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**ADVISORY SERVICES
IN THE ESTABLISHMENT OF A
FERTILIZER PLANT IN PARAGUAY
(Pre-investment stage)**

Project SF/PAR/96/001
Contract No:96/148/JP

FINAL REPORT

Ordered by:

**UNIDO, United Nations Industrial
Development Organization**

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Warsaw - Asuncion, October 1996 - June 1997

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Abstract

To strengthen the management capacity of the Ministry of Industry and Commerce (MIC) of the Republic of Paraguay, Project PAR/91/007 has been launched as a part of public sector reform. PAR/91/007 has been executed nationally and at present has been completed. During the Project execution significant improvements in the operative capacity of MIC has been achieved. However, further capacity building is necessary in identification of the business opportunities oriented accordingly to the country strategy industrialization proposals.

UNIDO preparatory assistance Project UC/PAR/94/087 was aiming to advise the MIC in industrialization approaches and development of selected industrial sub-sectors and to define the programme of action as well as technical co-operation with UNIDO. For the implementation stage UNIDO trust fund technical assistance Project SF/PAR/96/001 has been approved.

This Report is an advisory note to the Ministry of Industry and Commerce of the Republic of Paraguay and is related to the establishment of the fertilizer installations in the country. The modalities of the implementation of the pre-investment programme has been discussed and formulated. This Report reflects the following stage of elaboration of the pre-investment documentation:

- selected offers have been collected and further action of collection is continued,
- The Environment Impact Assessment draft document has been prepared and parameters will be agreed and provided to the local agency,
- the package of policy measures has been discussed and in principle accepted to be incorporated into Promotional Pamphlet,
- the Compounded Investment Cost Assessment has been prepared, market, locational studies assessed and prepared to be transferred to the Feasibility Study Team,
- the Terms of Reference for Feasibility Study have been prepared, discussed and approved.

The accomplishment of the preparation of the Feasibility Study, EIA and Promotional Pamphlet would complete the pre-investment stage activities. The final assessment of the project promotion would be provided in June 1997 by UNIDO experts.

Introduction

The Government of Paraguay is considering the Fertilizer Project as one of the priorities of the industrialization programme. The Fertilizer Plant would consume the substantial part of a contracted amount of natural gas to be delivered from Bolivia. Currently there are not other outlets which are able to utilize this amount of gas.

The considered Fertilizer Project seems to be attractive for Paraguayan industry, as it could fulfill all strategic parameters as well as it shows preliminarily satisfactory feasibility. It seems that local private industry itself or jointly with the foreign investors could be interested in implementation of this project.

To open the way for further decision making process the following documents have been prepared by UNIDO:

- selected offers have been collected and further action of collection is continued,
- the Environment Impact Assessment draft document has been prepared and parameters will be agreed and provided to the local agency,
- the package of policy measures has been discussed and in principle accepted to be incorporated into Promotional Pamphlet
- the Compounded Investment Cost Assessment has been prepared, market, locational studies assessed and prepared to be transferred to the Feasibility Study Team,
- the Terms of Reference for Feasibility Study have been prepared, discussed and approved.

The accomplishment of the preparation of the Feasibility Study, EIA and Promotional Pamphlet would complete the pre-investment stage activities. The final assessment of the project promotion would be provided in June 1997.

1. Expert's activities.

The task of the contract consists of:

- preparation methodological documents to explain the local groups of specialists methodological aspects of their work,
- carrying out training workshops,
- preparation of all necessary input data for the Fertilizer Plant Feasibility Study working out.

1.1. Activities time schedule

<u>Activities</u>	<u>Time of execution</u>
Award of the contract	September 1996
Preparation of the guidelines for: <ul style="list-style-type: none"> - comparison of the offers - EIA - Promotional Pamphlet - TOR for Feasibility Study 	September-November 1996
Preparation of the Intermediary Report	October 1996
Advisory Mission	4-28 November 1996
Preparation of the Draft Final Report	January 1997
Preparation of the Final Report	May 1997

1.2. List of local administrative and professional staff involved in the project implementation

UNDP	J.C. Crespi,	Deputy Regional Resident Representative
	C. Schwartzman,	Programme Assistant
UNIDO	Ms. V. Gregor,	HEPD/EDR, Backstopping Officer
	P. Rozwadowski,	11-55 expert
	W. Baethgen,	11-51 expert
MIC	Dr. U.Scavone,	Minister IC
	dr. L.Aguirre,	Undersecretary of State
	Ramon Maciel,	International Cooperation Department
	Dr. C.A. Martinez,	Director of Technical Cabinet,
MIP	Dr.G. Sosa,	Secretary of State
MAG	P.J.Molas,	Head of EIA Department
FPMT	Sergo von Horoch	
	Victorio Oxilia Davalos	
	Eduardo de Loof	

