectives as well as being selected to match each of the objectives will be examined for adjustment of their relationship and the most desirable and most realizable proposal will be adopted.

The two points above are the basic viewpoints in a consideration of Paraguay's textile industry and the building of a model of Paraguay's textile industry will be centered on these. Chart 5-1 shows the kind of concept flow that will probably be examined.

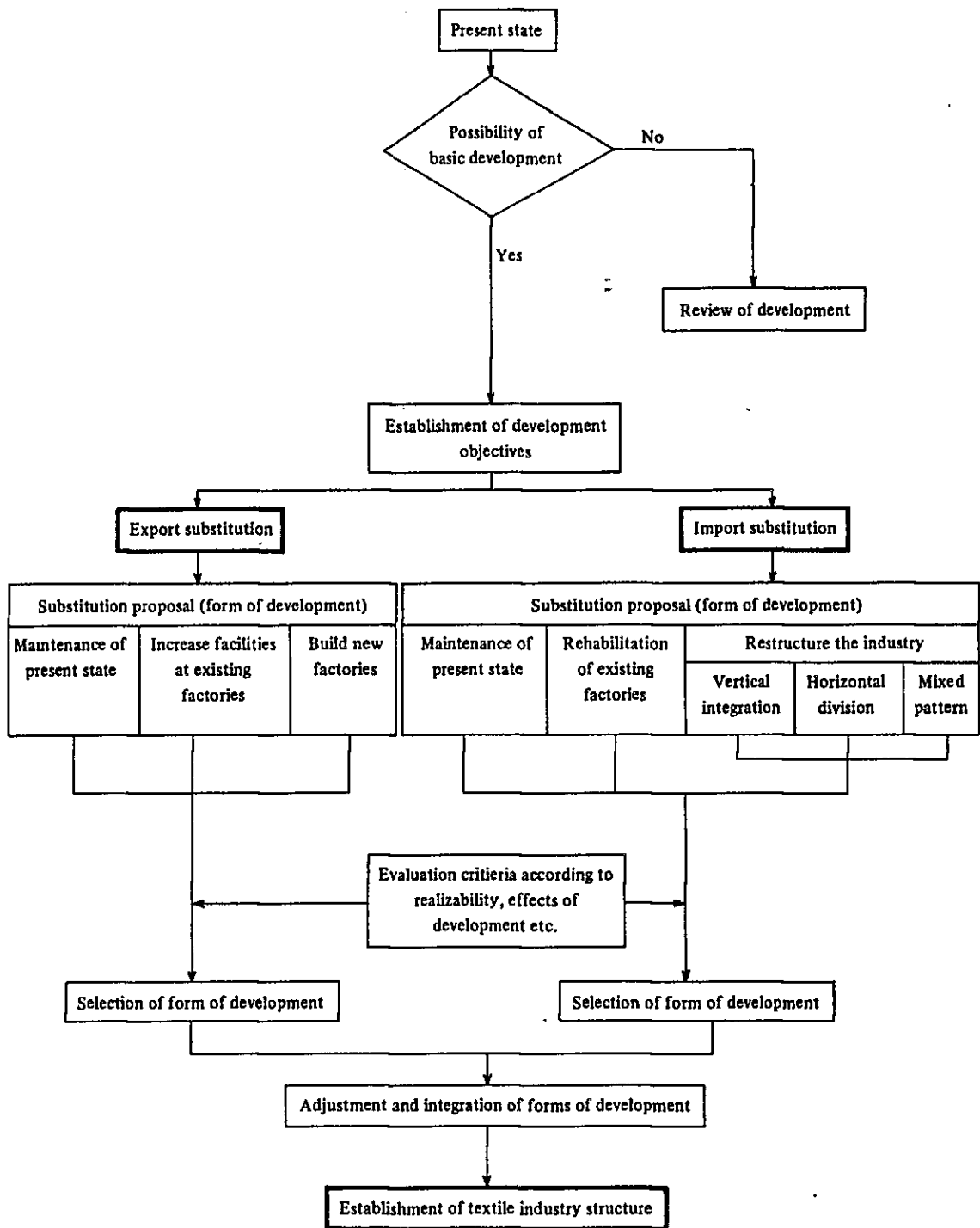


Chart 5-1 Process of Building up a Model for the Structure of the Textile Industry

(2) Objectives

The objectives being considered by the Paraguayan government are the establishment of an export substitution-type industry in order to increase the added value of exports, and the promotion of import substitution.

The former objective ties up with the export substitution concept advocated by Hla Myint. In other words, the idea is to give a greater added value to exports of primary industrial goods, gradually changing these to exports of high level industrial products and by doing so develop the industry gradually increasing industrialization.

In view of the present make up of Paraguay's economy which tends to be something of a monoculture dependent upon the export of such primary products as cotton and soybeans, this is brought to mind as an extremely natural way of thinking.

There are two points here which must be taken into consideration. First is the relationship with import substitution.

In many developing countries import substitution type industrial development has come to a standstill, but this is not a case of a means of development which is exclusive of all others, i.e. import substitution or export substitution for both of these should have a place in the overall framework of Paraguay's economic development process.

The second point is that while the objective for the time being is the increase in the added value of exports, from cotton to cotton yarn, cotton fabric and products, what should be kept in mind is that in the export substitution concept this does not simply stop at the textile industry but in the long term spreads to the export substitution of other primary products and further to the diversification of the industrial structure.

