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ABBREVIATIONS

ADG	Average Daily Growth
BOI	Board of Investment
CFI	Clothing and Footwear Institute
CIF	Cost, Insurance, Freight
CTU	Community Training Unit
DCSM	Deallergenated Castor Seed Meal
DECS	Department for Education, Culture and Sport
DEG	Deutsche Entwicklungsgesellschaft
DTDC	Desolventizer-Toaster-Dryer-Cooler
DTI	Department of Trade and Industry
DOST	Department of Science and Technology
EC	European Community
ESCAP	Economic and Social Commission for Asia and Pacific
FAO	Food and Agriculture Organization
FCR	Feed Conversion Ratio
FLIC	Footwear and Leather Goods Institute
FLTDC	Footwear and Leather Goods Training and Demonstration Centre
FOB	Free On Board
GDP	Gross Domestic Product
HACCP	Hazard Analysis Critical Control Point
IDF	Industrial Development Fund
ILO	International Labour Office
JPO	Junior Professional Officer
kg	kilogramme
MFDC	Marikina Footwear Development Council
MOLE	Ministry of Labor and Employment
NDCSM	Non-Deallergenated Castor Seed Meal
NMYC	National Manpower and Youth Council
NGO	Non-Governmental Organization
NPK	Nitrogen-Phosphorus-Potassium
NRC	National Research Council (NRC)
NSO	National Statistics Office
OMSD	Office of Manpower Skills Development
PC	Personal Computer
PFF	Project Formulation Framework
PMDC	Provincial Manpower Development Centre
ppm	parts per million
PRODOC	Project Document
RMTC	Regional Manpower Training Centre
SGV	Sycip, Gorres, Vealyo & Co., Consulting Group
STC	Special Training Center
t	Metric ton
TCDC	Technical Co-operation among Developing Countries
TCOI	Thai Castor Oil Industries Co. Ltd.
UCD	UNIDO Country Director
UNIDO	United Nations Industrial Development Organization
UNDP	United Nations Development Programme

PREFACE

The Government of the Federal Republic of Germany and UNIDO consider it important to assess project sustainability and draw lessons also from projects which have been completed for a certain period of time. For this purpose an umbrella project for ex-post evaluations was approved and is being financed by the German Government.

That umbrella project foresees a series of ex-post evaluations of which the first two are covered by this report. To increase cost-effectiveness of the exercise, it was decided to cover two projects in one mission. This first exercise was a preliminary attempt and the first of such joint ex-post evaluation. It was not only meant to investigate the sustainability of the projects' results but also to refine the approach to be taken in future ex-post evaluations.

The projects selected for the first mission are both related to the agriculture sector in so far as they are based on agricultural inputs and, in the case of one project, provide a product to the same sector. One of the projects (US/PHI/85/109) is a typical institution building project, whereas the other (US/GLO/87/125) aimed at the establishment of a demonstration plant including the transfer of technology developed by UNIDO under a previous, German financed project. The counterpart in the former project was a government institution, i.e. the project belongs to the traditional type of technical co-operation projects, whereas project US/GLO/87/125 was implemented in co-operation with a private company. Both projects aimed at a regional or global outreach and, according to their design (project document), were not meant to be purely national projects.

The field mission to Manila and Bangkok, carried out from 9 - 24 March 1991, was preceded by a desk review of relevant materials such as background and project documentation and followed by the preparation of the evaluation report based on a preliminary draft prepared in the field and materials collected during the mission.

The report is presented in three parts. Each project is covered by one separate part, whereas lessons learned are summarized in Part III as they are of a general nature having application beyond the particular project from which they were derived.

PART I: US/PHI/85/109 FOOTWEAR AND LEATHER GOODS INDUSTRIES CENTER

A. INTRODUCTION

The purpose of the mission was to undertake an ex-post evaluation of the project US/PHI/85/109 Leather Goods and Footwear Industries Center to assess the sustainability of the project's results¹. The field visit of the mission to Manila took place from 11-16 March 1991. The team was composed as follows:

Mrs. B. Rau, Ministry for Economic Co-operation, Federal Republic of Germany, Team Leader
Dr. H. Boergel (Mrs.), Independent Consultant, Federal Republic of Germany
Mr. O. Kloetzer, Technical Expert
Ms. C. Heider, Evaluation Officer, UNIDO

The mission consulted with the Director General and staff of the National Manpower and Youth Council (NMYC), the Office of Manpower Skills Development (OMSD) and the Footwear and Leather Goods Institute (FLIC), the UNIDO Country Director (UCD), representatives of municipalities and entrepreneur associations/cooperatives and a cross-section of entrepreneurs of the subsector. Visits were paid to the facilities of FLIC, satellite centers associated with NMYC, municipal authorities and factories of all sizes. Also, the Ambassador of the Federal Republic of Germany was informed about the purpose of the mission.

The mission is especially grateful to Ms. Hernandez and Messrs. Regondola and Alano of NMYC/OMSD/FLIC and Mr. Newman, UNIDO Country Director for their support during the full duration of its stay in Manila.

B. THE PROJECT

B.1. Project plan and document²

1. The project is a follow-up to the previous phase US/PHI/79/109 which assisted in the establishment of FLIC, at that time called Footwear and Leather Goods Training and Demonstration Center (FLTDC). Although the objectives of the first phase had been met, further assistance was found necessary to ensure sustainability of the institution. Furthermore, the second phase was designed to up-grade existing capacities and capabilities in order to attain an internationally recognized level as well as to expand the center by creating a product research and development unit together with an information and documentation unit.

2. The development objective of the project was, according to the project document, to contribute to the national economy and to that of the Asian region by upgrading and developing the leather, footwear and leather goods industry as a source of non-traditional export products. Moreover, the

¹ The Terms of Reference for the mission are contained in Annex 1.

² A detailed analysis of the project document is contained in Annex 3.

project aimed at preparing FLIC to take over the role of a regional center for the South-east Asia and Pacific region.

3. The problems of the leather based manufacturing subsectors and interrelated parts of the economy are manifold as it is further elaborated in Part C. of this report. The subject project aimed at addressing the problem of low productivity and quality standards due to lack of training at workers, technician and managerial level. By attaining improvements in this area, the subsector's productivity and competitiveness should be enhanced. The project concentrates, therefore, on the manpower development aspect of the leather goods and footwear sector while taking technical requirements into account.

4. The immediate or project objective is to upgrade FLIC's capacities and capabilities in providing services in the following areas: training (at nationally and internationally recognized level), product development for exportable quality footwear and leather goods, quality control and applied research, and extension services to industries. To attain this objective it was planned to establish or strengthen the corresponding departments of FLIC through staff training, provision of expertise, preparation and adaptation of training curricula and syllabi, and the delivery of equipment.

5. Both phases were financed through contributions of the Government of the Federal Republic Germany to the UN Industrial Development Fund (IDF) with a total amount of US\$ 1,191,415. The first project started in 1979 and assistance continued without interruption with the second phase, commencing in 1985. The second phase was operationally completed in the beginning of 1991.

B.2. Implementation

6. The delivery of inputs and implementation of activities are reflected in the Final Report of 5 November 1990. They were not subject to a detailed analysis in the scope of the ex-post evaluation.

7. Under the latest revision of the project almost 50% of the total budget was allocated for personnel, followed by less than 20% for equipment and approximately 8% for training, the remainder being allotted for a subcontract and sundries. A total of 95.1 m/m international and 10.0 m/m national expertise was provided in the areas of technology, quality control, machinery engineering, fashion and design, design and production, footwear components, etc. Equipment was supplied for the quality control laboratory as well as some supplementary parts to the other units, such as those for product research and development, footwear and leather goods, and maintenance. Instructors and technicians were trained on the job by consultants and through fellowships abroad. Internationally accredited training courses were developed and introduced through the assistance of the London based Clothing and Footwear Institute (CFI) which was subcontracted for this purpose. CFI staff was also involved in moderating examinations held at FLIC.

B.3. Time-frame

8. The duration of each phase of the project was set as two to three years without defining the precise completion date. The first phase of assistance

had approximately the same duration as phase II and already its evaluation³ indicated inadequacy of the project's time-frame.

C. PROJECT CONTEXT

C.1. Socio-economic context of the project⁴

9. Since the project focuses on leather based industries, the relevant subsectors are reviewed hereunder to reflect the prospects of the footwear and leather goods sector in light of its supporting subsectors. In view of the project's manpower development aspects, a brief on the manpower situation is given as well.

The economy

10. The Philippine economy has suffered major disruptions and setbacks in 1990. A prolonged drought cut down on agricultural production. A devastating earthquake resulted in severe physical and human losses. The Gulf crisis placed serious pressure on the balance of payments (about 1.3 million Filipinos are working in the Gulf states, sending home an estimated US\$ 2 billion p.a.). The real GDP growth rate dropped from 5.6% in 1989 to 2.5% in 1990. The inflation rate is up to 18.5%. A temporary 9% import levy and the subsidized pricing policy for oil products are hampering liberalization policies requested by the Consultative Group of donor countries, although the Group has expressed support to the Philippine Government's stabilization programme.

11. The rather depressing outlook on economic development for 1991 with an expected negative growth rate has recently become slightly more optimistic. The quick end of the Gulf war will ease some constraints of the balance of payments. The reconstruction of the Gulf region and the ,therefore, extended need of labor from South East Asia will most probably have a positive effect on the present unemployment rate.

12. The leather and leather goods sector is in the process of drawing more official attention than in the past. The governmental Board of Investment (BOI) has developed a strategic 12 year plan for the leather tanning and the leather goods sector (footwear and leather goods). The plan foresees in its first stage the establishment of a finishing plant to ensure supplies of high quality finished leather. To encounter shortages of raw materials, it is recommended in that medium term plan that either the Philippine Exporters Foundation or the Philippine International Trading Corporation would stockpile imported critical raw materials. The same strategy paper recommends the rationalization of import procedures and reduction of tariffs. Besides others, the development of training programmes "to upgrade workers'

³ Final Technical Evaluation Report, US/PHI/79/109 Footwear and Leather Goods Training and Demonstration Center, O. Kloetzer, 22 October 1983

⁴ An illustration of the leather goods and footwear sector and related sectors is contained in Figure 1.

productivity and middle management's analytical and supervisory skills"⁵ belongs to the priority areas to be addressed by the government. According to the cited plan, the availability of skilled manpower is a government responsibility, whereas upgrading of technical and managerial skills should rest in the hands of the private sector.

13. The potential impact of the leather based subsector on the overall economic performance and growth has to be assessed against various factors, such as employment opportunities, domestic and export market, technical constraints as well as actually attainable manufacturing value added (MVA). The following paragraphs provide some background information on the current situation of various sectors interrelated to the footwear and leather goods subsector.

Raw material availability and distribution

14. The raw material base is weak and up-stream problems start already at the level of livestock industries in which continuously declining production figures are recorded⁶. The competitiveness of meat production as one of the main outputs of livestock industries decreased due to cheaper meat imports leading to a lack of incentives for livestock raising. One of the effects of this situation is a shortage of raw hides which, consequently, affects the tanning sector. Among the most common sources of raw hides are cattle (49%), carabaos (28%), hogs (15%), and goats (8%). Pig skin is most commonly used for food stuff, therefore, is limited as a source for raw hides.

15. Tanning industries are mostly technically obsolete and under-utilized running at a capacity of maximum 30 %⁷. The aggregate annual rated capacity is estimated for finished leather at 46.5 million sq.ft. and 800 tons for sole leather. The subsector faces numerous technical problems which, in addition to the poor quality of raw hides, further lower the quality of its finished leather production. As mentioned in paragraph 12, the Government's strategic plan recognizes this problem. In addition to these problems, the tanning sector's operations depend heavily on imported tanning chemicals.

16. The local production of finished leather remained stagnant at about 14 million sq. ft. during the period 1984 - 1987. Between 1981-86 Philippines leather exports constituted an average of only 0.002% of total Philippines exports. The local production does not cover domestic demand; about 80% of the sector's raw material requirements are imported not only because of insufficient quantities produced locally but, moreover, due to quality standards. The average annual requirement of local manufacturers is estimated at 11.5 million sq.ft. for upper leather and 9.5 million sq.ft. for lining. In 1986 finished leather worth some 9.5 million US\$ (CIF) were imported, increasing slightly after a 33% decrease from US\$ 11,571 in 1984 to US\$ 8,707 in 1985. Tariffs on imported finished leather are higher than those imposed

⁵ BOI/DTI Long-term Sectoral Plan 1989-2000, Leather and Leather Goods, prepared by SGV Management Services, Manila November 1988. Such programs should be partially subsidized by Government.