2. Project documentation elaborated

2.1. Review of the Project status

2.1.1. Strategic assumptions of the Project implementation

There are the following strategic assumptions expressed by Government at the initiation of the Project :

a) the agriculture production of Paraguay must continuously grow and become more efficient. The "minig of the nutrients" from the soils by crops at inadequate fertilization leads to the lost of nutrients of value about USD 200 million per year. At some level of extinction of nutrients from the soil the agroproduction become impossible and desertification of land would follow. The strategic goal of the Government is to provide farmers the adequate amount of fertilizers at competitive price and advanced quality to improve the situation of the benefit\cost proportions in agriculture.

b) to use adequate amount of the natural gas to ensure economic operation of the NG pipe line. Therefore, the fertilizer complex has been completed by the methanol project to ensure the consumption of about 1 MNm³/day of NG.

c) combining the production of fertilizers with the production of methanol would solve the problem of stabilization of the prices of fuels. At the proportion of the consumption of fuels (gasoline type):

- 50% of hydrocarbons,
- 25% of ethanol,
- 25% of methanol.

the prices of fuels may remain stable over the long period of time (in total amount of about 800,000 t/year in year 2005). This may subsequently allow further using the ethanol without budget subsidies.

The methanol price would allow to introduce the internal subsidy by the operator for the economic mix of both alcohols. This would allow continuation of production of about 240 million l of ethanol per year by the year 2005.

Another option of the mathanol complex discussed briefly with Paraguayan authorities could consist of production of „eurodiesel” by transesterification of soya oil.

2.1.2. Structure of the project and its present status

2.1.2.1. Market Study

The Market Study considering the local and neighbouring states of Brazil demand has been prepared and assessed by international Expert. The conclusions show possibility to define the plant economic production capacity as well as production profile. The full compatibility of the production profile and demand profile should be adjusted at the contractual negotiations and reflected in the basic engineering.

The technical structure of the project has been selected after consideration of available technologies with minimum impact on the environment.

The plant would be composed from the following units:

- ammonia	600 MTPD
- nitric acid	720 MTPD
- NPK	1864 MTPD
- ammonium nitrate	465 MTPD
- calcium carbonate	370 MTPD
- methanol plant	600 MTPD

Those are the minimum economic capacity units at the modern standard of technology.

To supplement the P205 content of the fertilizers it has been decided on the basis of expenditures analysis to abandon the idea of importation of phosphoric acid. The additional cost of about USD 40 million on the infrastructure establishment would make project unfeasible. The concept to use the Brazilian storages in Parangua belonging to the producer of fertilizers seems to be not reasonable from the competitiveness point of view. Therefore, the concept of addition of MAP or TSP which are available from many sources and adding one of it to the NP slurry has been selected as a production profile alternative.

2.1.2.2. Location Study

The Location Study has been completed with preferential plant locations in Presidente Franco or Villeta, which are comparable in cost assessment.

Having in mind that project covers also the methanol plant and that off-site installations are of the same production profiles for ammonia and methanol, the construction of the plants in separate locations would incur additional costs. Therefore, because the preferred location for the methanol plant is Villeta, therefore it has been decided to construct both installations at Villeta site. The detailed evaluation of the location selection is given in the 11-55 UNIDO expert report.

2.1.2.3. Compounded Investment Cost Assessment

The Compounded Investment Cost Assessment has been prepared by 11-55 expert, using data from provided budget offers obtained from the contractors as well as the data collected from other similar projects in other countries, considering also to some extent local unit prices for civil works.

It has been found that a part of equipment could be executed in Paraguay by local construction companies.

The correspondence is currently held with Kellog, KTI on the new ammonia processes, FECO and INCRO on the nitrophosphate route. The additional information when appeared would be used also in Feasibility Study in case the correction is necessary. However, having in mind that project would be handed over to the private investor after completion of FS the final selection of process would be made in the contracts between the licensors and investor. Therefore, the idea of selection of processes has been abandoned, but the additional report comparing the technological issues of the processes would be prepared by UNIDO international experts on the home work basis.

2.1.2.4. Terms of Reference for the Feasibility Study

The Terms of Reference for the preparation of the Feasibility Study has been completed allowing for the bidding among the local companies.

It has been concluded that Feasibility Study must be prepared by the local consulting company and assessed by UNIDO expert. In the project budget there is a provision for such a mission for a staff member of UNIDO.

The reasons for such decision have been as follows:

- the preparation of the FS is a team work of several specialists providing different chapters of the Study and only consulting company could recruit all professionals.
- the COMFAR must be used in preparation of analytical part. UNIDO provided copy for purpose of this project and consulting company would use it temporarily.
- the FS must have an responsible author able to ensure the timing and quality of the job which is not possible to receive from private person.