Turning next to import substitution, apart from the matter of what form of development will restore the textile industry production in which has been stagnant for the last ten years and more, there is the matter of whether improvement is necessary. What must be considered very carefully is the fear of being left behind by the world textile industry if measures are not taken quickly and the possibility that, despite the potential it has for influencing economic development in a big way, if left in its present state it may produce a negative effect. This is a point which should be considered in connection with examination of just what measures will constitute an improvement of the textile industry. In other words, the viewpoint of development differs depending on whether in the end it is enough that the textile industry is able to export products or whether, regardless of the result, importance should be attached to its significance in the development process.

Export substitution and import substitution are extremely important development objectives in the consideration of the present state of Paraguay's economy and the textile industry. So that these objectives may be realized without being at variance with each other the forms of development should be examined, adjusted and integrated. Paraguay's textile industry will flourish through the coexistence of these objectives.

(3) Form of Development for Export Substitution

For the alternative for the form of development in the case of export substitution

one can consider the maintenance of the present state, the increase in facilities at existing factories and the construction of factories exclusively for exports.

1) Maintenance of present state

- ① Judging from the present state of the textile industry it basically lacks export competitiveness in both quality and cost.
- ② The exception is the Pilar Company which, because of the conditions of its location, might be able to supply some of its products to the northern part of Argentina where inflation is rampant.

It is clear that with this form the central role of export substitution cannot be fulfilled.

2) Increasing facilities at existing factories.

With this form it is supposed that after rehabilitation of the existing factories, some of the facilities will be renewed. The Pilar Company and America Textil Company may be considered as targets for this form of development but at present there is no room in the factory products for expansion of facilities and, further, because of the points listed below, this form can only be considered as a secondary means of development of export substitution.

- ① Exports to neighbouring countries may be possible after rehabilitation has set the industry on the right track, but exports of high quality goods to Europe and the United States would prove difficult.
- ② Modifying the constitution of existing companies from, what has been up to now, domestic market orientated production to export production would be accompanied by many difficulties.
- ③ Strategically, it would seem that the industry should work towards import substitution by means of domestic production and towards the improvement of management, technology and quality for the time being, and in the long-term, because of the nature of the market, a movement towards exports will become necessary and technically possible.

3) The construction of new factories solely for exports

The construction of new factories, the production of which is devoted to exports is economically and technically more realizable than increasing the facilities at existing factories. The forms that this could take are, the expansion of ginneries, joint ventures with foreign capital, joint investment by existing textile enterprises and a combination of these.

- ① By expanding the ginneries
 - a. The ginneries are accumulating more capital by exporting cotton but this could be promoted further with the proper guidance.
 - b. Some of the ginneries have plans to expand their business and in particular

their production of cotton yarn. There is a trend in the ginning industry for some ginneries going into textile divisions for the first time.

- ② By forming a joint venture with foreign capital
 - a. Compared with the other methods, the transfer of technology is easy and both technically and economically this is the most realizable method.
 - b. The introduction of foreign capital is difficult unless the environment for investment is well organized.
 - c. There is an outflow of some of the profit from the country and a weakening of the ability to accumulate financial resources.
- ③ Through joint investment by existing textile enterprises
 - a. This is a desirable model for the development of the textile industry.
 - b. With joint management it is difficult to give full play to management ability and to organize the managements and it is not easy to change over from the management methods implemented in the past.
 - c. Because of the level of capitalization it is difficult to start off with a large scale enterprise and the venture will probably have to be enlarged in stages.
 - d. This should be considered in relation to the form of development for the improvement of the structure of the textile industry, and the improvement of the management of existing factories is a more urgent task than exports.
- ④ A combination model

A joint method through a combination of the three models described above may also be considered.

With the establishment of new factories given over completely to exports, where it is possible to make the ginnery-expansion model the basis, a joint venture with foreign capital could be contemplated. An export-only factory would probably be run by a private enterprise but financial assistance from the government would probably be indispensable.

With the export-substitution model the construction of an export-only factory is probably the most advisable because of the following:

- a. It would be the most competitive because of its ease of operation, quality and cost.
- b. It
- b. It would have a large activating effect on existing textile enterprises should the textile industry be reformed as mentioned below.
- c. Exports are the final objective for the existing textile enterprises and to make

them the first objective would require immense efforts.

Chart 5-2 shows the make up of the export substitution model. Gineries will, to begin with, export ginned cotton and after having accumulated sufficient capital they will start with spinning, seeking joint investment as the case may be. They will secure land and buildings which give the necessary space for the long term plans for exports to Europe, will begin production with the necessary units of facilities, increasing these in accord with demand and will, at first supply exports for the neighboring countries and, where necessary, supply goods for the domestic market.

In export substitution, the present total volume of ginned cotton exports will not all be switched over to textile product exports but will be exported on a volume which corresponds to the economic scale of production, these exports gradually being increased.

Consequently, while the proportion of ginned cotton in the export volume is large, a specific quantity will be substituted by yarn, woven goods and other textile products.