⁶ Public investments in this area were drastically cut to one third of the 1986-level in 1988. Source: Medium Term Philippine Development Plan 1987-1992, Proclamation 51, Manila 1986.

⁷ BOI/DTI Long-term Sectoral Plan 1989-2000, op.cit.

by other countries in the region which results in a protection of tanning industries at the cost of leather goods and footwear manufacturers. Tax exemptions are, however, granted to producers manufacturing for export markets, provided the manufacturer is registered with the BOI.

17. Larger manufacturers of leather products tend to procure finished leather directly from the raw material supplier, whereas the majority of medium and small enterprises have to satisfy their requirements through wholesale agents. That distribution network is concentrated in the hands of relatively few dealers who are said to have a strong influence on leather prices and product availability. Shortage and unreliability of raw material supply adversely influences manufacturers' willingness to accept large volume orders, particularly for export markets.

Structure and organization of the sector

18. Leather goods manufacturing is run by over 400 firms and footwear industries comprise an estimated 2,000 companies of which over 900 are registered with the Marikina Footwear Development Council (MFDC) in 1990. Between 1981-86 the leather goods industry is estimated to have had the largest growth potential. About 39% of the footwear enterprises produce leather shoes, the remaining manufacture non-leather footwear and slippers/sandals. Industries are geographically concentrated in Metro-Manila and the Provinces of Bulacan, Laguna and Cebu. Mostly family owned, enterprises can be classified into small-scale (69%), medium-scale (20%) and large-scale (11%).

19. The leather goods and footwear sector is not well organized but rather divided. No single organization (national association) represents the entire subsector. Due to different interests, partially originating from different sizes of individual enterprises, a fragmentation between SMEs and larger industries is apparent. Several associations and cooperatives have been established according to regional and local interest groups, personalities, etc. and seem to operate independently. The lack of a coherent organized structure of the leather sector in which one umbrella organization promotes the interest of the entire subsector has contributed to a stagnation of the sector's development over the past ten years as the proliferation of associations obstructed from developing and agreeing on common positions on policy and development issues.

20. In the footwear sector the technical level ranges from basic manual work in small, home-based workshops to mechanized factories. Machinery of smaller manufacturers is largely obsolete and, according to some sources, 15 years behind latest technologies. New investments are not encouraged by conditions such as lack of locally produced machinery, insufficient or non-existent after-sales services and shortage of spare parts.

21. The majority of companies in this sector are facing financial constraints starting already at the level of working capital requirements. The Department of Trade and Industry (DTI) maintains a lending programme under which entrepreneurs can obtain credits, however, this programme is not accessible to smaller companies. Problems in obtaining loans center around not only interest rates but, moreover, lengthy administrative requirements.

Market

22. The domestic consumption of footwear is estimated by the BOI⁸ to be on average 1.8 pairs/per capita annually, with a population of 58.7 million resulting in a total of 106,000 million pairs (1989). The per capita consumption ranges from 0.5 pairs (lowest income group) to 5.0 pairs (highest income group). Exact figures for the domestic consumption of leather goods are not available, however, are estimated to be relatively low, with the consumers mainly coming from the middle to higher income groups.

23. The export market for leather goods can be divided into two major types, i.e. direct exports (manufactured leather products, based on imported raw materials, for the export market by locally owned companies) and consigned exports (manufactured by foreign companies' subsidiaries) of which the latter constituted over 80% of leather goods exports. Direct exports grew during the periods 1981-1986 from US\$ 7.8 million to US\$ 9.5 million, reflecting a compounded annual growth of 3.9% during that period, while consigned exports, consisting of leather gloves only, recorded an increase in value over the same period: from US\$ 36.9 million to US\$ 48.8 million or 5.7%. Main markets were USA, Canada, Australia, Japan, and the Federal Republic of Germany. Leather goods exports constituted, however, annually only, on average, one percent of the Philippine's total exports over the period 1981 - 1986.

24. Footwear exports totalled in 1988 more than 20 million pairs amounting to the value of US\$ 63,709,000⁹, including leather and non-leather shoes. The export value (FOB) of full leather or composite leather shoes in 1989 was equivalent to over US\$ 7,460,202 and increased in 1990 to US\$ 8,689,391 as compared to total footwear exports (i.e. including non-leather shoes)¹⁰ of US\$ 96,286,148 (1990) and US\$ 88,234,808 (1989). Throughout the 1980's the total footwear export growth rate in terms of export value (in US\$) fluctuated heavily between -16% and +17%. The sector is considered by some sources to be a significant foreign exchange earner and is expected to be expanding further in the future. The share of leather footwear in total exports of the Philippines amounts, however, to less than one percent only (1989/1990).

Manpower

25. A recent ILO study¹¹ on the overall employment and manpower situation in the Philippines indicates a declining trend in the availability of skilled labor in the industrial sector as a whole as well as the manufacturing sector. The percentage of professional and technical workers decreased from 6.3% to 5.2% of the total labor force of the past five years.

26. While upstream activities of the leather production, i.e. tanning industries, are capital intensive, the manufacturing of footwear and leather goods is rather labor intensive. Therefore, the development of this subsector

⁸ BOI Sectoral Development Programme.

⁹ Foreign Trade Statistics (NSO), Central Bank

¹⁰ Philippine Exports to the World, January - November 1990/1989, Board of Investment, Manila.

¹¹ Employment and Manpower in the Philippines, A Sectoral Review Report, ILO, August 1990.

may contribute to creating employment opportunities, particularly for women who constitute approximately two thirds of the work force especially in sewing, finishing and packaging of leather products¹². In 1989, the leather goods and footwear sector employed over 60,000 employees. The sector created about 4,500 jobs over the five-year period 1981 - 1986. NMYC anticipates employment to increase in this sector to over 100,000 by the year 1995, based on an average annual growth of employment in that sector by 9.66% for the period 1980-1989.

27. Skill level and magnitude of the work force does not satisfy industries' needs. Traditionally, training is provided through on-the-job training even in cases where existing training institutions' capacities are under-utilized¹³. This is mainly due to the traditional approach of on-the-job training, normally at a level below market requirements (skills, management, quality control, etc.). Associations like the MFDC undertook a survey in 1990 of some 115 shoemaker firms in the Marikina area which resulted in a list of priority areas in which training is needed. To these belong closing (17.4%), lasting (14.8%), pattern cutting and sewing/upper making (13% each), cutting/clicking and finishing (8.7% each), etc. Similar results were obtained in a survey conducted by FLIC in 1989 covering some 50 footwear and leather goods manufacturers.

28. At the management level various studies¹⁴ indicated the need for in production planning, quality control, financial and strategic management, organizational development, management skills, etc.

C.2. Institutional context of the project

29. The project was implemented by NMYC which was moved from the Office of the President of the Republic of the Philippines to the Ministry of Labor and Employment (MOLE). The mandate of NMYC is manpower development in a broad perspective, from scientists and professionals to operative and skilled workers. NMYC takes active part in the areas of manpower planning, management coordination, delivery (of manpower development schemes) and licensing and certification. Other institutions involved in this area are the Department for Education, Culture and Sport (DECS), the Department of Science and Technology (DOST), private institutions, etc. Recent development policies call for a stronger participation of the private industry in this sector.

30. The organizational set-up of NMYC is grouped into the fields of manpower development policies and actual training. The latter group concentrates on providing general manpower skills development programmes which are handled by regional departments, i.e. the Regional Manpower Training Centers (RMTC), Provincial Manpower Development Centers (PMDC), and Community Training Units (CTUs). In addition, NMYC has a number of specialized subsectoral training centers (STC) in the fields of machine tools, maintenance, textiles, etc.

¹² DOI/DTI Long-term Sectoral Plan 1989-2000, Leather and Leather Goods, November 1988, prepared by SGV Management Services Division.

¹³ DTI/BOI, Long-term Sectoral Plan 1989-2000, op.cit.

¹⁴ BOI/DTI, Medium-Term Plan, opt.cit., and Revised Short-Term Plan, J. Cunanan and Company

FLIC and its satellite centers, such as the recently inaugurated center in Marikina, Biñan belong to this group of subsectoral training centers.

31. Since 1985 financial requirements of FLIC are provided by the Philippine Government with a budget of 1.2 million Pesos p.a. This budget has remained unchanged since then, despite an annual inflation rate of about 18% and a growing number of trainees. Income is generated through services to industries, such as material testing (in the FLIC laboratory), quality control, and training fees. Revenues from the production unit in 1990 (i.e. Pesos 25,895 - see paragraph 43) cover approximately 10% of FLIC's personnel cost only. Lack of foreign currency and limited financial support by the private sector represent a major constraint to FLIC's operations.

D. RESULTS AND FINDINGS

D.1. Institutional set-up

32. The organizational structure of FLIC has been streamlined into three departments: one for training, one for quality control and one for production as compared to that envisaged in the project document which consisted of five department, i.e. footwear, leather goods, product research and development, laboratory and maintenance and a documentation unit. In addition, the presently established departments are supported by marketing, information and publication and auxiliary services. Maintenance services are provided by a ~~company~~ NMYC maintenance specialized training center. The current organigram is presented in Figure 2.

33. The total staff amounts to 17 as compared to 35 in the original plan. The assignment of posts is as follows: training department 7; quality control department 2; production department 6; marketing and information/documentation 1; and auxiliary services 1. An expansion of staff cannot be expected due to budgetary constraints.

34. FLIC has experienced a 45% fluctuation of staff trained under the project (CFI diploma and certificate - see paragraph 35) due to non-competitiveness of salaries and incentives. To improve income possibilities for staff, a special scheme was developed by FLIC to compensate for extra-teaching after office hours, depending on demand and capacity utilization of the Center. At present, vacancies are filled by recruiting suitable graduates from CFI certificate courses conducted at FLIC. The "training of trainers" which is part of the more advanced diploma course would need to be continued in order to create a pool from which FLIC may recruit trained personnel.

D.2. Training and service activities of FLIC

35. Training courses are conducted at various levels, the most advanced being the certificate and diploma courses accredited by the Clothing and Footwear Institute (CFI) in London. The certificate course comprises six modules, i.e. design & pattern cutting, clicking and materials technology, closing technology, making technology, cost/quality/science and applied management, with theoretical and practical lessons. The course duration is one year. The diploma course is an advanced one-year-course building up on the certificate

examination and is composed of seven modules, i.e. design & pattern cutting, production management/organization, general management, clicking/materials technology, closing technology, making technology and a final project.

36. Training materials and syllabi for these courses were provided by CFI under the project's subcontract and are documented in a series of training manuals. These materials are based on CFI standards and were, in the scope of the subcontract, adapted to local needs. They are of high quality at an international level. The final report prepared by the subcontractor gives detailed descriptions of course conduct and content as well as examination proceedings. FLIC follows these guidelines when conducting its training courses. Contacts to CFI London continue beyond the project for certification of course graduates. The diploma course, however, has been discontinued after the second batch of graduates, apparently due to lack of demand and difficulties in financing the foreign currency portion of the examination (US\$ 200 per student).

37. So far, two courses at diploma and four courses at certificate level were conducted. Most of them were held in the scope of the project; only the last certificate course ended after project completion. 18 students passed the diploma examination and 42 out of 51 participants completed successfully the certificate course, including four foreign students from the Shanghai Leather Institute, People's Republic of China.

38. The internationally accredited CFI degree is, in principle, accepted at the national level, although it is not formally accredited. NMYC/FLIC intend to pursue the matter of formal accreditation at national level with the Department of Education, Culture and Science (DECS).

39. Basic skills courses include short-term specialized training in the fields of sewing operations, bottom making, components cutting, components preparation and assembling, etc. The, mostly unskilled, trainees (out of school youth) may attend one or more courses and can enter the productive sector already after acquiring skills in one of the courses. Techno-discussions are held in the main manufacturing areas, i.e. near to entrepreneurs who need not invest much time for travelling to the courses venue, and take place either at FLIC satellite centers or the facilities of local associations. The discussions are mostly short workshops and cover subjects like production planning, work measurements methods, product costing, quality control, etc. To some extent, follow-up sessions are held.