Therefore, selecting the proved methodology of UNIDO FS preparation using COMFAR, having as an author a responsible consulting company as well as assessment by UNIDO staff member would be feasible to prepare and present the Study to the future investor and financing banks.

The FS should be prepared in the following alternatives:

- a) joint Fertilizer and Methanol complex,
- c) Fertilizer Plant only,
- b) Methanol Plant only with 1200 MTPD capacity.

The solutions could ensure possibility of construction of the NG pipe line from Bolivia of the assumed capacity of 2.5 MNm³/day, even at the case when identification of the private investor for Fertilizer Plant would be delayed, and Methanol Plant may find the investor earlier in the time. In this case only one from the Government strategic goals would be fulfilled: to provide stable prices of fuels. The other goals would be postponed to the time when Fertilizer Plant would be made operational.

The general Plant **Plot Plan** and **Process Flowsheet** have been elaborated and are attached to **Draft Final Report**.

2.2. Areas of activities

2.2.1 Studies preparation modalities

2.2.1.1. Methodology of offers comparison

The **Table of Contents** of the **Methodology of offers comparison** (guidelines for comparison of the offers) provided by Expert is given below:

- 1. Background data**
 - 1.1 General description of the technological profile of the Fertilizer Plant in Paraguay
 - 1.2 Technology assumptions
 - 1.3 Scope of the offer
 - 1.4 List of installations
 - 1.5 Inquiry cost formats
- 2. Procedure of the technology comparison by processes**
 - 2.1 Assumptions on the contractors submission
 - 2.2 License
 - 2.3 Technological flowsheet comparison. List of process units.
Comments on preferences. Status of technology selected by contractor.
Process optimization. Table of the comparison
 - 2.4 Assessment of the product profile. Table of the comparison
 - 2.5 Assessment of the raw materials required. Table of the comparison
 - 2.6 Assessment of the raw material consumption. Table of the comparison
 - 2.7 Assessment of the utilities consumption. Table of the comparison
 - 2.8 Assessment of the labour requirements. Table of the comparison
 - 2.9 Assessment of the pollution parameters. Table of the comparison
 - 2.10 List of catalyst. Origin, unit reactor load, duration of active life.
Regeneration and recuperation possibilities
 - 2.11 List of chemicals used. Amounts. Origin. Annual cost
 - 2.12 Technological profile of the process. (without depreciation)

- 3. Procedure of the equipment selection comparison by installations**
 - 3.1 International codes and standards. Table of comparison
 - 3.2 Assessment of the completeness of specification in regard to the technological flowsheet
 - 3.3 Assessment of the selected equipment. Material. Size (in case of doubts). Transportation limits check
 - 3.4 Replacements
 - 3.5 Equipment fob price. Table of the comparison
 - 3.6 Spare parts and maintenance costs evaluation
 - 4. Procedures of the infrastructural installations selection comparison**
 - 4.1 Natural gas supply system. Modalities of NG utilization. Table of comparison
 - 4.1 Electrical energy supply system. Table of comparison
 - 4.2 Water preparation, cooling and treatment system. Table of comparison
 - 4.3 Steam production/consumption system. Table of comparison
 - 4.4 Waste water treatment system. Table of comparison
 - 4.5 Off-gases treatment system. Table of comparison
 - 4.6 Inter-installation communications. Qualitative evaluation
 - 5. Procedures of supply and financial proposals comparison**
 - 5.1 Validity of offers
 - 5.2 Technical assistance proposals assessment (services). Table of comparison
 - 5.3 Financing proposals. Suppliers credit availability and conditions. Table of comparison
 - 5.4 Joint-venture proposals
 - 6. Procedure of integrated evaluation of the offers**
 - 6.1 Cost of production. Financial sheet. Table of comparison
 - 6.2 Qualitative parameters comparison
 - 6.3 Conclusions and recommendation
 - 7. Guidelines for FPMT to prepare selection proposal to the PETROPAR Management.**
- Annex I.** Process Flowsheet of the Fertilizer Plant
Annex II. Plot Plan of the Fertilizer Plant

2.2.1.2. Terms of Reference for Feasibility Study

The **Table of Contents** of the **Terms of Reference for Feasibility Study** (guidelines for preparation of the FS) provided by Expert is given below:

- 1. Background data**
 - 1.1 General description of the technological profile of the PETROPAR Fertilizer Plant in Paraguay.
 - 1.2 Technology assumptions
 - 1.3 List of installations
- 2. Modalities of the Feasibility Study preparation**

3. **List of studies related to the feasibility studies prepared within the project SF/PAR/96/001**
4. **General content of the Feasibility Study**

The following chapters are be included into Feasibility Studies:

Chapter I.	Executive summary
Chapter II.	Origin of the project and general assumptions
Chapter III.	Market study assessment and required production programme. Assumed capacity
Chapter IV.	Technology and equipment
Chapter V.	Raw materials and utilities
Chapter VI.	Location and site
Chapter VII.	Organization chart, management and employment
Chapter VIII.	Project implementation programme
Chapter IX.*	Environment Impact Assessment. Dispersion model.
Chapter X.	Investment cost. Production cost. Financial evaluation. Economic evaluation
Chapter XI.*	Promotional Pamphlet

* EIA and Promotional Pamphlet would be prepared by UNIDO

5. **Methodological guidelines**

Annex I	Process flowsheet of the Fertilizer Plant
Annex II	Plot plan of the Fertilizer Plant
Annex III	Table of contents of the Feasibility Study

2.2.1.3. EIA guidelines

The **Table of Contents** of the **Environmental Impact Assessment** guidelines provided by Expert is given below:

1. **EIA - Goals and procedures**
2. **Production profile of the Fertilizer Plant**
 - 2.1 General description of the technological profile of the fertilizer Plant in Paraguay
 - 2.2 Technology assumptions
 - 2.3 List of installations
 - 2.4 Environment pollution limits
3. **Emissions and pollution originating from fertilizer plant**
4. **Review of the country legislation and internal company rules:**
 - risk assessment data (MRL, NRL, MAC etc.)
 - provisions for penalization
 - legislation in process of preparation

5. **Review of the technological process provided by the licensors for the Fertilizer Plant:**
 - assessment of the raw materials and contents of hazardous materials
 - technological scheme of the emissions (the flow-sheet is analyzed from the point of view of emissions)
 - material and energy consumption coefficients (theoretical, offered)
 - balance of emissions
 - comparative analysis of balance of emissions
 - product quality and content of the hazardous materials
 - by-products quality and content of the hazardous materials
 - options of the by-products further processing
 - emissions of the hazardous materials
 - review of the emissions processing (washing, treatment)
 - review of the new processes/equipment of the emissions treatment
 - listing of the hazardous operations and review of the preventive measures

 6. **Emissions, effluents and disposal:**
 - the air analysis,
 - waste water treatment efficiency
 - solid waste deposits
 - emergency emissions

 7. **Economic and financial analysis:**
 - cost of the environment protection
 - pre-treatment and treatment installations
 - regulated disposal costs
 - investment costs of the environment protection
 - discounts from by-products
- Annex I.** Process Flowsheet of the Fertilizer Plant
Annex II. Plot Plan of the Fertilizer Plant

2.2.1.3.1. **BAT for the Fertilizer Project**

The most up-dated environment protection data are considered by the Fertilizer Project in Paraguay.

The European Fertilizers Manufacturing Association (EMFA) has carried out extensive studies and published agreed by member companies the guidelines on Best Available Technics (BAT). The BAT concludes which are the achievable environmental emissions levels and energy consumption figures for the principal fertilizer manufacturing processes in Europe. The BAT being a combination of different proprietary and public domain processes should be available for purchase by all operators at a price not entailing excessive costs. These activities are supporting the European Union in the framework of Integrated Pollution and Control Directive (IPPC), where emissions limit values will be set based on the BAT. For the fertilizer industry EMFA has prepared 8 BAT-booklets. They cover the production processes of the following products:

- booklet 1: Ammonia
- booklet 2: Nitric acid
- booklet 3: Sulfuric acid
- booklet 4: Phosphoric acid
- booklet 5: Urea and UAN
- booklet 6: AN and CAN
- booklet 7: NPKs by the nitrophosphate technology
- booklet 8: NPKs by the mixed acid route

The booklets are available from EMFA. The BAT references would be approved by EU Commission by the 1998. The achievable emission level for the European fertilizer industry using BAT are given in the following tables.

Tables: Achievable emission levels for the European Fertilizer Industry using BAT

Source of information publicly available:

European Fertilizers Manufacturing Association, EMFA,
Avenue E. Van Nieuwenhuysse 4,
B-1160 Brussels, Belgium,
Fax (0322) 675 3961

Ammonia

Type of emission	ppmv	mg/Nm ³	mg/l	kg/t of product
NO _x to air	75 (150)	150 (300)		0.45 (0.9)
SO ₂ to air	as for combustion plants			
NH ₃ to water				
Spent catalysts				0.2 (0.2)
Energy consumption: 32.5 GJ/t NH ₃ (new plants)				

Nitric acid

Type of emission	ppmv	mg/Nm ³	mg/l	kg/t of product
NO _x to air	150 (400)	300 (800)		1.6(4.2)as100%

Sulfuric acid

Type of emission	ppmv	mg/Nm ³	mg/l	kg/t of product
SO ₂ to air				2-4 (10)
SO ₃ to air				0.15 (0.6)

Phosphoric acid

Type of emission	ppmv	mg/Nm3	mg/l	kg/t of product
Fluoride to air		5 (30)		0.04 of P2O5
Dust to air		50 (150)		

Gypsum re-use of disposal on land may continue if accepted by EQS.