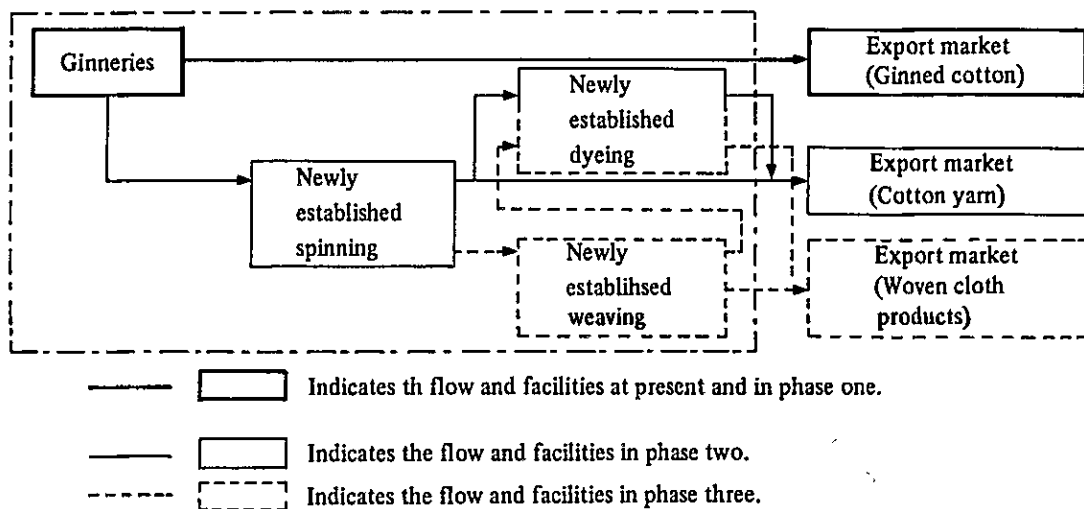


Chart 5-2 Make up of the Export Substitution Model

(4) Development form for Import Substitution

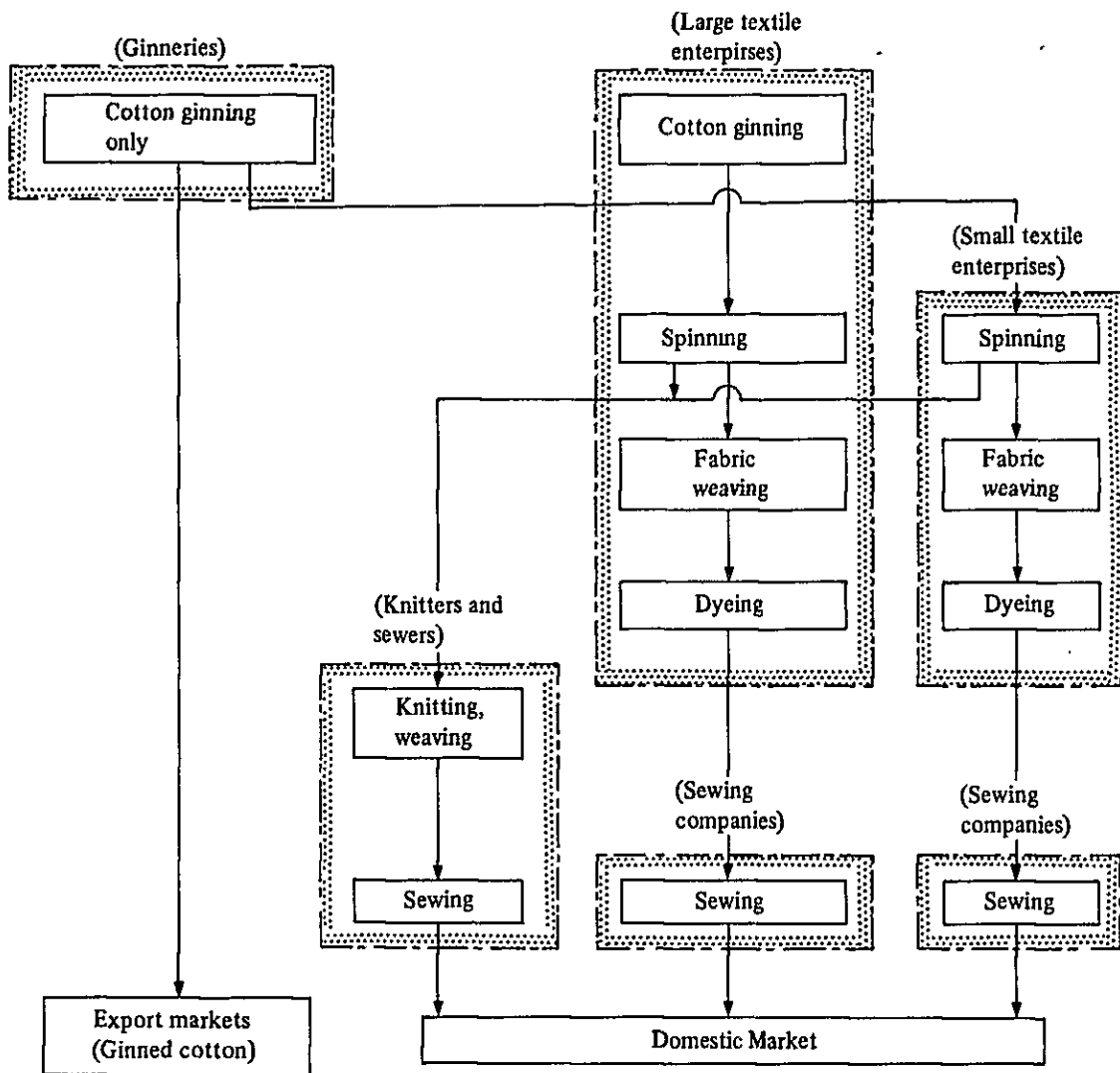
In the case of import substitution the maintenance of the pressure state, rehabilitation of existing factories and improvement of the industrial structure of the textile industry may be considered as development form alternative.

1) Maintenance of present state

Should the textile industry continue in its present state the results which may be contemplated are as follows (Chart 5-3 shows the present structure of the textile industry).