40. The following participation in FLIC training courses was recorded over the last 14 months, i.e. from January 1990 to March 1991:

Type of course	Total particip.	Maintenance/QC	Leather Goods	Footwear	female particip.
Basic Skills	375	20	110	245	159 (42.4%)
Upgrading	48	48			4 (8.3%)
Techno-Discussions	372	not specified but covering general and specialized topics			
CFI Certificate	23		23		8 (34.8%)
CFI Diploma	not conducted during the last 14 months				

41. The quality control department has, since its inception in 1983, performed more than 700 service agreements to carry out chemical and physical tests of leather qualities and features for industries. The cost for services are calculated according to cost accounting practices, including overheads, materials, etc. although excluding personnel cost. Prices are estimated to be approximately 30% below the cost of institutions offering comparable services. Nonetheless, the department is said to be one of the major income generating sections of the Center, however, exact aggregate figures on the section's income are not available to the evaluation mission. The department is also responsible for training in the areas of quality control, material testing, quality standard development and small skin tanning which are part of the regular training activities of FLIC. In the scope of its work the quality control staff provides also technical advice to manufacturers as well as undertakes some experiments on material coating and coloring. The project provided 18.4 m/m of expertise in testing and quality control, laboratory equipment and a six-month fellowship in leather tanning to one of the laboratory staff. Parts of the subcontract may have touched upon the subject as well.

42. In the area of product development, services are limited to pattern grading, design and pattern cutting. The Center rates its capabilities in this respect as only relatively satisfactory, mainly due to the departure of the trained designer. The present staff would require more exposure to industry. Common facilities comprise of machinery which is available at limited or no charges to manufacturers who lack specialized equipment. Extension services to industries are, according to information from the Center's staff, limited to training needs analysis and training. Two extension or satellite centers were established by FLIC in Marikina and Biñan, however, these seem to be tailored to providing training rather than technical extension services.

43. The production unit serves as show case of a professionally organized factory. It mainly operates for training purposes where students are exposed to actual working conditions and receive on-the-job-training. In addition, companies subcontract FLIC for specific orders. Through the latter, some revenue is generated, however, the number of contracts is still limited. The production unit is fully operational since the last quarter of 1990 and recorded a total production up to end 1990 of 96 pairs of shoes and 213 pieces

of leather goods which generated an income of Pesos 25.895. From January to mid March 1991, 299 pairs of shoes and 142 pieces of leather goods were produced resulting in an income of Pesos 16,853.50.

D.3. Target groups

44. Target groups reached by FLIC are manifold. Training and services are not concentrated on a particular group, although there appears to be a focus on larger and medium-size companies. Common facilities are utilized by less mechanized manufacturers who lack machinery available at FLIC. In-plant services are mostly extended to medium-scale companies, whereas laboratory tests are mainly undertaken for larger enterprises. Skills obtained in advanced training programmes are of interest only to such employers that have reached a minimum capacity. Basic training courses benefit mostly those participants who are later employed by better paying medium-scale enterprises. Participants in techno-discussions come mostly from medium-size enterprises.

45. Some participants in training courses are financed through scholarship programmes which are sponsored by larger footwear manufacturers. Four of the students in the certificate course ending in March 1991 were financed under such arrangement. These students are mostly related to and/or employed by the sponsoring firm, although FLIC also seems to have some untied funds for which scholarship promotion campaigns are undertaken. The number of sponsored students is, however, still limited.

46. Interaction with industries should have been fostered through an Advisory Board in which private industries, consumer groups and FLIC participate. Board meetings take place infrequently and members do not appear to be fully representative for all groups of the subsector. The dialogue between the parties concerned is limited and co-operation is not effective. NMYC/FLIC management recognizes the fact that co-operation needs improvement, however, is also aware of limitation inherent in the subsector (see paragraph 19)

D.4. Regional focus

47. During the implementation phase of the project FLIC has trained four foreign students (see paragraph 37). Standards and achievement of training were rated excellent by the supervisor of the trainees at their home institute. So far this was the only activity with regional outreach where FLIC provided training to foreign students. The Center's competitive edge in the region is its ability to conduct internationally accredited CFI diploma and certificate courses. This potential has not been sufficiently marketed up to now.

D.5. Interaction with other projects

48. A former FAO project addressed problems in the tanning sector which could have up-stream interrelation to the FLIC project. The mission did not find any evidence of formal co-operation between them. FLIC, on its own, claims to co-operate with the FAO project counterpart in the area of quality control and material testing. An EC-financed leather project appears to have similar objectives as the UNIDO project, although assistance was directed towards export-oriented manufacturers. Co-operation has been limited to occasional

joint training events, such as seminars, and the exchange of some expertise. ILO is implementing a project to develop apprenticeship programmes one of which may touch upon the leather processing industries. That project is still in the stage of identifying subsectors which will be covered.

49. Overall, the coordination of project planning, design, execution and co-operation is left, in the main, to donors and implementing agencies for projects with a budget below US\$ 1 million.

E. CONCLUSIONS

50. The immediate objective, i.e. strengthening of FLIC, has been attained as far as level and quality of training is concerned. This is, however, not the case with respect to FLIC staff in post. Also, the project's contribution to the attainment of the development objective cannot be measured since quantifiable terms are difficult to establish and verify.

51. The planned Advisory Board, which should form the link between the private sector and FLIC, is not yet operational. The lack of organization of the subsector, the absence of an industrial representation as well as the inoperationality of the Advisory Board impede communications between FLIC and the private sector. This situation not only limits the impact of FLIC, but also the potential financial support it could receive from private enterprises as well as feedback on training needs. The potential catalytic effect of FLIC on the organization of the subsector has not been realized.

52. The target group (end users) of the training programmes is not clearly defined and encompass the various levels of the subsector without any specification. This results in a wide range of activities which could be more effective if planned and implemented with a specific focus on end user needs. It appears that FLIC is spreading its capacities to cover a large number of clients instead of specializing its services for a defined target group. Only for one of FLIC's services, i.e. material testing and quality control, the main target group can be determined as larger companies. Medium-size companies are being made aware of FLIC's services and increasingly call on them.

53. FLIC continues to depend on government financing, presently secured by an appropriation act. Private sector support to finance the institution directly or indirectly needs further expansion. A revenue recovery programme has been formulated by NMYC/OMSD/FLIC for the next five year plan.

F. SUSTAINABILITY

54. The project contributed to attaining technical capacities which were sustained beyond the project's duration. However, much of the technical capabilities are not institutionalized yet and their sustainability within the frame of FLIC depends on whether qualified staff remains with the institution.

55. The financial sustainability of the institution is, at present, secured by the Government appropriation. FLIC's initiatives regarding income generating schemes are a positive indication, however, remunerations are not yet sufficient for self-sustaining the institution.

56. End users are increasingly aware of FLIC and its services. However, despite the need for manpower development, demand is not overwhelming. A marketing strategy, as planned by FLIC, is necessary to foster FLIC's interaction with end users. Some of the difficulties to overcome are, inter alia, the traditional approach to training, i.e. on the job, and the location of FLIC, i.e. far off the main manufacturing areas.

57. Government plans for the subsector indicate high expectations for the development of this industry, however, supportive policies concerning upstream sectors, starting with livestock and tanning industries, would need to be implemented to ensure the basis for prosperous development of the leather goods and footwear industries.

58. The long-term sustainability depends on future support by the Philippine Government (financial and personnel) as well as private industry. Over the past ten years of UNIDO assistance a relatively stable foundation has been laid. Set-backs were caused by financial constraints (low salaries) which lead to a high turn-over rate of FLIC staff. The performance of staff and administration is satisfactory and in individual cases outstanding. In view of the fact that direct international support is discontinued, the short and medium-term sustainability of the project will depend on the continued presence of the continuing dedications.

G. RECOMMENDATIONS

59. The Advisory Board should be made operational with an appropriate representation of all private entrepreneur groups of the subsector. The Board should be constituted of two members of Government (NMYC and MOLE), the Executive Director of OMSD, three representatives each of the footwear and leather goods industry. Local representatives of ILO and UNIDO should serve as observers and be responsible for the coordination with other technical co-operation projects.

60. FLIC should be considered for close cooperation with the ILO apprenticeship project if the leather goods and footwear sector will be included under that programme. Full use should be made of capacities available at FLIC by closely associating it with the ILO project.

61. FLIC should develop and implement a self-promotion strategy to enlarge its outreach and find ways and means for private sector participation in financing its operations.

62. The network of regional satellite centers should be further strengthened to enlarge the impact of FLIC and its network to reach target groups based in the individual industrial regions with training programmes and services. These satellite centers should be financially supported by the respective municipality and local industries and be supervised and managed by FLIC.

63. Target groups (end users) and their requirements need to be clearly defined to establish adequate programmes which meet their training needs. Participants should be carefully selected, possibly already for the basic skills development programmes, to ensure that graduates enter the productive sector.

64. CFI diploma courses should be continued. They are essential for the

training of trainers required at FLIC and its satellite centers. Furthermore, such courses will put FLIC in a better position to compete with other training institutions in the Asia region, and thus enable FLIC to build up its envisaged regional TCDC capacity.

65. The scholarship programme should be expanded and FLIC should increase negotiations with companies who potentially could contribute to the scheme. This would automatically ensure the placement of graduates in relevant industry positions.

66. Track records on and contacts should be kept to former trainees to record their engagement in relevant industries as well as to engage them as promotion agents for FLIC training and services.

67. Based on FLIC's capacities and capabilities, FLIC together with UNIDO should develop a special six weeks programme on needs and interests of potential participants from the region. UNIDO should consider such a course to be included in its group training programme, possibly for financing by a donor country.

68. FLIC should consider to register the CFI certificate and diploma courses in UNIDO's Guide to Training Opportunities thereby attaining world-wide publication of these courses.

69. Once operational, the Advisory Board should consider the promotion of means for assisting small and medium-size entrepreneurs in accessing financial resources, easily and at reasonable cost, possibly through the creation of a revolving fund.

PART II: US/GLO/87/125 CASTORBEAN MEAL DETOXIFICATION

A. INTRODUCTION

The purpose of the mission was to undertake an ex-post evaluation of the project US/GLO/87/125 Castorbean Meal Detoxification and Deallergenation Technology to assess the sustainability of the project's results¹⁵. The field visit of the mission to Bangkok took place from 17 - 23 March 1991. The team was composed as follows:

Mrs. B. Rau, Ministry for Economic Co-operation, Federal Republic of Germany, Team Leader

Dr. H. Boergel (Mrs.), Independent Consultant, Federal Republic of Germany

Prof. Dr. E. W. Lusas, Technical Expert, Director, Food Protein Research and Development Center, Prof. of Food Sciences and Technology, Texas A&M University, USA

Ms. C. Heider, Evaluation Officer, UNIDO

The mission consulted with the General Manager, the Marketing Manager, the Plant Director and other staff of Thai Castor Oil Industries Co. Ltd. and international resident staff of UNIDO, ESCAP, FAO and UNDP. Discussions were also held with staff of the Kasetsart University, representatives of private animal feed and livestock companies as well as a number of farmers. The Ambassador of the Federal Republic of Germany had been informed of the mission and a Mr. Albert Graf, Counsellor, was briefed by members of the group.

The mission is grateful for the assistance extended by the management and staff of the Thai Castor Oil Industries Co. Ltd. and to Mr. Roeland Kortas, UNIDO Programme Officer (JPO), UNDP/UNIDO Bangkok.

B. THE PROJECT

B.1. Project plan and document¹⁶

70. The project is a follow-up to the previous phase US/GLO/77/033. During that project, a new technology for detoxification and deallergenation of castor seed meal had been developed. Subsequently the project US/GLO/87/125 was designed to implement the industrial scale application of this technology. An appropriate counterpart was sought which led to an agreement with the Thai Castor Oil Industries (TCOI) Co. Ltd. in Bangkok, Thailand.

71. The project's development objective was the large scale commercial production of detoxified and deallergenated castor seed meal ready for use as a protein source in mixed animal feed, safe for handling by those sensitive CB-1A allergen. The immediate objective was the installation and demonstration of a fully operational castorbean meal detoxification and deallergenation unit, installed in the existing production line of TCOI.

¹⁵ The Terms of Reference for the mission are contained in Annex 1.

¹⁶ A detailed analysis of the project document is contained in Annex 4.

72. The first phase project addressed the problem that, so far, no technology existed to detoxify and deallergenate castor seed meal. Hence, the residue was difficult to dispose off as toxins and allergens limited possibilities to use the byproduct occurring in the process of castor oil production. The meal's potential value as animal feed ingredient was almost entirely lost as it could be used, to limited extent, as animal feed for cattle only. When used as fertilizer, the product would cause human health problems in form of allergies. The second phase addressed, in addition, the problem of industrial scale production of detoxified and deallergenated castor meal.

73. Both phases were financed through contributions of the Government of the Federal Republic Germany to the UN Industrial Development Fund (IDF) with a total contribution of US\$ 1,518,314. The first project started in 1978 and assistance continued without interruption with the second phase, commencing in 1987. The second project was operationally completed in October 1990.