Urea

Type of emission	ppmv	mg/Nm3	mg/l	kg/t of product
Granulator: - urea dust - NH3 to air	75 (250)	50(80) 50(165)		0.25 (0.4) 0.25 (0.83)
Prill tower: - urea dust - NH3 to air	75 (150)	50 (150) 50 (100)		0.5 (1.5) 0.5 (1.0)
Vents NH3 to air				0.06(0.75)
Urea to water			1 (150)	0.0005 (0.1)
NH3 to water			5 (150)	0.0025 (0.1)

Ammonium nitrate

Type of emission	ppmv	mg/Nm3	mg/l	kg/t of product
Granulator/prill tower - dust - NH3 to air		15 (15) 10 (10)		Total to air - dust 0.5 (0.5) - NH3.0.2 (0.2)
Neutralizer cooler/drier: - dust - NH3 to air		30 (30) 50 (50)		
Solids and CAN: - dust - NH3 to air		50 (50) 50 (50)		
N to water			100 (100)	0.2 (0.2)

Nitrophosphate (NPK)

Type of emission	ppmv	mg/Nm3	mg/l	kg/t of product
NH3 to air		50 (250)		0.3 (1)
NOx to air		500 (500)		0.2 (0.2)
Fluoride to air		5 (5)		0.02 (0.02)
Dust to air		50 (50)		0.3 (0.3)
P205 to water			28 (30)	0.06 (0.11)
NH3 as N to water			60 (120)	0.12 (0.5)
NO3 as N to water			15 (150)	0.03 (0.3)
Fluoride to water			13 (26)	0.05 (0.05)

NPK (mixed acids)

Type of emission	ppmv	mg/Nm3	mg/l	kg/t of product
NH3 to air		50 (50)		0.2 (0.2)
NOx to air		70 (70)		0.3 (0.3)
Fluoride to air		5 (5)		0.02 (0.02)
Dust to air		50(50)		0.2 (0.2)
N to water			0 (100)	0 (0.2)

2.2.1.4. Promotional Pamphlet

The **Table of Contents** of the **Promotional Pamphlet** as guidelines for its elaboration provided by Expert is given below:

Defintions an Abbreviations**Abstract****Introduction**

1. **General background data**
 - 1.1. Date and place of this Promotional Pamphlet publishing
 - 1.2. Place of availability of this Promotional Pamphlet
 - 1.3. Authors of this Promotional Pamphlet
 - 1.4. Data about Project initiator
 - 1.5. Data about Project promotor
 - 1.6. Persons, responsible for this Promotional Pamphlet and their statement.

- 2. General data about the project to establish Fertilizer Plant in Paraguay**
 - 2.1. General conditions
 - 2.1.1. State policy toward agriculture
 - 2.1.2. State policy toward industry and trade
 - 2.2. Fertilizer market and present supplies
 - 2.2.1. Application of fertilizers
 - 2.2.2. Sources of supplies and list of main fertilizer suppliers
 - 2.2.3. Consumption of fertilizers
 - 2.2.3. Fertilizer trade infrastructure
 - 2.2.4. Fertilizers export changes
 - 2.3. Raw materials
 - 2.3.1. List , quantities, sources, availability
 - 2.3.2. Transportation infrastructure
- 3. Reasons and purpose of this Promotional Pamphlet**
- 4. Project technical background data**
 - 4.1. General description of the technological profile of the PETROPAR Fertilizer Plant in Paraguay.
 - 4.2. Technology assumptions
 - 4.3. List of installations
- 5. Concept of a Company**
 - 5.1. Initial financial structure
 - 5.2. Future financial structure
 - 5.3. Initial Plant organization chart
 - 5.4. Plant organization chart
- 6. Project financial background data**
 - 6.1. Company capital
 - 6.2. Plant assets
 - 6.3. Plant liabilities
 - 6.4. Income statement
 - 6.5. Cash Flow
 - 6.6. Analysis Statement
 - 6.7. Internal Rate of Return and Net Present Value
- 7. Other information about the Project**
 - 7.1. Localization of the Fertilizer Plant
 - 7.2. Communication
 - 7.3. Industrial infrastructure
 - 7.4. Labour availability and social infrastructure
 - 7.5. Investment risks

- Annex I.** Proces flowsheet of the Fertilizer Plant
- Annex II.** Plot plan of the Fertilizer Plant
- Annex III.** Initial Plant organization chart
- Annax IV.** Plant organization chart

2.2.1.4.1. Optional Government policies for the Fertilizer Project promotion

Government policies have many - sided character, but basically indirect and direct governmental involvement into industry development are foreseen.