- ① Some of the enterprises will survive, others will collapse, as a result of which there will be a shake out with 2 or 3 large textile companies remaining, the rest being engaged in knitting and sewing. The surviving companies will have the following features:
 - a. Large enterprises like the Pilar Company which have political influence.
 - b. Enterprises which have specific monopolistic markets and which are given over to the sole production of specific products which have a high added value.
 - c. Enterprises which are diversifying into the ginned cotton, cotton seed oil and animal feed business.
 - d. Enterprises which have plans to change from ginned cotton and go into the yarn business for the first time (some exporting, coarse count of yarn).
- ② Imports will continue and being pressured by these company earnings will fail to rise, they will have large stocks on hand and there will be little investment desire. As a result the industry will remain uncompetitive in international markets in terms of quality and price.
- ③ The government will continue to adopt protectionist policies to try and preserve the industry (banning imports of yarn and textiles). To secure profits the industry will set high prices, transferring the burden to downstream enterprises and the consumer. However, in the long run the majority of the domestic market will be controlled by imports with the domestic industry as ever unable to cope with the improvement in the consumer's standard of living or expansion of the market.

As a result, while a few leading companies and downstream sewing and knitting companies will probably remain but a large number of the other companies will be wound up and the structure of the textile industry will be more and more simplified.



Note: In the flow spinning to wearing, pre-wearing is taken to be included in the spinning section.

Chart 5-3 Structure of Textile Industry at Present

2) Rehabilitation of existing factories

Rehabilitation includes improvements both of the software type, i.e. in management, production and operating technology and of the hardware type, i.e. renewal of facilities and machinery. In the case of the textile industry in Paraguay, the software type of improvement has great significance.

As was indicated in the diagnosis of the companies, there are two companies, Pilar and America Textil for which an improvement in the company's constitution would be possible through rehabilitation on an individual enterprise basis. These two companies would be able to recover by their own efforts through the provision of guidance of the software type while principally being able to use the existing facilities with some replacements.

However the old spinning equipment at America Textil will probably have to be scrapped.

It is desirable that those enterprises which become the object of rehabilitation make import substitution in the domestic yarn and textile market their basic objective and after that work to improve production technology so that they can also move towards exports to neighbouring countries.

3) Restructuring of the textile industry

This is the most positive form of import substitution, not merely resting at the improvement of individual enterprises but changing the very structure of the industry itself. Three models can be contemplated: vertical integration, horizontal division and a combination of these.

① Vertical integration model

This has the following characteristics:

- a. The construction of new factories is required.
- b. Technical guidance and improvement of quality are easy.
- c. Vertical integration through large capitalization can produce large profits, but the risks are also considerable.
- d. It becomes difficult to expand the industry after integration but it does become a model for the spread of the same form to other industries.
- e. Leads to reliability in quality stability and in deliveries and to a reduction in transport costs.

The structure of the textile industry at present is of the vertical integration pattern but to increase this vertical integration one can contemplate the textile companies going into knitting and sewing, the smaller textile companies going into cotton ginning and, further, the knitters and sewers moving upstream and the ginneries moving downstream.

At present it would not be possible for textile enterprises to go into knitting and sewing for reasons of funds and technology and this would probably be a subject for consideration as a new venture when operations have stabilized and there are plans to expand business.

It would probably be difficult for smaller textile companies to go into cotton ginning because they do not have the necessary funds.

There are examples of knitting and sewing companies moving upstream in Brazil but in Paraguay there is little capital and the sewing companies have no intention of making such a move. There are those who are planning to move from cotton ginning into cotton yarn production but it will be difficult to expand business in the domestic market alone.

② Horizontal division model

This has the following characteristics;

- a. Development would be fast if converters can be reared.
- b. Entry is possible with small amounts of capital.
- c. It would allow room for the vitalization of the existing textile enterprises and would have a large effect on the industry as a whole.
- d. It would be more difficult to standardize product quality and to raise the level of quality in the weaving part of the industry.

With the Pilar Company conducting production on an intergrated basis and being in a distant location a horizontal division of labour in the industry would prove difficult of the Pilar company were to be included.

The division of labour between enterprises in the Asuncion area would be possible, and, for example, a joining of the dyeing parts of the industry would probably be very effective in respect to costs and quality..

As a result of the diagnosis of the companies it was found that it would be best for some of them to limit their business to specific areas and division of labour could be considered between such companies. However, it is difficult to provide positive guidance regarding the winding up of companies and the division of labour and strong relief measures by government is probably necessary.

③ A combination model

This would be combined form of the vertical integration and horizontal division models.

The following is the basic thinking behind a restructuring of the textile industry and the combination model would probably be applied.

- a. While there would naturally be rehabilitation guidance, where there is room for improvement by the efforts of individual companies this would be utilized to the full.
- b. Where there is a limit to what can be done by individual companies themselves, a formula for improving the industry as a whole will be considered.
- c. In shake out of companies by means of government guidance it would be difficult to marshal opinions in the industry and a formula causing little disruption in the industry would be more acceptable.
- d. Since it will be necessary for existing textile enterprises to move towards import substitution in the short term and export substitution in the long term, as well as organizing the structure of the industry to make this possible, the strength of new export-oriented companies will be made the most of (this is examined in the following section).

First, because Pilar Company and America Textil will be dealt with by a separate rehabilitation method they will be excluded from the shake out of companies under this form.

For the other enterprises, wide ranging changes in their business will be required if they are to continue and with the production of coarse count products for the domestic market as the objective, a reduction in their operations and joint production by enterprises in the same line of business can be contemplated.