B.2. Implementation

74. It was foreseen that the project would provide TCOI processing equipment as well as expertise through a subcontract to the Food Protein Research and Development Center, Texas A&M University System, who had developed the technology during the first phase project. The latter was to advise the Thai counterpart on requirements for setting up procedures to detoxify and deallergenate castor seed meal. One animal feed formulation specialist for three m/m was recruited as well.

75. The subcontract, as the main substantive component of the project, included the following:

- Finding a low-cost extruder, confirming its effectiveness by trial runs and recommending supporting equipment which finally was procured from Anderson International Corp.
- Advising TCOI and the equipment supplier on technical aspects of the process throughout the procurement, installation and start-up period.
- Determining the efficacy of construction-grade calcined calcium hydroxide (quicklime) as a lower-cost, locally available treatment chemical.
- Development of a subprocess for screening defatted castor meal that produces: (i) a high-protein fraction containing 41% protein and 27% crude fiber, and a high-fiber fraction containing 26% protein and 37% crude fiber using a 2.00 mm screen; and (ii) 45% protein-21% crude fiber and 20% protein-35% crude fiber fractions using a 1.18 mm screen.
- Training a quality control laboratory technician at Texas A&M University.
- Preparation of large quantities (20 g) of CB-1A allergen and 25 ml antibody serum.
- Preparation of 3 metric tons (t) of detoxified and deallergenated

castor seed meal products that were shipped to TCOI in Bangkok and Lohmann Tierernährung GMBH in West Germany for use in feeding tests.

- Four 5-day visits by the principal investigator to TCOI in Bangkok to advise and assist in establishing the processing line, review planned animal feeding tests, establish the Quality Control Laboratory and train local technicians.
- Continuous assistance throughout the life of the contract by telephone and facsimile communications.
- Dissemination of information by presentations at technical meetings and referral of the process to interested parties.

76. The equipment, as indicated above, was procured from Andersen International Corp., in consultation with the Texas Food Protein Research and Development Center and TCOI.

B.3. Conceptual approach

77. The Castorbean detoxification technology development and application programme was implemented in a two phases consisting of a research phase (US/GLO/77/033) and an large scale application phase (US/GLO/87/125), the latter being subject to this evaluation. The approach taken was reasonable in that it was based on the results of an independent research phase which may, if the research results were considered promising, be followed by an industrial application phase. Private industries tend to apply a similar approach to avoid large investments in areas which have not been fully investigated.

C. PROJECT CONTEXT

C.1. Socio-economic context of the project

78. The project is closely related to the agriculture sector as it is processing an agriculture produce (crop) and its end product is entering the agriculture sector as an ingredient for animal feed or fertilizer. This has lead the evaluation mission to focus on the Thai conditions in these areas and in order to be able to assess the realized and potential importance of the project to the economy.

The economy

79. Thailand's rate of economic growth is expected to slow down to about 7-9% per annum in 1991 after the economy's best showing in more than two decades in 1988 with a growth rate of more than 11%. The inflation rate has gone up from 3.8% to about 6%, while wage increases for unskilled workers have not kept pace with inflation. The Gulf crisis has placed additional pressure on the overall performance of the economy. Foreign investment in labor intensive and export oriented industries remain the main backbone of the country's economy. The diversification of products and the improvement of skills will be the most important development objectives in the medium term.

The agriculture sector

80. The agriculture sector is considered the main economic source in Thailand in terms of employment and income generation¹⁷. The sector's contribution to the Gross Domestic Product (GDP) ranks second with around 15% after manufacturing with approximately 25%. Trends between 1987 and 1989 indicate a decline of the agriculture sector's share in the total GDP¹⁸, whereas the manufacturing sector's share is increasing. The average growth rate of the agriculture sector during the Fifth National Plan was 5.7% which exceeded that plan's target of 2.9%¹⁹. The growth rate fell to about 2% in 1990 after having achieved 4.1% in 1989 and 9.5% in 1988.

81. The growth trend of the agricultural sector will depend, *inter alia*, on measures taken to encounter growing international competition as well as climatic conditions. The sector appears highly price flexible and farmers adjust plantation plans to price expectations. The government intends to start an improved scheme to assist farmers through an agricultural extension programme under which services in form of soil analysis, crop selection (diversification) and plantation plans and fertilizer recommendation will be provided. Thus, farmers will have increasing access to technical support for production of agricultural crops.

82. Out of the 51.4 million ha total land, 23.7 million hectares are farm land. Land used for agricultural production is 79% privately owned, the remaining 21% are rented from landowners. The average farm size of (private and rented) is 4.5 ha, however, 60% of the farms have more than 5 ha.

83. In 1989, the sector engaged some 63 per cent of the total employed work force. Geographically, the labor force is concentrated in the North-East of the country where the majority of farms exists. At the same time, that region is the country's poorest with the lowest farm income. The average farm income in 1987 was Baht 31,161 (US\$ 1,200), with the highest average income reaching Baht 54,000 (US\$ 2,075) in the Central Region.

Agriculture crops

84. Crops comprise the main share of total agricultural production with 70.5%, followed by livestock (14.5%), fisheries (9%) and forestry (6%). The growth rate of crop production was in 1989 4.8% only, falling behind the previous year's rate of 13.2% due to unfavorable climatic conditions. Sugar cane production is by far the largest with 37,230,000 t, followed by the two main cash crops cassava and rice amounting to 22,312,000 t and 21,400,000 t, respectively, in 1989²⁰. Soybean is the most prominent oil seed and produc-

¹⁷ Mr. W. Ratanawaraha, Technical Division, Cooperative Promotion Department, Ministry of Agriculture and Cooperatives, Bangkok, Thailand, February 1991.

¹⁸ Annual Economic Report 1989, Bank of Thailand

¹⁹ W. Ratanawaraha, *opt.cit.*

²⁰ Cane and Sugar Office, Office of Agricultural Economics, Tapioca and Kenaf Production Survey Group.

tion grew by 16.1% from 510,000 t in 1988 to 592,000 t in 1989. Castor seed production in Thailand is rather limited and the crop does not appear in aggregate statistics.

85. Thailand, as the world's largest producer of cassava, mostly produces this crop for export. Domestic consumption is rather low, although tapioca use in animal feeds increased to 700,000 t in 1988.

86. Annual yields of castor seed have been declining over the past ten years from around 35,000 t (beginning 1980's) to 27,500 t in 1989. As a secondary crop it is mostly inter-cropped with other species, such as e.g. rubber which, however, did not yield promising results as diseases attracted by castor affect growth and output of rubber. In terms of cultivation area, castor seed competes with cassava which, to some extent, has replaced castor cultivation mostly due to price competitiveness. The current market price (March 1991) for local castor seed is Baht 7.50 per kg in comparison to Baht 6.00 per kg imported castor seed from China.

Livestock industries

87. Livestock industries, as the second largest component of the agriculture sector, recorded increasing growth rates in 1988 and 1989 with 4% and 4.7%, respectively. The expansion of this subsector resulted mainly from an increase in broiler chicken production in response to rising demand for export and domestic consumption. Swine output grew at a lower rate as price drops over the past years inflicted losses on the farmers, hence discouraged increased production²¹. The subsector's expansion took place despite increasing prices for animal feed.

Animal feeds, fertilizers and pesticides

88. Thailand is a net-importer of protein for animal feed with a local demand of 6 million tons p.a. Large feed producers must import feed protein sources because of inadequate local supply, but transportation costs are high, e.g. approximately US \$45/t freight for soybean meal produced in the United States. In addition, soybean crop and meal is protected by high tariffs to promote an increase of domestic production. Fish meal and 44% protein content soybean meal are the primary feed protein sources. The local major energy feed sources are maize, cassava (tapioca) and broken rice. Prices for animal feed increased by 4.5% in 1989 after a sharp rise during previous years following the increase of prices for feed ingredients.

89. The application of mineral fertilizers is the lowest in Asian region. None are produced locally and local industries are mostly based on mixing imported ingredients. Plans originating from the early 1980's to establish an urea plant have not materialized since, therefore, fertilizer suppliers remain highly import dependent. Pesticides are used in indiscriminate manner which necessitates pesticide content control testing before using crops or residues in feedstuffs.

²¹ Annual Economic Report 1989, opt.cit.

Castor seed

90. The seed of the castor plant, Ricinus communis L (EUPHORBIACEAE) contains approximately 50% oil. It occurs in triglyceride form, with ricinoleic acid (12-hydroxy-9-octadecenoic acid) accounting for about 90% of the fatty acids. The major uses of the oil and ricinoleic acid are in industrial applications, including plastics, specialty soaps and lubricants.

91. As with most oilseeds, the extraction process yields more meal than oil, the by-product being castor meal. Commercial castor meal contains approximately 32-38% protein on an as-fed basis, potentially qualifying it as a feed protein source especially in protein-deficient nations which import expensive feedstuffs. It also contains a high level of fiber (30-35%) and can be used, in limited quantities, for animal feed. Approximately 91% of dry castor meal is organic, and its major current use is as a fertilizer with an NPK (nitrogen-phosphorous-potassium as N-P₂O₅-K₂O) content of 6-2-1 percents, respectively.

92. Castor meal contains two toxic components (ricin and ricinine - glyco- and aglycoproteins, respectively) and the highly potent allergen CB-1A which limit the by-product's value as animal feed component and fertilizer. Untreated meal can be used as an ingredient for animal feed for ruminants (cattle) only, however not for poultry or swine as its toxicity may cause high mortality rates in the animals fed. Even in application as fertilizer, persons handling the meal often develop allergies.

93. The human health problems: respiratory discomforts, allergies, asthma, and skin rashes and lesions which workers develop when handling castorbean meal has become legendary. Many industrial nations consider this a noxious crop and have willingly exported its growing and processing to lesser-developed nations. However, with improving health, occupational safety and environmental standards, developing nations no longer are willing to accept these problems either.

C.2. Institutional context of the project

Counterpart Institution - Thai Castor Oil Industries Co. Ltd.

94. TCOI was registered as a private company in 1977, following an agreement for a joint-venture between Deutsche Rizinus-Oelfabrik Boley and Co., which operates a major castor oil extraction plant in Europe and Thai Agro Export Co., a leading Thai castor seed exporter. Shareholders in the company are the Industrial Finance Corporation of Thailand (15.4%), Deutsche Entwicklungsgesellschaft (DEG) (5%), Deutsche Rizinus-Oelfabrik Boley and Co. (28%), Thai Agro Export Co. (16.25%), Kangwan Tantipongnat (17.58%) and others (17.77%). The company had initially a registered capital of Baht 30 million, which increased by 1988 to Baht 55 million. The annual turn-over in 1989/90 was over 400 million Baht.

95. The castor seed extraction plant is located at Praphadaeng, Sumatpratkarn Province, a community on the west bank of the Chao Phraya River approximately 15 km north of Bangkok. The plant was constructed in 1979, and is a hydraulic cage press-solvent extraction operation utilizing primarily German-made equipment. The equipment is typical of many oilseed extraction-

oil refinery plants and is generally state-of-the-art. Within the last 12 years, major design improvements have been made in desolventizer-toaster-dryer-coolers (DTDC)s to reduce energy costs. The current DTDC is in good condition and does not detract from product quality. Plant loss of hexane is less than 2 kg/t of seed processed, and the equipment and property are well-kept - all indicative of good management practices.

96. The plant has a capacity of 45,000 t/yr castor seed which is an increase of about 30% over the initially installed crushing capacity of 30,000 t/yr. The maximum processed to date is 38,000 t/yr. Approximately 30,000 t/yr (130 t/day) of castor seed is processed currently, of which 10,000 t is procured in Thailand and 20,000 t imported from the Peoples' Republic of China. Process yield is approximately 43-47% castor oil and 48-51% castor meal, with 16,500 t meal produced annually. Most of the oil production is exported to Japan, USA, Europe, Australia and Asian countries. A Thai-Japanese affiliate company started producing down-stream castor oil derivatives at the end of 1985. The main products are artificial waxes.

97. The company has a total of 124 employees and operates the mill in three shifts with 14 workers per shift, crushing 130 tons seed per day. A total of seven employees is engaged in the testing laboratory (quality control) working eight hours per day.

98. The castor seed processing sequence is typical of many oilseeds, except that the seed is not dehulled. The castor plant produces three seeds per pod which are removed by dehusking before sending to the oil mill. The seeds are received in burlap bags; dumped into a hopper-elevator; cleaned to remove trash, stones, sand and tramp metal; steamed to achieve an inner seed temperature of 80°C. to deactivate the lipase enzymes; and hydraulically pressed. The presscake (containing approximately 13% oil) is then granulated, extracted with hexane in a carousel-type extractor, drained, desolventized, heated ("toasted") at a temperature of 120°C for 1½ hr to destroy the ricin and ricinine, and cooled. The non-deallergenated castor seed meal (NDCSM) is then ground, and bagged by a subcontractor or sent to the deallergenation line.