The indirect involvement is related to establishment of the political atmosphere of the support of the increase of the food production using different means i.a. fertilizers. The indirect involvement includes:

(a) Establishment and operation of the R&D programmes related to the soil fertility and crops production increase. This is realized in the establishment of the Agricultural Research Institute and Agro-Extension services under the control of the Ministry of Agriculture. The Extensions Services having local laboratories should be authorized to control and certify the quality of fertilizers (imported or from network of local dealers).

(b) Promotion and direct support granted to the farmers education and to their local organizations. Publication of the agrotest results and support of advertising of utilization of agricultural inputs. Organization of the country wide competitions and prized expositions. Support to organization of the local financing system (cooperative banks and cooperative trading organizations).

(c) Establishment of the stock exchange(s) for the agricultural inputs as well as for agricultural products with possibility of conclusion of future transactions.

(d) Support of the dealers system organization by training and financial credits for the establishment of the trading infrastructure. This would allow to avoid establishment of the local distribution monopoly either parastatal or private.

(e) Establishment at the Industrial Technology Research Institute the Fertilizer Group working on the collection and processing of information on fertilizers in the following areas:

(i) world wide and regional prices of fertilizers and their precursors, logistic costs, marketing and distribution costs, production statistics and trends of development;

(ii) technology reviews and technological profiles updating of the leading technological processes in the fertilizers;

(iii) preparation of the opportunity and feasibility studies and financing schemes of the fertilizer industry development. Publication of the results and promotion of the concept of the fertilizer industry development at the international forum and through bilateral inter-governmental meetings.

The direct involvement of the Government is controversial. Theoretically liberal i.e. free market Governmental policy should promote position of total neutrality of the Government as far as agricultural production and applied inputs. However, this theoretical position is not practically implemented by the industrialized countries which directly support agricultural prices financially and employ other forms of agriculture support. The system of subsidies applied by the European Union countries as well as USA is very complicated and perhaps should not be reproduced in the developing countries. It is not the task of this report to discuss these systems. However, all countries should consider possibility of introduction of selected policy instruments of the direct involvement to stabilize the agroproduction in the country what would also influence the world wide food situation.

The direct involvement is related to the following policies:

(a) Establishment of the Agricultural Fond as a public (or mixed) trading organization. The task of the Fond is to buy agroproducts when prices are falling down, endangering the farmers income and their intentions to produce in the following season. Fond would sell the products at the seasonal switch, when the prices of the food products on the market are growing. Therefore, the Fond plays double role:

- (i) ensuring the stability of the farmers income parity;
- (ii) ensuring the stability of the food prices at the local market in the interest of the population.

The regulatory role of the imported agroproducts prices is low as the production of food in the developing countries is cheaper than that at the international markets even taking into considerations the export price subsidies.

(b) Establishment of the network of the agricultural preferential credits to facilitate the credit access for farmer. Having in mind the seasonal character of the agricultural production and risk factor, the credit facilities should be organized at the preferential rates. The difference between the market interest and agrocredit cost should be financed from the profits of the Agricultural Fond or directly from the budget. The repayment of the debt should be allowed in the natural form of products supplied to the Agricultural Fund.

(c) Establishment of the comprehensive system of the custom duties and elastic adjustment of the system to the changeable situation. The role of the custom duties is the motivate local production at the competitive level inside the country, considering the export subsidies of other countries. However, market should be open for the performance of the processing of imported raw materials to exported products.

(d) Direct support in the establishment of the fertilizer industry. The fertilizer industry as raw material processing branch, is highly capital consuming with longer return on investment than many other industries. Therefore, if the establishment of the fertilizer industry in the country is showing its strategic values, than the Government should consider two options of the support:

(i) establishment of the para-statal shareholding company and construction of the plant from the budgetary sources or using international financing. At the later stage the company could be privatized either by selling it to the strategic investor, or by stock exchange shares sale;

(ii) establishment of the joint-venture between the public and private capital (also foreign) and issuing the Industrial Development Bank guarantees to the financial institutions. In this case also preferential interest rates could be considered for the part of local financing.

The imported equipment and materials could be freed from the custom duties and other local taxes.

(iii) establishment of the preferential industrial situation allowing private investor to undertake the establishment of the fertilizer plant. This require establishment of the long term tax holidays, opening the local credit facilities at the preferential conditions, technical support for investor financed by the Government, as well as the special custom arrangements for imported equipment and materials as well for export of the product at the first stage of the plant operation when local demand still would not balance the plant capacity.