To begin with, in those cases where the results of the company diagnosis indicate that there is new equipment which can be employed by the companies, production at those sections will be continued through improvements in operating technology. What's more where at other sections there are cost and technological difficulties in production with the present equipment no plant investment will be made and the equipment will be scrapped unless there are sufficient funds. In this case both Forno y Valle Company and Pedro Genoves e Hijoo Company will change to concentrate exclusively on fabric weaving. Secondly, for joint production the buildings of the I.T.A.S.A. Company will be utilized. For this company to continue there must be an overall replacement of its equipment and if this can be replaced there is room for the company to recover. On the other hand, the buildings themselves are worth making use of and the replacement of the equipment will be done by seeking investment from the two companies mentioned and, if possible, from the gineries, as a result of which joint production using new equipment while making use of the I.T.A.S.A. factory will be possible.

Under joint production, spinning, weaving and processing facilities will be installed and there will be integrated production of such coarse count products as poplin, brode, shirting and sheeting, and as well as supplying some of the yarn to Forno y Valle and Pedro Genoves e Hijoo, yarn and woven fabric will supplied to knitters and sewing companies.

Meanwhile, because of strong competition from imports some of the knitters and sewing companies, such as Fenix, are operating on modern lines and in general there is a strong desire to improve their management. Some operating technology guidance will probably be enough to produce the necessary improvement. The place of the apparel section will, as is described later on, probably be to act as a powerful means of activating the textile section. Chart 5-4 illustrates the above state of affairs. In other words, Pilar and America Textil are shown in this diagram as large scale textile enterprises handling the production of fine count products. The replacement of some spinning and weaving facilities will also be possible. Further, in Chart 5-4 small scale textile enterprises are responsible for production of coarse count products but the dyeing and finishing section has been scrapped. This refers to Forno y Valle and Pedro Genoves e Hijos and utilizing the buildings of I.T.A.S.A. new spinning, weaving and dyeing sections will be established to produce coarse count products on a joint basis. Yarn will be supplied to the weaving sections of the contracted small scale textile enterprises and to the knitters and sewing companies from the newly established spinning sections via the newly established dyeing section (shown by flow ① and ② in Chart 5-4). This weaving section will supply some of its cotton cloth to the knitting and sewing companies via the newly established dyeing section (flow ③ and ⑤ in Chart 5-4) and some products will be supplied to the knitting and sewing companies from the newly established textile weaving section via the newly established dyeing section (flow ④ and ⑤ in Chart 5-4).

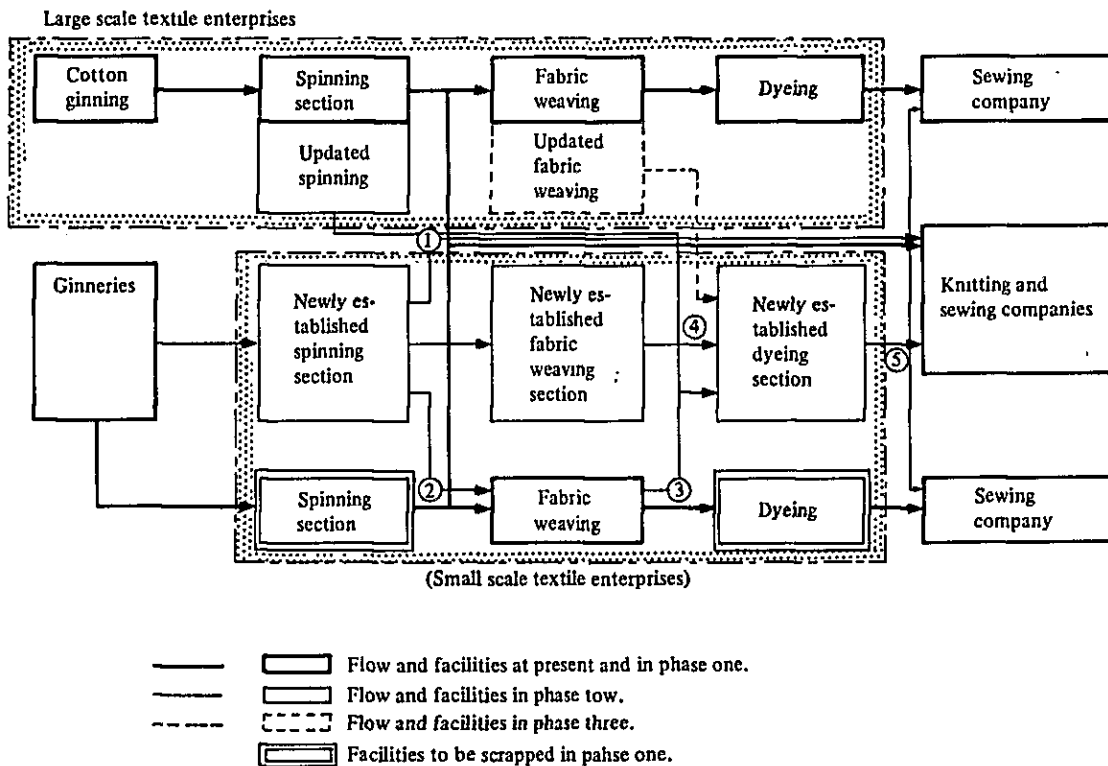


Chart 5-4 Structure of Import Substitution Model

The large scale and small scale enterprises can coexist without competing against each other since they are making different kinds of products. In the main aiming at import substitution in the domestic market the large scale enterprises will build up their competitive power and then aim their sights at exports to neighbouring countries.

It is necessary to consider the following points in connection with joint production. That is, in the case of the restructuring of the textile industry, with the exception of Pilar and America Textil which will be the subject of rehabilitation, the unification and abolition of production by the other three companies is a precondition for survival and the circumstances are extremely severe. Consequently, it is assumed that these three companies will concentrate on production for the fabric weaving section and that spinning, weaving and dyeing production will be on a joint basis, but should integrated joint production prove difficult, the following alternative proposal may be considered.