99. The oil mill produces "pressed oil," which can be refined into premium grades of castor oil (Pharmaceutical Grade, Extra Pale Grade and Pale Pressed Grade). The "extraction oil" can be refined into less expensive grades (Commercial Grade, and Un-bleached Un-neutralized Extraction Oil. The bulk of world trade is called "No. 1 Grade", and is made by mixing about 8 parts of "pressed oil" with one part of "extraction oil". "Pressed" and "Extraction" oils are kept separate until shipment to maintain maximum flexibility in meeting grade specifications ordered. TCOI staff believe that oil pressed from mashed seed, as by a screw-press, is inferior in quality. The oils are refined (free fatty acids converted into soaps by reacting with potassium hydroxide solution), gravity settled, decanted, filtered, bleached with activated earth, and dried/deodorized.

Support institution - Kasetsart University Bangkok

100. TCOI has a long-lasting co-operation relation with the Kasetsart University, Bangkok, which undertakes research in the field of, inter alia, crop development, animal feed testing and formulation etc. The university has undertaken animal feed tests in connection with the project. A tour of

the nutrition research facilities by one mission member showed that the animals were clean and well-kept, probably indicating that diseases are well under control as required for meaningful nutrition studies. The faculty was well informed in nutritional sciences and research design, and quite capable of conducting research needed for this project.

D. PROJECT RESULTS AND OBSERVATIONS

D.1. Technical operations of the detoxification line

101. The extracted castor seed meal is held in a metal silo upon receipt from the extraction plant, and processed as shown in Figures 2 and 3 provided by TCOI. The plant is equipped with an extruder (8 inch diameter grain expander) and other major components which are all imported, except for bins which were purchased locally. The original 3-level plant design, partially relying on gravity flow, was amended to a 1-level design due to the fact that an existing building had to be used which does not allow for a three-level operation.²²

102. Various materials handling problems (ineffectiveness of vertical screws and clogging of conveyors) problems were experienced initially. TCOI has corrected these problems with the approval of the equipment supplier, and seems satisfied with the current operation of the line.

103. During the grinding process, the meal is ground to pass a 3.35 mm mesh screen. It is then weighed in a weigh hopper, and transferred to a twin-ribbon blender in 800 kg quantities. Then, 10 kg (1.35%) of quicklime is added, plus 54 kg (6.6%) water to raise the moisture content of the mixture to about 14%. The hot mixture is mixed in the ribbon blender for 120 seconds, transferred to the second ribbon blender for an additional 350 seconds mixing, and then conveyed to a live-bottom surge bin from which it is conveyed to the extruder. In the extruder, the moisture level is raised to about 20%, and the mixture is heated to a pre-discharge temperature of 130°C. It exits through a flat-faced die with 1 cm (7/16 in) diameter round holes with some puffing, and is cut into collets approximately 1.5-2.0 cm long. These then are dried to 6-8% moisture content, ground through a hammer mill and bagged in 50 kg polypropylene bags. Each bag is coded by month. Approximately 14-20 batches can be processed in an 8 hrs shift.

104. The current process differs from the flow sheet in that the meal is no longer separated into high protein and high fiber fractions as originally installed, and the screener has been removed from the line. TCOI anticipates difficulties in selling the high fiber-reduced protein fraction, and has decided to deallergenate unseparated meal only.

105. The detoxification and deallergenation line is equipped with a PC-type computer-operated weighing-mixing-transfer control system which automatically runs the line from the weigh scale through the surge bin. Plant management found that this piece of equipment is not entirely necessary as it felt plant operators could weigh the ingredients manually. Only limited provisions exist for manual override in case of computer failure which would cause a halt in production until a computer service man would come from Bangkok. Power

²² The factory is located in a living area. The local construction code does not permit an expansion of the company's present facilities.

failures are, according to the plant management, not experienced frequently, and if so, for short duration only. At the scene, it was agreed that cost-effectiveness of the computer-control system may, in general, be questionable for a developing country when capital for processing equipment is scarce and infrastructure requirements may not be in place or entirely reliable.

106. The capacity of the system is estimated at 2.5-3 t/hr. To date, the plant has deallergenated 700 t of castor seed meal, with an estimated capacity of 5.6 t/day (1 shift). Two operators are required to run the plant. Bagging of the end product is done by plant personnel. TCOI does not consider the plant to have been truly operational until mid-January 1991. It is too early to determine the actual up-charge per ton of meal processed, but the variable costs (labor, energy, quicklime and maintenance) are estimated at the lower end of the US \$10-15/t range in the initial plan which was prepared before the project commenced.

107. An operations manual for the process does not exist and obviously has been omitted in the project and its contracts.

D.2. Animal feed tests

108. Animal feed tests in the scope of the project were undertaken by the Kasetsart University Bangkok. For this purpose, twenty-four piglets were fed iso-nitrogenous, iso-caloric (constant protein, constant energy) starter diets at 4-10 weeks, followed by growing-finishing diets until reaching approximately 90 kg. These two diets were formulated at 18.1% protein and 2,989 Kcal/kg and 15.2% protein and 2916 Kcal/kg, respectively. Deallergenated castor seed meal (DCSM) prepared at Texas A&M University was used in these trials which included a control group, and groups being fed with feedstuff containing 4% or 8% NDCSM, and 4% or 8% DCSM, respectively. Pigs fed DCSM did as well or better in average daily growth (ADG), feed conversion ratios (FCRs) and final weights compared to pigs fed the control ration. However, starter pigs fed NDCSM adjusted more slowly to the ration (evidenced by lower ADG, higher FCR and lower final weight) compared to pigs on control or DCSM diets. These responses to NDCSM improved as pigs became older, but the pigs never caught up in final weight with those on control or DCSM diets. Generally, carcass qualities were similar for pigs from all diets, but weights of livers were higher for pigs receiving higher levels of either DCSM or NDCSM²³.

109. The essential amino acid compositions of TCOI-produced DCSM, as such and compared to commercial 44% protein soybean meal, are shown in Table 1 and essentially agree with earlier deallergenation results at Texas A&M University.

110. In a second test series, diets containing 0, 4, 8 or 12% TCOI-produced DCSM were fed to groups of 10 pigs each during starting and growing-finishing stages. The results are summarized in Table 2. No statistically significant differences in FCR were observed during the starting stage between the control (0% DCSM) and up to 12% DCSM, or during the growing finishing stage up to 8%

²³ "Report: The Use of Detoxified and Deallergenated Castor Meal as Pig and Poultry Feeds. The Use of Various Levels of Detoxified and Deallergenated Castor Meal as Protein Supplement in Growing-Pig Diets," Department of Animal Science, Faculty of Agriculture, Kasetsart University, Bangkok, Thailand submitted to United Nations Industrial Development Organization, 1989.

DCSM. It appears that the practical upper limit for feeding DCSM to pigs is in the 8-12% range. At the higher (16%) level, finishing weights decreased and feed conversion ratios increased appreciably, possibly due in part to the increased fiber content of the diet arising from the DCSM. Again, carcass qualities were comparable at all levels of DCSM, although average liver weight increased with the level of DCSM fed.

111. Table 3 shows growth performance and mortality rates of 120 broilers fed control (0%), 4 or 8% levels of NDCSM or DCSM. Mortality rates for chicks at age 0-3 weeks were 71.7 and 78.3% for 4 or 8 % NDCSM, respectively, documenting unacceptability of NDCSM as a broiler ration component. Mortality rates of chicks fed 4 or 8% DCSM were not significantly different from the control at all stages up to sale at 7 weeks. DCSM, even at levels up to 8% of the diet, gave weight gains and feed conversion ratios that, although numerically higher, were not significantly different from those of the control ration. Carcass qualities of birds fed DCSM were not significantly different from those fed 4 or 8% DCSM. Again, livers were somewhat larger in birds fed DCSM although not significantly different from those fed the control diet. Livers and gizzards of surviving birds fed NDCSM were significantly larger than those fed the control ration.

112. Growth performance of Sherrie ducks raised on diets containing 0, 4, 8 or 12% DCSM is shown in Table 4. Finished body weights were essentially the same at all levels of feed, and feed conversion ratios were somewhat higher (although not statistically significant) for ducks receiving DCSM. Carcass qualities were essentially similar for all diets, although livers, gizzards and hearts were somewhat larger for some ducks fed DCSM compared to control diet.

D.3. Quality of the end product

113. The quality control laboratory is adequately equipped and well-kept. The technician working in connection with the detoxification and deallergenation process, has a master's degree and essentially works as a serologist. In addition to performing immunodiffusion tests, she also makes her supply of antibody serum using rabbits. The current test for identifying the allergen content in the treated meal requires four hours, which according to the plant management is too long to be efficient. Tests to control the toxic content of the meal are not undertaken regularly.

114. The quality of the product is maintained by monitoring residual CB-1A, determined by immunodiffusion tests run in duplicate, and by pH, moisture and ash analyses. Each day on starting the equipment, every 5th bag of meal produced is analyzed for the first 20 bags, then every 10th bag for next 20, and then once every 30 minutes from the bagging bin. The pH (typically 9.2-9.5) is an indicator of whether sufficient lime was added in the mixer in case of high CB-1A content in the processed meal. The plant seeks to reduce CB-1A content to below 200 ppm (with a maximum upper limit of 250 ppm), and was producing meals with CB-1A residuals of 40-150 ppm on the day visited.

115. In summary, NDCSM is not acceptable as a feedstuff for broilers because of the high mortality rate of birds in addition to potential allergy problems for handlers. DCSM appears acceptable in feeds at levels up to 8-12% for starting and growing-finishing pigs, 8% for broilers, and up to 8% for Sherrie ducks under the animal care practices of the experiments.

116. Although carcass quality is not affected, liver weight appears to increase with increased usage of DCSM. The main function of the liver is to purify the bloodstream of metabolic waste products and toxic materials, and enlarged livers generally are indicative of elevated functional stress.

D.4. Marketing of the end product

117. Castor meal has a world-wide reputation of containing toxic and allergic components which makes it difficult to market any castor meal based product. To overcome this negative reputation, TCOI started a pilot sales campaign for the domestic market under which 300 of the total output of 700t DCSM were sold to about 45 pilot farmers through the existing network of distributors for animal feeds and fertilizer. In order to obtain co-operation, TCOI has assumed the risks of animal losses that might occur during the test period. The selected farmers are testing the deallergenated meal in swine and duck raising. The product's acceptance by the test users is expected to have a positive marketing effect as it is hoped that positive experience will be communicated within farmer communities. A medium and long-term marketing strategy for the domestic market will be developed after this testing phase. Once demand for the product increases, the production might be scaled up as well.

118. On the export market, some 100 t DCSM has been sold to customers in Taiwan and Japan as organic fertilizer. TCOI intends to enter the foreign market first by a successful promotion of DCSM as fertilizer which should convince customers that toxic and allergic elements have successfully been eliminated. Thereafter, it is expected that the product may become acceptable as animal feed ingredient as well.

D.5. Feeding results of test farmers

119. A swine farmer visited by the evaluation team uses 44% protein soybean meal, 57% protein fish meal and DCSM (about 35% protein) as protein sources, and primarily maize and rice bran as energy sources. Vitamin, mineral and medication premixes also are added. The practice is to feed 18% protein starter ration, 16% protein growing ration, and 14% finishing ration, with caloric densities of 3,200 - 3,000/kg feed. A typical growing-finishing FCR is 2.9 kg dry feed/kg of body gain. The producer started by adding 12% DCSM to the already formulated feed, but cut back to using it at 12% in the formula in place of soybean meal because the additional protein made the pigs grow too rapidly. The first lot of pigs has not yet been fully raised on the newly-available DCSM, but no changes in animal mortality or FCR have been noticed thus far.

120. A duck raiser with two shaded pens of 2,500 ducks each was visited as well. Sherrie ducks are received when newly-hatched, raised, and marketed at 53-55 days at approximately 3 kg weight. The ducklings must be feed on formulated feed purchased from the duckling supplier for the first 7 days. Afterwards, the birds are fed hand mixed feeds, using soybean meal, fish meal and DCSM as protein sources, and primarily broken rice and rice bran as the energy sources. Vitamin, mineral and antibiotic premixes also are incorporated in the feed. DCSM is included at 8%. Two crops of ducks have been raised on DCSM with good results, and the grower feels the ducks are less fat and more lean.