The selection of the option should be made on the basis of the detailed economic and financial study taking into account macroeconomic factors (e.g food self-sufficiency, foreign trade balance, export promotion, employment and utilization of the local resources etc.).

(e) direct support to the marketing and distribution system. Establishment of the regional trading companies (public or mixed). The initial investments should be organized at the preferential conditions similar to that provided for the fertilizer plant establishment (see Paraguayan Law 60/90).

2.2.1.5. Compounded Investment Cost Assessment methodology

(a) Process units

The process units split of cost elements has been prepared using data from Snamprogetti budget offer (lump sum modality) and modified Peters' methodology. The following structure of costs has been resulted:

- equipment, containing the FOB cost of equipment, machinery bulks (piping, valving, electrical equipment, cabling, instrumentation) as well as hardware for laboratory, mechanical workshop etc.,
- construction, containing civil works costs as well as the costs of the construction materials,

- engineering, containing software : license costs, basic engineering, detailed engineering (including civil engineering), and services such as inspection of equipment as well as supervision of erection and start up of plant,
- transportation and related costs containing: freights, including sea and barges freights as well as the unloading of equipment on the site and other costs,
- spare parts for 2 years of operation, site delivered.

All elements have been assessed and provided in the tables in format allowing direct utilization in using the COMFAR software. There is a full correlation between the Snamprogetti offer and compounded investment cost information.

(b) Offsites have been divided into two groups:

- internal offsites defining all utilities and storages,
- external offsites defining basically out of battery limits of plant expenditures.

Offsites producing utilities have been excluded from the total investment cost as they provide services at the cost including the depreciation and return on investment.

Investment cost for offsites has been disclosed on the basis of preliminary design of utilities functions and volumes of works and supplies. The data from existing plants have been used and adapted to local conditions.

(c) Additional costs related to the pre-investment costs, start-up costs, pre-investment costs as well provision for unexpected growth of prices (contingency) have been considered and added at the end of investment cost calculations using ratios originating from practise in large scale investment projects.

(d) Compounded Investment Cost Assessment tables have been developed.

2.2.1.6. Production cost assessment

Production cost assessment has been discussed in two versions:

- (a) costs arise within battery limits installations
- (b) costs arise in infrastructural installations

Cost of the production has been assessed on the format using concept of the transfer costs. Owing to the fact that all intermediate products are processed in further stages of fertilizer production it was not practical to calculate revenues from their subsequent transfer (sales) among Plant Divisions, assuming imported prices. This operation could be voluntarily manipulated because there is no import to Paraguay of ammonia, and nitric acid, therefore it would be nearly impossible to provide reliable information on the costs of the supplies.

Opposite to that there are quite good price records of the fertilizers of different composition imported to Paraguay and being sold in the Brazilian neighbouring states, where Plant production would be directed in amount over the 50% at the beginning stage of the plant operation.

Therefore, only fertilizers (final products) and methanol costs are calculated including depreciation.

Working capital and its costs, as well as financial charges and its impact on the project profitability would be given in the financial analysis where assumption on the capital composition, interests and other important project policy parameters would be considered.

The cost calculation are structured in the following format:

- materials costs
- utilities costs
- labour cost
- overheads costs

adding depreciation costs and sales cost to the final products. This structure allows easy adoption of the COMFAR software for financial analysis.

The technological profiles are marked respectively. The final product is marked " FINAL PRODUCT". It is indicated which fertilizer intermediate product is processed.

The CICA and Technological profiles are given in three options:

- a) Fertilizer Plant and Methanol Plant located together (see Report 12.1)
- c) only large scale Methanol Plant is considered (see Report 12.2)
- b) Fertilizer Plant only (see Report 12.3)

2.2.2. Training activities

2.2.2.1. Training workshops

The training workshops for local specialists on methods of preparation the following documents have been carried out by Expert:

- Compounded Investment Cost Assessment
- Environmental Impact Assessment
- Feasibility Study
- Promotional Pamphlet

List of the workshops participants:

- (a) Compounded Investment Cost Assessment workshop
 - **Sergo von Horoch**
 - **Victorio Oxilia Davalos**
 - **Eduardo de Loof**
- (b) Feasibility Study TOR discussion workshop
 - **Sergo von Horoch**
 - **Victorio Oxilia Davalos**
 - **Eduardo de Loof**
- (c) EIA assessment study
 - **Sergo von Horoch**
 - **Victorio Oxilia Davalos**
 - **Eduardo de Loof**
- (d) Promotional Pamphlet preparation methodology
 - **Sergo von Horoch**
 - **Victorio Oxilia Davalos**
 - **Eduardo de Loof**

2.3. Other industrialization projects:

During the implementation of the UNIDO project UC/PAR/94/087 it have been identified several potential areas of the industrialization in Paraguay, namely:

- Artificial fibres production
- Processing of the castor, soya and palm oils
- Agricultural raw materials processing.