First, in the case where the investment burden to start up spinning production is too great, the company could get supplies of yarn from Pilar or America Textil.

However, in such a case since it must be purchased from outside the cost of the raw yarn rises and just how cheaply it can be laid in becomes the central factor in the decision.

Next we come to weaving which, under the import substitution model, is to be on a joint production basis, but for I.T.A.S.A. is a question of renewing equipment. If the same company is able at least to make plant investment if only in the weaving section then there will be no need to have joint production.

These three companies need a dyeing section and rather than each company possessing one and suffer from a low rate of operation and poor productivity as at present, the economies would be much greater if these were concentrated in one place.

As explained above, under the alternative proposal at the very least the dyeing sections must be organized on a joint basis, but there are other methods for spinning and weaving. However, in view of the small size of the target market and from the technical viewpoint joint production of spinning, weaving and dyeing will be the primary proposal here and this formula will be the basis for the development plans.

(5) **Harmonizing the Export Substitution Development Formula and the Import Substitution Development Formula**

In order to make the import substitution development formula more effective one can consider harmonizing and integrating it with the export substitution development formula, taking into consideration the development schedules of them both. Chart 5-5 shows the relationship between the export substitution model and the import substitution model. Because the export-oriented factory to be newly established is superior technically than the existing factories,

this technical strength will be used in the restructuring of the textile industry.

1) When yarn production has started at the export-oriented factory

- ① High quality, low cost yarn will be supplied to knitting and sewing companies from the newly established spinning section of the export-oriented factory (flow ① and ③ in Diagram 5-5). This production for the domestic market is a necessary step for the export-oriented factory at first until its exports get on track.
- ② The knitting and sewing companies are greatly interested in a relative improvement in quality through competition with imports and through supplies from the export factory will have a wider choice of yarn.
- ③ The large scale textile enterprises will undergo rehabilitation and will renovate their spinning sections once operations are running smoothly, supplying yarn to the knitting and sewing companies (flow ⑥ and ② in Chart 5-5) and if possible will export some of the yarn (flow 5 in Chart 5-5). In order to compete with the yarn which will be supplied by the newly established spinning section of the export-oriented factory (flow ① and ③ in Chart 5-5), the large scale textile companies will improve the quality of the yarn supplied to the knitting and sewing companies and for export.
- ④ Once the quality of the cotton yarn produced by the existing textile enterprises improves then the supplies to knitting and sewing companies from the export-oriented factory will be switched to exports and the knitting and sewing companies will be supplied by the large scale textile enterprises.

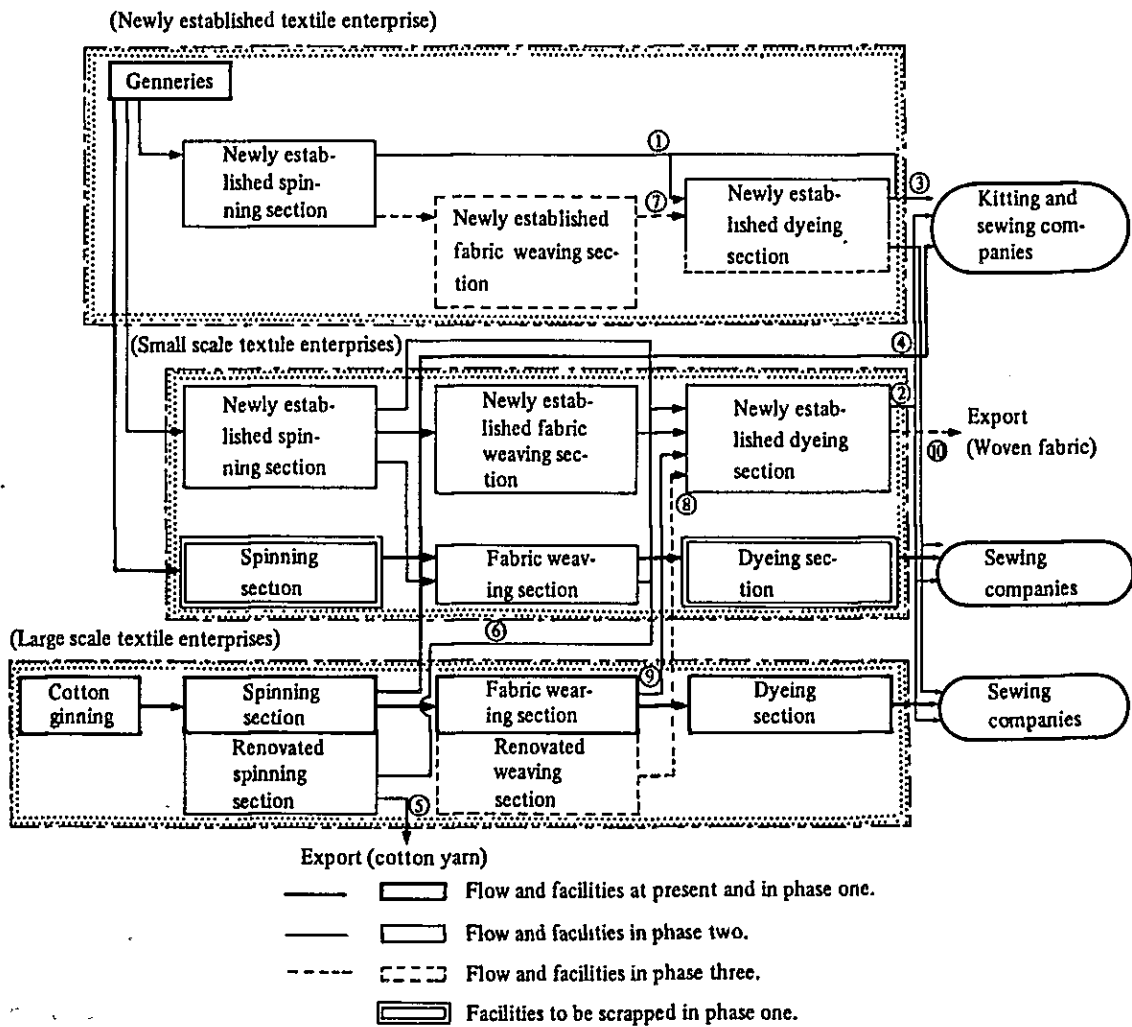


Chart 5-5 Structure of Harmonized Export Substitution and Import Substitution Model