D.6. Dissemination of technology

121. A presentation of the detoxification and deallergenation technology was made by the responsible UNIDO staff member at a meeting of the International Castor Oil Association which, subsequently, issued a publication on the subject matter. The research programme was also mentioned in the Food Protein Research and Development Center's annual report. The programme should, therefore, be known to the research community.

122. The industrial application of the technology, i.e. the demonstration plant established at TCOI, has been seen by a few visitors only, partially due to the fact that the plant started operating in January 1991 only. Some limitations arise from the agreement signed between TCOI and UNIDO whereby visitors should be cleared and announced by UNIDO. Therefore, visitors without this clearance have not been permitted to the plant.

123. The technology and industrial installation are not protected by patent as the donor wished that the technology should be accessible to developing countries without any limitations. This fact bears, however, the risk that technology and demonstration plant may be replicated and/or be patented by a third party.

E. CONCLUSIONS

124. The project is well integrated into the company's set up and looked after by trained staff and experienced management. The delay of what timeframe of production (it only started about two months ago versus an anticipated project completion by the end of 1989) was caused by technical problems with the production line. Also, demand is too low to make line operations a priority activity of plant management.

125. In view of the domestic supply situation of animal feeds and fertilizers (see paragraphs 88 and 89), prospects for DCSM appear good, provided negative reputation associated with the product can be overcome.

126. In deciding whether to install similar capacities elsewhere, the techno-economic feasibility needs to be critically analyzed to establish the technical viability and economic soundness of the project. Aspects such as raw material supply, protein demand in the country, marketing potentials, alternative use of castor meal would need to be considered in any decision making process.

F. SUSTAINABILITY OF THE DETOXIFICATION LINE

Technical sustainability

127. The technical and mechanical objectives of this project appear to have been adequately met. Sustainability of the project results now depend on effective marketing of detoxified-deallergenated castor seed meal and on its profitability.

Economic feasibility - product marketing

128. From the technical-engineering view point, reductions in unit processing costs will occur as volume increases. Also, considerable safety margins have been established which restrict throughput and add to unit production costs. With time and experience, some reductions in processing cost per unit can be made without endangering product quality.

129. The major challenge is in successful market introduction and distribution of the detoxified-deallergenated castor seed meal. The current strategy of developing both domestic and export feed markets, with user-friendly fertilizer markets as backup, and marketing to users instead of in bulk to feed mixers and fertilizer distributors to increase overall return, seem well-conceived. Further, TCOI's marketing campaign (see paragraph 117) is building credibility among local farmers and, in addition, the company is working with the local university and extension specialists, who already have a degree of respect and following of farmers through their intensive practical short course programmes.

Oil mill operations

130. The plant is located in a heavily populated surrounding which restrict possibilities for physical expansion and construction options. Environmental complaints filed by the neighborhood may eventually force relocation of the plant. This aspect, however, is of little relevance to the project since equipment and process is transferrable.

131. The company is well aware that castor seed can be grown at lower cost in some other countries, and currently imports significant quantities from the Peoples' Republic of China. It is considering establishing a castor oil processing partnership in the PRC if and when warranted by stable economic and political conditions.

132. The long-term sustainability depends on the product's market acceptance. The capability to develop a market is ensured by the company's long experience in marketing other products.

G. RECOMMENDATIONS

133. A Processing, Ingredients Specifications and Quality Control Manual should be developed. Packages of information which allow a new technology to be transferred are the real "product" of all research and development programs. A manual that describes, in concise and simple terms: 1) process objectives; 2) sequential operations in flow sheet form with time, temperature and particle size values; 3) equipment specifications; 4) ingredient specifications; 5) critical packaging requirements if any; and 6) quality control procedures including sampling techniques, analyses, and record keeping practices, is needed to assist technology transfer to other enterprises. Since the product is a feed ingredient which has an impact on the food chain, the manual should be based on modern HACCP (Hazard Analysis Critical Control Point) principles. For projects of this kind, a Manual should be developed at the start of the project, with a revised Final Version issued after start up and before the project is operationally complete.

134. Since provisions were not made for development of a Processing, Ingredients Specifications and Quality Control Manual in the original contracts, UNIDO might negotiate with the project participants to prepare a manual on a consultant basis.

135. Even though the current process utilizes only three ingredients: extracted castor seed meal, construction quicklime and water, descriptions and specifications such as particle size of the meal and quicklime, and limitations on toxic heavy metals (lead, mercury, arsenic, cadmium and selenium) should be stated.

136. Additional chemical analyses, and metabolizable energy determinations for each intended animal species, should be conducted to prepare an NRC (U.S. National Research Council)-type specification of the product made at TCOI. This is the accepted world practice for defining feed ingredients, and is needed for formulation of feeds on a computerized linear program least-cost basis. The staff at Kasetsart University is well-qualified to conduct the metabolic studies and to oversee the project. The chemical analyses probably will be less costly if performed in modern commercial analytical laboratories.

137. The enlargement of livers of animals fed deallergenated castor seed meal should be explored further: (i) to confirm whether safety of the resulting livers in the human food supply is ensured; and (ii) to seek an explanation of the apparent stress on functioning of the liver, and potential feed additives or process changes to reduce that stress.

138. Provisions should be made in similar future contracts for a return on-site visit by an evaluation team approximately 1-2 years after the project is operationally completed to determine techno-economic sustainability of the process introduced and effectiveness in marketing the product.

139. UNIDO should develop and enforce a mechanism to ensure that newly developed and transferred technologies are conveyed to a maximum number of beneficiaries for whom that technology is relevant. One step may be the incorporation of the technology into INTIB and the UNIDO Newsletter. The project may also render itself to UNIDO's investment promotion programme.

140. It should be considered for future projects to finance projects aiming at transfer of technologies to financially sound companies partly through soft loans, partly through grants (case-by-case decision). Modalities for such an approach would need to be developed by the donor and UNIDO.

PART III: LESSONS LEARNED

A. EVALUATION APPROACH

141. Adequate timing of ex-post evaluations is crucial. It is almost impossible to assess the project's sustainability if the ex-post evaluation is conducted in too short a period after operational completion of the project, i.e. after the last project-financed activity has been completed. A minimum of 12 months should have passed since external assistance ceased before an ex-post evaluation is undertaken. This requirement should be adhered to strictly. Other types of evaluations may be called for at any other time.

142. The duration of five working days at the project site is inadequate for a series of thorough interviews and investigations with a wide range of actual and potential end users and for the collection of data on the project's context. The duration of the mission should be determined depending on the project and evaluation requirements.

143. The evaluation should be preceded by a thorough desk review and the team should, on that basis, have consultations prior to the field visit to agree on the evaluation approach, issues which need to be addressed, the division of work and the content outline of the report.

144. When undertaking cluster evaluations, a reasonably grouped sample of projects should ideally be selected. The mission is aware that this might not always be possible. This will enable the mission to abstract from its findings at project level and make suggestions at policy or programme level.

B. SUSTAINABILITY

145. The evaluation team would like to reiterate the importance of good project planning (design) for the attainment of sustained/sustainable results. To adequately cover sustainability concerns in project planning and design, thorough analysis of external factors, target groups (end users) and forecasts of medium-term trends demand and supply are required. This may dictate a longer pre-project phase which should result in projects more relevant to pressing development needs. Also, projects will be more responsive to recipient country's needs (relevance). Nonetheless, sustainability cannot be entirely predicted as unforeseen effects often occur during project implementation. This underscores the need for the careful monitoring of external factors during the project's lifetime.

146. Sustainability depends heavily on end users' needs for products and/or services provided directly or indirectly through the project. A careful market analysis should be carried out during the pre-project phase. Developing a marketing strategy should be made part of the assistance "package" to ensure that target groups are effectively reached.

147. Sustainability and impact assessment should take larger room in the evaluation and subsequently the report.

C. PRIVATE SECTOR CO-OPERATION

148. Traditionally multilateral technical assistance projects are implemented through Governments and in co-operation with the public sector organizations. Modalities and procedures have been developed over time which are suitable for projects of this kind. Co-operation with the private sector, i.e. projects in which the direct beneficiary is a private enterprise, requires a number of clarifications and modifications of existing policies and procedures.

149. While a number of issues mentioned hereunder did not occur in connection with the evaluated projects, policy discussion and decisions seem to be needed on the following points:

- Which should be the criteria for selecting an enterprise to be assisted? Should assistance be directed towards the needy who, however, may not have the capacity to support a project, i.e. meet pre-requisites and provide counterpart contributions? Or should assistance be provided to those who have already acquired some experience, can support a project, though may need assistance to lesser extent?
- What are modalities for assistance? Government rules and regulations for proposing projects, administering project activities and eventually transferring title of equipment after project completion, have to be discussed and agreed by recipient governments and UNIDO to ensure smooth implementation of projects. Presently, established rules may not be applicable to projects with the private sector, hence may require adjustments.
- In case the recipient (commercial) enterprise is enabled to increase its profits through the assistance of the project, should part of the project cost be recuperated? If so, should this amount be paid into a revolving fund which could be utilized for other projects? The modalities of such a revolving fund would need to be established by UNIDO.

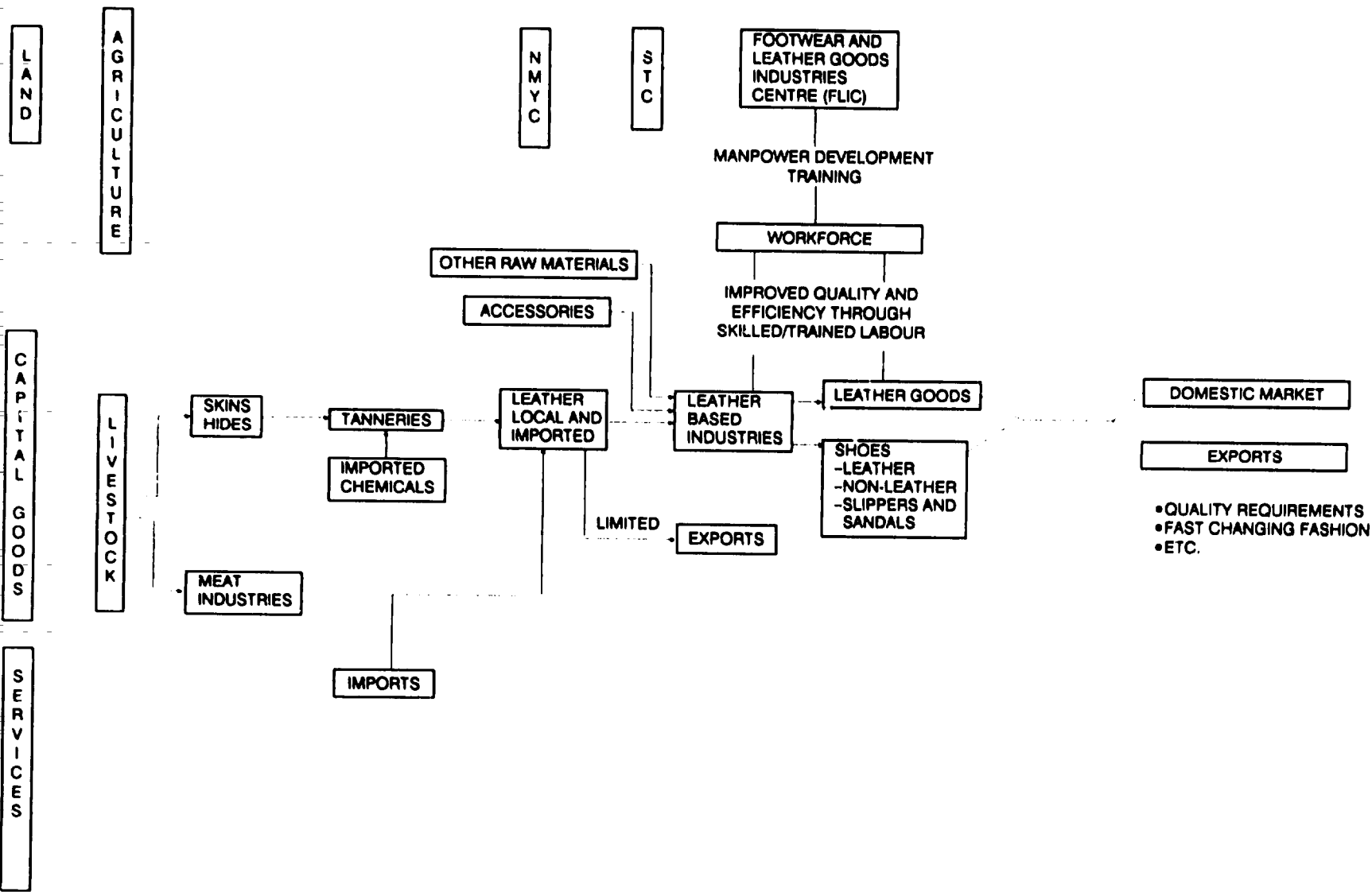
D. DEVELOPMENT AND TRANSFER OF TECHNOLOGY