2.3.1. Artificial fibres production

One of these areas is the production of the artificial fibres using the waste cotton from the cotton processing industry as well as the product from the local paper mill in the future. The programme is composed of two products:

- a) acetate silk
- b) carbamate viscose

Ministry IC during the promotion missions has identified interest of the Spanish company SELDA AC to participate in the project. To prepare the MIC for the discussions with SELDA FPMT, the preliminary UNIDO report containing the information related to the acetate silk has been prepared by the expert and handed over to the MIC.

The information related to the carbamate viscose has been prepared by the expert as well at the MIC request expressed during the mission and handed over to Ministry as a TOR for discussion with SELDA representatives.

Particulars are described in **Draft Final Report** Consensus Paper

2.3.2. Processing of the castor, soya and palm oils

Within programmed area of the industrial development the oils possible processing has been identified. Considering all aspects of the relations between the agriculture and industry this area has been found profitable.

There already exists industrial activities in the area (PAG SA), however to intensify the activities in this field the urgent action of the Government is necessary. The assistance should be concentrated around the selection of the best technology and preparation of the detailed market evaluation and customers identification e.g the activities which are not affordable by the small private entrepreneurs.

The proposal has been handed over to the MIC and MIP.

Further pre-investment studies have been proposed and guidelines of the studies preparation discussed. The problem of these studies financing should be settled by Ministry of Planning.

Particulars are described in **Draft Final Report** Consensus Paper.

2.3.3. Agricultural raw materials processing.

An idea to support Paraguayan Government policy of medium scale agricultural raw materials processing industry was discussed and is presented in **Draft Final Report** Consensus Paper.

The pre - investment studies **Table of Contents** agreed for a/m potential areas of cooperation is given below:

Abstract**Executive summary****Introduction**

- 1. Industrialization - a strategic goal of the developing country.**
 - 1.1 Identification of the strategic parameters of the industrial development in Paraguay.

- 2. Development strategies, policies and industrial structure**
 - 2.1. General Methodology
 - 2.2. Selection of the strategies for the network
 - 2.3. Search for industrial structure of the network
 - 2.4. Industrial policies for the network
 - 2.5. Review of market evaluation ^{*\}
 - 2.6. Review of location preselection ^{**\}

- 3. Development programme - selected options**
 - 3.1 Selected strategic assumptions
 - 3.2 Prices and investment costs
 - 3.3 Technological network
 - 3.4 Technological profiles
 - 3.5 Pre-feasibility evaluation of the technological networks
 - 3.6 Promotional pamphlet

- 4 Implementation plan**

Conclusions and Recommendations**Bibliography**

- Annex I.** Prices and investment costs
Annex II. Technological profiles of the installations

- ^{*\} Local market and Mercosur trade in products from the network would be assessed by local team
^{**\} Location preselection would be prepared by local team

2.4. Consensus paper

The Consensus Paper at the end of Mission has been discussed and agreed. The paper summarizes the Fertilizer Project status and provides the information on the all parties necessary actions.

The **Table of Contents** of the **Consensus Paper** is given below:

- 1. Assessment of project status**
 - 2. Plan of action**
 - 3. Other industrial projects**
 - 4. Conclusions and Recommendations**
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- | | |
|-------------------|---|
| Annex I. | Plot Plan (see main body of the report) |
| Annex II. | Job descriptions 11-51, 11-53, 11-54, (see main body of the Draft Final Report) |
| Annex III. | Policy measures proposal to be inserted into promotional pamphlet (see main body of the Draft Final Report) |
| Annex IV. | Budget of the fiber cooperation project |
| Annex V. | TOR for other industrial projects |
| Annex VI. | Table of contents of the opportunity studies |

3. Conclusions and recommendations

3.1. Conclusions

- a) project implementation is carried out according to the schedule agreed at the project approval
- b) specialized qualified studies have been made and are ready for presentation to the local consulting companies to be involved in preparation of the Feasibility Study to support consultants activities,
- c) the contractors provided PETROPAR with budget offers only what required additional analytical review of the offers (see Report 12)
- d) further procedure of industrialization programme has been agreed.

3.2. Recommendations

- a) FS should be subcontracted to the local company
 - b) Job descriptions of the proces assessing experts should be changed to homework studies of 1 m/m
 - c) Fielding of CTA (May) and UNIDO FS staff member by early June should be ensured by UNIDO
 - d) Considering proposed cooperation programme with UNIDO, Secretariat of Planning and MIC would take necessary decision and in case of cooperation acceptance to provide necessary funds for futher actions.
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