2) When cotton fabric production has started at the export-oriented factory

- ① The export-oriented factory will supply some of the cotton cloth produced by its newly established weaving section to the knitting and sewing companies via its new dyeing section (flow ⑦ and ③ in Chart 5-5). The knitting and sewing companies will choose between this and the cloth supplied by the existing textile companies (flow ⑧ and ② in Chart 5-5) and this will result in an improvement of the quality of the fabric in the existing textile enterprises.
- ② Once the quality of the cloth has improved to a level where it can be exported by the weaving sections of the existing textile enterprises (flow ⑩ in Chart 5-5) a decision should be made as to whether to restrict the supplies from the export-oriented factory and supply the knitting and sewing companies from the existing textile enterprises.

5-3 Textile Industry Development Process

(1) Establishment of New Export Factory and Restructuring of Textile Industry

We considered the future shape of Paraguay's textile industry in the previous section. This is a target shape for the textile industry and a great effort will be required to realize it. The Paraguayan governmental authorities are thinking along the lines of a basically private enterprise led promotion in their policy for promoting the textile industry and are aiming at a directive rather than a compulsory approach. Consequently a drastic policy under which a large scale nationalized textile enterprise would be established and there would be a compulsory integration and shake out of existing textile companies is ruled out but government guidance as to the direction of development will be required.

Further, in a free economy environment enterprises which have failed to make enterprising efforts will be subject to the after-effects of absorption and adjustment.

The establishment of a new export-oriented factory and the restructuring of the textile industry, including the rehabilitation of existing companies and establishment of new sections, are the two basic pillars for export substitution and import substitution development objectives. When these are compared, the latter has little effect on the former and tends to be ex post facto. Meanwhile, the former has a large simultaneous and parallel influence on the development of the latter.

What's more, the normal strategy for the development process is to shift from import substitution, achieved by restructuring the textile industry, to export substitution but in Paraguay's case since an increase in the level of its technology, described later on, is a prerequisite for development, the reverse process of making use of the external impact may be considered. This becomes even more partial when the fact that there is no room at the existing textile companies for establishing an export-orientated factory is taken into consideration.

Consequently, taking these points into account, the most practical strategy will probably be to make export substitution the basis for development and to endeavor to promote the textile industry by employing this induced effect.

In other words, it is desirable for the existing textile enterprises to go ahead with import substitution and, by employing the vitality of new enterprises which are export-oriented, to gradually change over to exports. (see Chart 5-6)

The existing textile companies consist, in terms of present plant capacity, of two large scale enterprises and the rest, being small-scale enterprises, and it will be possible to increase the capacity of the former by rehabilitation.

On the other hand, much of the latter's equipment is superannuated and apart from some equipment chiefly fabric weaving, which is still usable it would be less of a burden to scrap it. This equipment is used in the production of coarse count products but if production for the domestic market is to be continued then costs will probably have to be reduced by spinning and dyeing production being done on a joint basis.

Under such circumstances, it is thought that the large scale textile companies will grow in strength, first being successful with import substitution and then moving toward export substitution, by making them compete in the domestic market with the products of new export-orientated enterprises.