150. To play an active role in the development and transfer of technology UNIDO may have to consider following policy issues:

- Define selection criteria for priorities within the areas defined by the General conference in which new technologies should be developed for identifying most promising and needed areas).
- Definition of an approach to cover, *inter alia*, the following stages: (i) selection of research area, (ii) technology development (iii) up-scaling and application on pilot and industrial scale, (iv) preparation of operating manuals and other documents, (v) analysis of end product characteristics and uses, (vi) marketing of end product, etc.
- Following the good example of the projects evaluated, financing of each of the afore-mentioned stages should be phased, i.e. not all phases should be contained in one project document to ensure that in case e.g. the R&D phase indicates the envisaged process is not

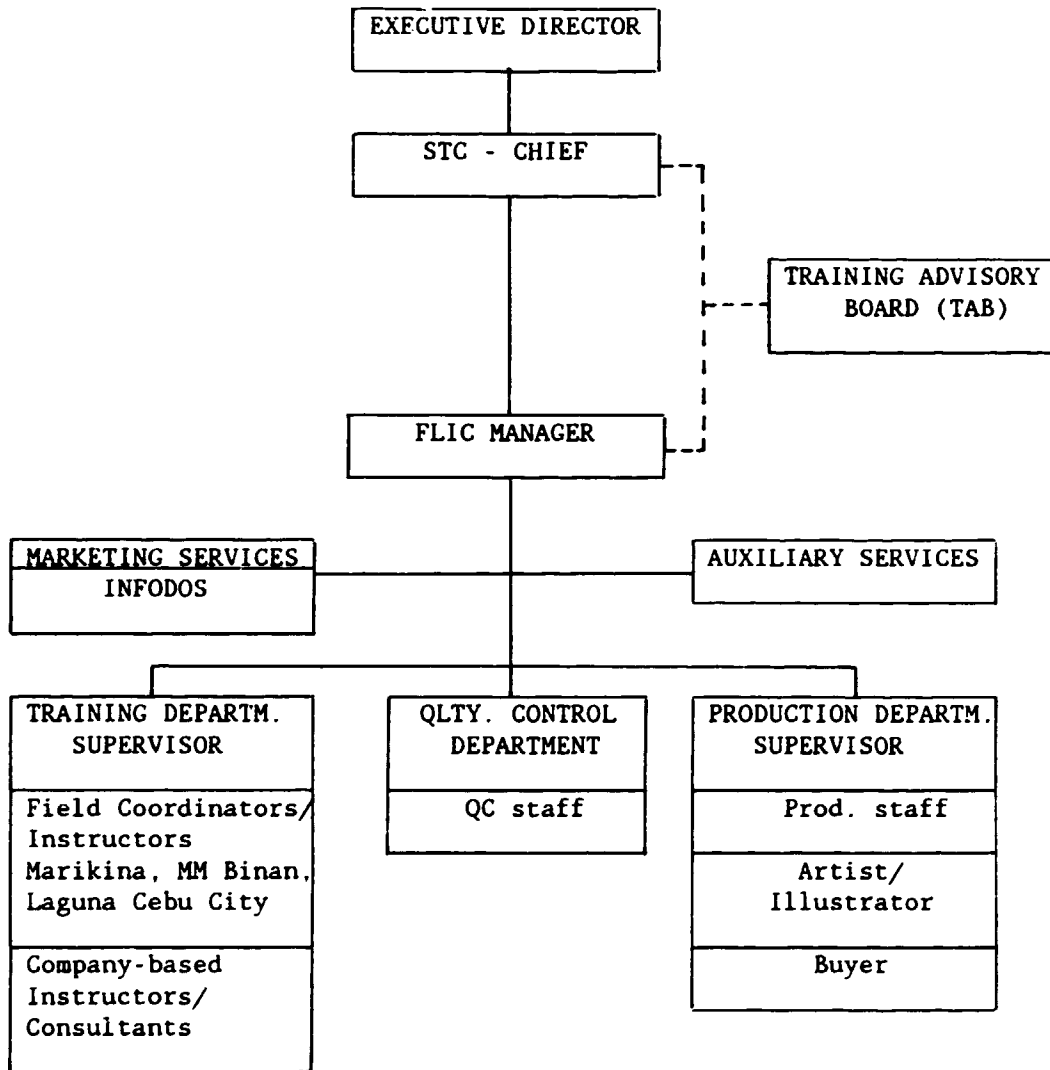
viable, subsequent phases are not further pursued. A principle agreement to continue financing a defined programme should be sought.

- Consideration of possibilities to patent new technologies by UNIDO to protect them from being patented by someone else and thereby restricting access to this new technologies. Regulations ruling the distribution of technologies could, e.g. foresee that LDCs receive technology free of charge, whereas advanced countries have to render fees. The latter could be utilized in a technology development fund to keep the programme going.

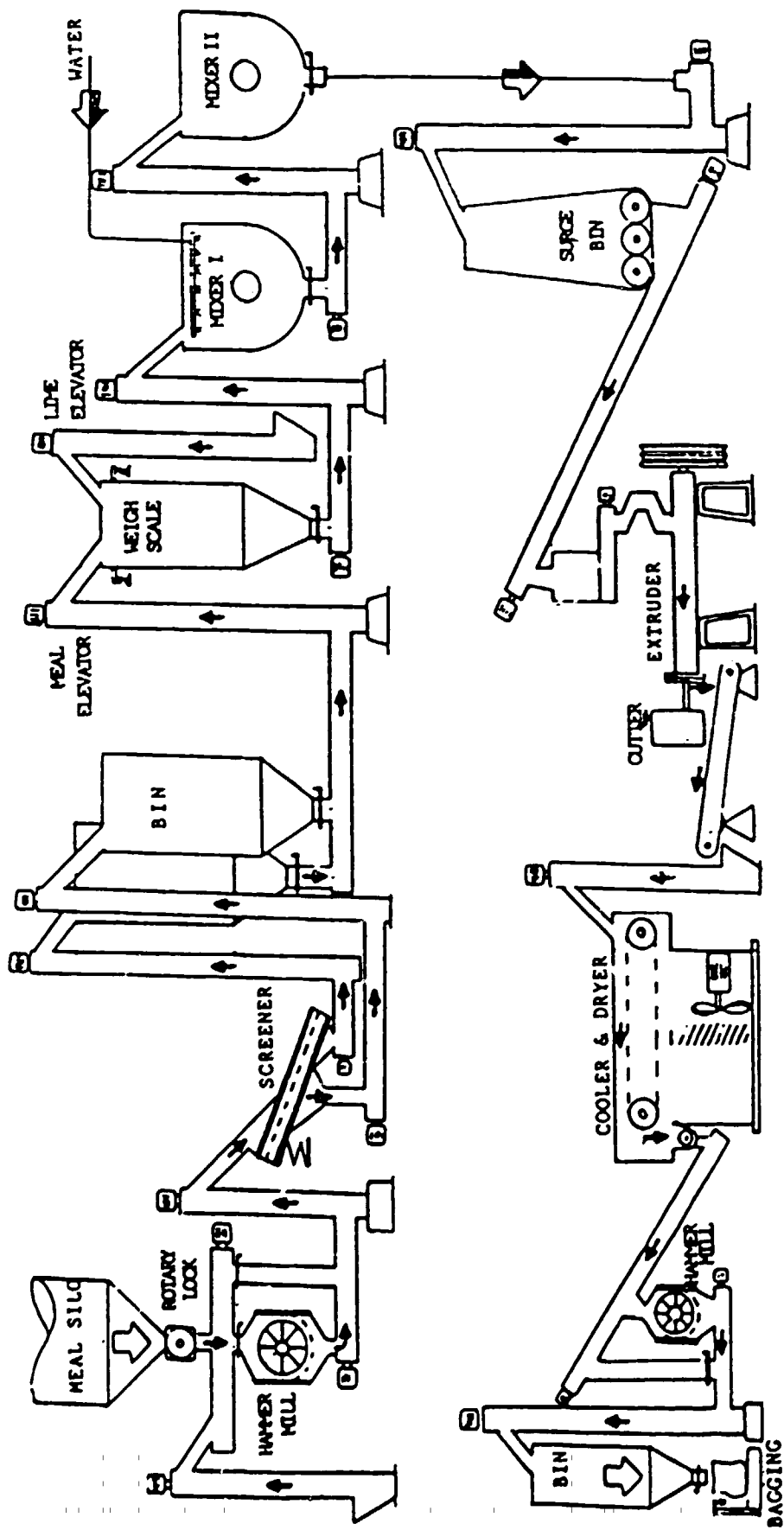


PROJECT CONTEXT (1)
 US/PHI/85/109 FOOTWEAR AND LEATHER GOODS INDUSTRIES CENTER

ORGANIGRAM
OF THE
SPECIALIZED TRAINING CENTER
FOOTWEAR AND LEATHER GOODS INDUSTRY CENTER
(STC - FLIC)



FLOW CHART OF CASTOR MEAL DEALLERGENATION (Illustration)



FLOW CHART OF CASTOR MEAL DEALLERGENATION (Description)

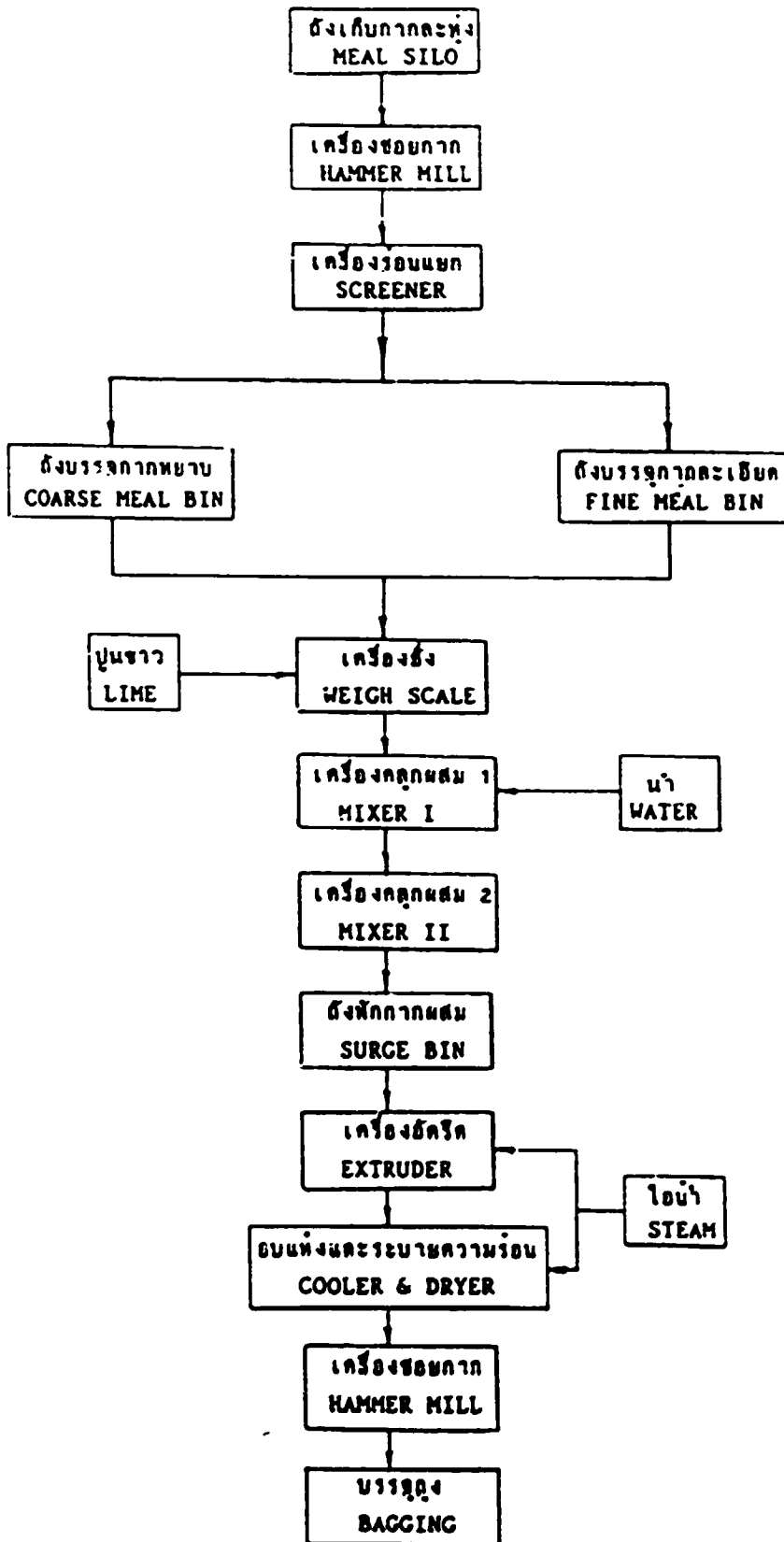


Table 1: Amino acid composition of Thai deallergenated castor meal seed (DCSM), compared with commercial soybean meal and protein equivalent basis soybean meal¹.