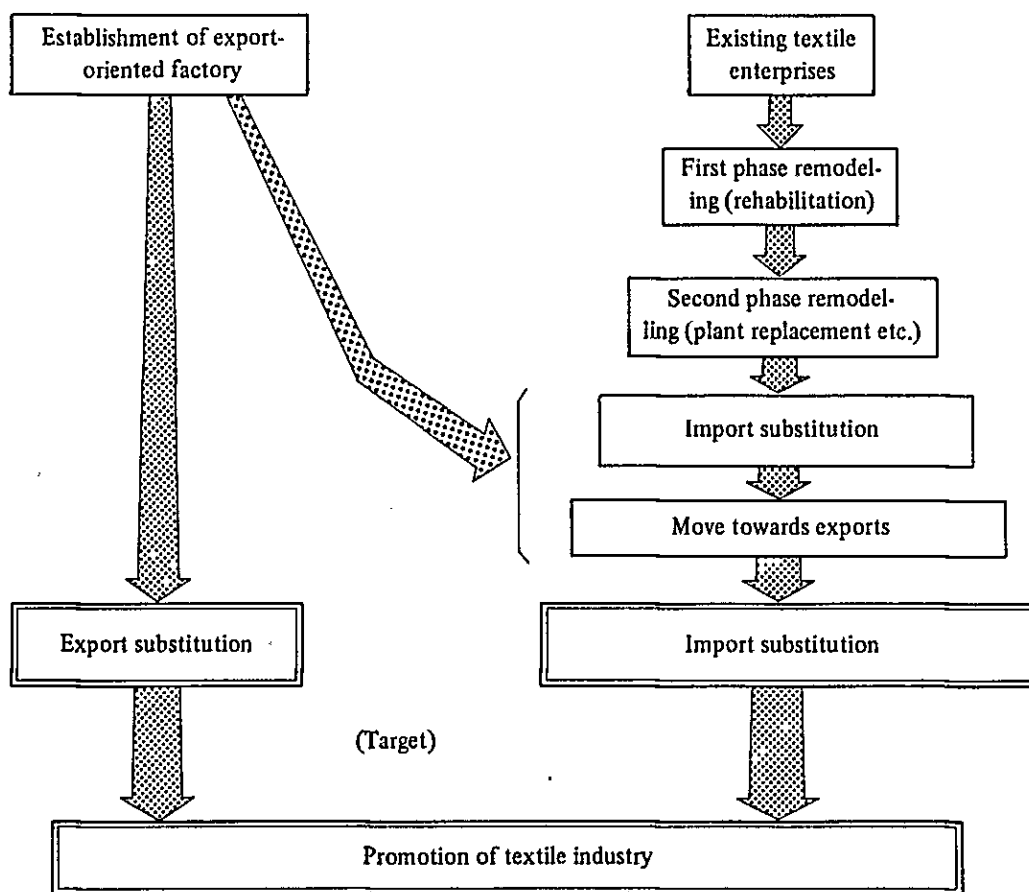


Chart 5-6 Basic Development Strategy

(2) Rehabilitation of Existing Companies and Boosting of I.N.T.N.'s Functions

A new export-orientated factory will be the central feature of development and its vitality will be utilized to push forward improvements in the industry but what is required before it will be able to display this function is a raise in the level of Paraguay's textile technology. To this end there is the short-term policy for individual companies which involves the rehabilitation of existing companies and in which is included basic technology related to operation, costs, quality, manpower and other aspects of production and the long-term policy for the textile industry as whole. I.N.T.N. in particular will have an important role to play and this and the above are explained below.

1) Rehabilitation of existing textile companies

The feasibility and necessity of rehabilitation have already been explained, rehabilitation being the first step in the promotion of the textile industry and the details are given in the next chapter. Technological guidance from leading textile countries is indispensable for this rehabilitation, as is the enlightenment and education of manager and technicians.

2) Boosting the functions of I.N.T.N.

This organization should play a central role in raising the level of technology in Paraguay's textile industry.

- a. First, through the assistance of the specialists from the leading textile countries, management must be given education regarding the improvement of quality and improvement of the way their companies are run.
- b. While boosting the functions of I.N.T.N. by expanding its machinery and increasing its personnel, once enlightenment activities have made progress in the industry, it must undertake activities which will raise the level of technology, such as the enforcement of standardization, export inspection, technical service (quality control, product inspection etc.), research and development and public relations and publicity. To accomplish this, guidance and supervisory authority must be granted to I.N.T.N. so that it can perform its functions satisfactorily. In particular where existing enterprises do not stop at production for the domestic market but start to export, I.N.T.N. guidance on standardization as well as export inspection will be indispensable and it must establish an inspection system which will be recognized and accepted by foreign countries.

(3) Development Process

The pivots for the development of Paraguay's textile industry are firstly the boosting of the functions of I.N.T.N. and secondly, the establishment of an export-oriented factory, and to these will be allied the rehabilitation of existing factories and the establishment of new joint production factories as the restructuring of the textile industry is advanced.

It is desirable that the development be divided basically into three stages.

Phase I: Laying of foundations, the central items of which will be the boosting of I.N.T.N.'s functions and rehabilitation of existing textile companies.

Phase II: This will center on the export of yarn and on pushing forward import substitution through the replacement of facilities in existing textile companies etc.

Phase III: Woven fabric and products will be exported and existing textile companies will move from import substitution to export substitution.

The length of each phase will generally be about 5 years but should the program progress well the program time will be shortened and the next phase moved to.

Table 5-2 shows the development process in table form. A precondition for these phases to be pushed forward with is an acceleration of private business based on the market mechanism.

In particular, the employment of internal mechanisms within the industry, such as new export-oriented enterprises, the downstream sewing industry and converters (to be described later) is aimed at for an improvement in the existing textile companies but the guidance and supervisory responsibility of the government is vital for these to properly fulfill their functions.

Table 5-2 Development Process

Time Object	Phase I	Phase II	Phase III
I.N.T.N.	Boosting of I.N.T.N. functions	Guidance and supervision	Guidance and supervision
Large scale textile enterprises	Rehabilitation	Replacement of spinning facilities	Replacement of weaving facilities
Small scale textile enterprises	Rehabilitation, scrapping of spinning and dyeing facilities	Establishment of new spinning, weaving, dyeing facilities	
New textile enterprise		Establishment of new spinning factory	Establishment of new weaving, dyeing factory
Converters		Rearing of converters	

To push forward with the development a strategy must be chosen from the kind of production technology viewpoint described above but to further enhance development a supporting policy from the sales aspect is also important. In particular, the securing of markets is a prerequisite for fullscale exports of yarn and textiles and for this purpose it will be necessary to foster the so-called converters.

Converters, in general, undertake the collecting of information, product planning and sales, and are wholesale trades who buy in unprocessed, unadjusted grey fabric from the spinners and weavers, commission its dyeing to dyer and sell the finished product to sewing companies. As well as having a higher added value than unprocessed, unadjusted grey cloth, there is the risk that dyed cloth which fails to match demand will be left unsold. This risk is greater in the case of exports than in the domestic market and the converter's information collecting ability is a key to the success or failure of exports.

Not only does the converter possess sales channels for exports but he occupies an intermediate position in the distribution of textiles, fulfills the function of regulating supply and demand through his financial power and will have a large influence on the promotion of the textile industry.