Item	Castor bean meal	Soybean meal	
		44%	Protein Equivalent Basis
Crude protein	34.39	44.00	34.39
Lysine	1.07	2.90	2.27
Methionine	0.69	0.52	0.41
Cystine	0.69	0.66	0.52
Threonine	1.02	1.70	1.33
Arginine	3.00	3.20	2.50
Isoleucine	0.74	2.00	1.56
Leucine	1.91	3.37	2.63
Phenylalanine	0.92	2.10	1.64
Valine	0.69	2.20	1.72

Table 2: Growth performance of starting and growing-finishing pigs fed 0, 8, 12 and 16% deallergenated castor seed meal (DCSM)²

Trait	DCSM			
	0%	8%	12%	16%
<u>Starting 4-5 weeks</u>				
Starting wt, kg.	6.05	5.89	6.03	6.02
Finishing wt, kg.	21.20	20.66	20.34	18.14
ADG, gm/da	360 ^a	349 ^a	341 ^a	302 ^b
Feed consumed, gm/da	884	876	849	872
FCR	2.47 ^a	2.53 ^a	2.54 ^a	2.94 ^b
<u>Growing-Finishing (34-90 kg)</u>				
Starting wt, kg.	33.12	34.04	34.32	34.01
Finishing wt, kg.	94.11	92.21	93.84	89.63
ADG, gm/da	669 ^a	647 ^a	661 ^a	618 ^b
Feed consumed, gm/da	2.48	2.41	2.57	2.47
FCR	3.71 ^a	3.72 ^a	3.89 ^{b,c}	4.00 ^c

¹ Data from Aginomoto Co. (Thailand) Ltd. (castor bean meal) and NRC (1988) (soybean meal).

² Average from 10 animals. Different superscript a,b,c, indicated a statistically difference of P<0.05 level. Starting and growing-finishing pigs are two sets of statistics.

Table 3: Growth performance and mortality rate of broilers fed 2 levels of non-deallergenated castor seed meal (NDCSM) and deallergenated castor seed meal (DCSM)³.

Measurement	Control (T ₁)	NDCSM		DCSM	
		4%(T ₂)	8%(T ₃)	4%(T ₄)	8%(T ₅)
<u>Day 0-3 wk</u>					
Total wt. gain, gm	430.37 ^a	76.63 ^b	53.90 ^b	420.57 ^a	445.25 ^a
Feed consumed, gm	805.08 ^a	116.74 ^b	162.63 ^b	820.34 ^a	800.00 ^a
FCR	1.87 ^d	2.82 ^e	3.33 ^e	2.10 ^d	1.80 ^d
Mortality rate, %	0.834 ^a	71.67 ^b	78.34 ^b	0.0 ^a	0.824 ^a
<u>Day 0-5 wk</u>					
Total wt. gain, gm	891.17 ^a	325.49 ^b	259.51 ^b	950.76 ^a	902.05 ^a
Feed consumed, gm	1,842.04 ^a	668.19 ^b	524.67 ^b	1,904.55 ^a	1,829.41 ^a
FCR	2.07	2.19	2.68	2.00	2.03
Mortality rate, %	3.38 ^a	80.0 ^b	87.63 ^b	0.00 ^a	1.75 ^a
<u>Day 0-7 wk</u>					
Total wt. gain, gm	1,460.00 ^a	694.97 ^a	556.07 ^b	1,554.07 ^a	1,517.31 ^a
Feed consumed, gm	3,033.42 ^a	1,865.87 ^b	1,358.69 ^b	3,305.31 ^a	3,112.04 ^a
FCR	2.08 ^a	2.72 ^b	2.66 ^b	2.13 ^a	2.05 ^a
Mortality rate, %	3.38 ^a	80.0 ^b	89.17 ^b	2.50 ^a	2.50 ^a

Table 4: Growth performance of Sherrie ducks (0-8 weeks) raised on feed containing 0, 4, 8 and 12% deallergenated castor seed meal (DCSM).

% DCSM in Diet	Body Weight (kg)	Feed Consumed (kg)	FCR	Mortality Rate
0 (T ₁)	2.55	8.45	3.32	2.08
4 (T ₂)	2.55	9.14	3.59	0.00
8 (T ₃)	2.52	8.86	3.52	0.00
12 (T ₄)	2.54	8.99	3.54	2.08

³ Different superscript (a,b) indicated a statistical difference at P<0.01 level; superscript (d,e) indicated a statistically difference at P<0.05 level.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Ex-post Evaluation - US/GLO/90/265
US/GLO/87/125 Castor Meal Detoxification Technology
US/PHI/85/109 Footwear and Leather Goods Industry Centre

TERMS OF REFERENCE

1. Background

The umbrella project US/GLO/90/265 was approved to enable the Government of Germany and UNIDO to undertake ex-post evaluations of German-financed projects executed by UNIDO. Heretofore, ex-post evaluations of such projects were not undertaken regularly since no financial provisions had been allocated for this purpose.

It was decided initially there will be two evaluation rounds of two projects each. The first mission will, in addition to evaluating the two projects referenced above, also provide feedback on the approach for undertaking ex-post evaluations. These findings will be immediately tested in preparing for and conducting the second ex-post evaluation round of two further projects. Guidelines for ex-post evaluation will be developed if these two exercises indicate a necessity.

The evaluation missions governed by these terms of reference will cover US/GLO/87/125 Castor Meal Detoxification Technology based in Bangkok, Thailand and US/PHI/85/109 Footwear and Leather Goods Industry Centre based in Manila, Philippines.

The US/GLO/87/125 project is the second phase of a two-phase project. During the first phase a technology was developed to detoxify and de-allergenate castor meal. The second phase was designed to support the large-scale application of this technology. The project was implemented in co-operation with Thai Castor Oil Industries.

The US/PHI/85/109 project aimed at strengthening the existing Centre's capacities and capabilities by raising the work of its product development, maintenance and extension services, testing laboratories and training programmes to international standards.

Both projects are active in the development of the agro-industry subsector to which UNIDO has been requested to accord high priority by its policy-making organs. They were chosen for ex-post evaluation since they represent good examples of a technology development and dissemination project (US/GLO/87/125) and of an institution-building project (US/PHI/85/109).

2. Scope, purpose and methods of the evaluations

The primary purposes of the in-depth ex-post evaluations are as follows:

- (a) To assess whether the achievement of the projects' objectives have led or are likely to lead to a significant contribution to the projects' development objectives.
- (b) To assess the relevance and whether the problems that were to be addressed by the project were solved.
- (c) To assess the achievements of the projects against its objectives, including the utilization of outputs produced or results achieved, including re-examination of the projects' design.
- (d) To identify and assess the factors that have facilitated the achievements of the projects' objectives as well as factors that have impeded the fulfilment of these objectives.
- (e) (i) Institution-building project: To examine the extent to which the results of the projects have contributed towards a sustained capacity and capability to provide services to end users.
(ii) Direct support: To examine the extent to which the results of the projects have led to the development of viable technologies, processes and/or products which meet stated needs or requirements. Where applicable, follow-up investments or commercialization have taken place.
- (f) As part of the above-mentioned tasks, the mission will also review whether the approaches utilized by the projects have led to optimum results as or whether other approaches could have improved the results. These should include the cost effectiveness of the project activities undertaken.
- (g) To identify internal factors which may have influenced the projects' objective achievement or non-achievement. For example, factors could include project design, quality of expertise provided, adequacy of training, etc.
- (h) To identify external factors which may have influenced the projects' objective achievement or non-achievement. For example, factors could include unexpected changes in government priorities, changed economic conditions, or new developments in technology.
- (i) To assess the extent to which the projects' results and any impact achieved continue to contribute to project and development objectives.
- (j) To record the effects the projects have had on their surroundings (institutional, technical, economic, social).

3. Project design

In ex-post evaluations the question of project design should be reconsidered since the quality of adequacy of project design not only largely influences its management and implementation efficiency and effectiveness but also a good design will help ensure a project's sustainability. To assess these aspects the following issues should be addressed:

- Was the project concept relevant to the needs of the country and appropriate to the country's socio-economic and technical content?
- Were the critical assumptions required for successful project completion and for sustainability adequately considered? To what extent did these materialize?
- Were success criteria and milestones included in the project design by which project performance and impact of the project could be monitored and evaluated?
- Were the pre- and end-of-project status' descriptions sufficient to allow foreseeing, inter alia, whether sustainability could be attained?

4. Outputs and project objectives

Beyond the promotion of outputs and the achievement of objectives, the evaluation should address the following aspects to help determine whether the positive results of the project are likely to be sustained:

- Were the project achievements sufficient and of adequate quality to meet the needs of end users? Were the needs correctly identified?
- Were the measures envisaged, which would help ensure sustainability taken up by project and counterpart personnel?
- To what extent is the project's sustainability dependent on external factors which are beyond the immediate control of project management? Have these factors affected sustainability?
- Did the demand forecasted for project-strengthened service capabilities and/or technologies developed materialize?
- Will the project assisted institutions be capable to continue meeting future demands?
- Is an organization assisted by the project co-operating with other organizations to maximize project results?
- Were management systems and financial arrangements developed which would allow the continuation of activities previously supported by the project? Are government subsidies required?
- Are linkages with industry well established? Is industry benefit-

ting from the project? Should the project assisted organization market its services better?

5. Project specific issues

(a) US/GLO/87/125 Castor Meal Detoxification Technology

This project aimed to commercialize a newly developed technology to detoxify and de-allergenate castor meal. The following project specific issues should be addressed by the evaluation:

- Did the detoxification technology developed under the previous phase prove to be suitable for large-scale production?
- Have efficient production processes been established at the counterpart facilities?
- Can the counterpart sell its (improved) product with a reasonable profit?
- Are sufficient raw materials available to operate the production facility at an economically sound capacity?
- Did the benefits, particularly increased demand for the improved product, materialize?
- What are the market prospects, both local and export?
- Have adequate arrangements been made to disseminate the technology developed? How far has this been achieved?

An assessment of these aspects will require interviews with the counterpart institution, research institutions (such as the Kasetart University Bangkok), government officials, animal feed procedures, end users (distribution channels and/or life stock industries), etc.

(b) US/PHI/85/109 Footwear and Leather Goods Industry Centre

This project aimed to strengthen the Centre's product development, maintenance and extension, testing and training service capabilities and capacities. Being a typical institution-building project, most of the relevant issues which need to be addressed by the ex-post evaluation have already been listed above. The evaluation will need to assess:

- Whether the capabilities were strengthened to meet international standards.
- Whether the Centre can continue improving its capabilities and capacities on its own, with perhaps only highly specialized support as the need arises.
- Assess whether industry fully uses and appreciates the Centre's service capabilities and capacity. Is the Centre willing and able to adjust its services to the varied needs of industry.

- Is there an increasing demand to use the Centre's services.
- Does the industry have a voice in how the Centre operates. Have adequate industry linkages been established.
- Assess the fee structure of the Centre and the prospects the Centre has to become self-financing.
- Assess whether staff incentives exist and are sufficient to attract, motivate and keep highly qualified staff.

An assessment of these aspects will require interviews with counterpart staff, government officials, former and present trainees, footwear and leather goods industrial end users, industry representatives, relevant industry associates, if any, etc.

6. Composition of the mission:

The mission will be composed of:

- one representative of the Government of Germany;
- one representative of UNIDO;
- one expert for each project to join the evaluation for their respective parts of the mission;

These representatives should not have been directly involved in the design, appraisal or implementation of the projects.

7. Consultations in the field

The mission will maintain a close liaison with the UNIDO Country Director in each country who will be requested to assist the mission in arranging visits to and interviews with the groups identified above for each project.

Although the mission should feel free to discuss with the authorities concerned all matters relevant to its assignment, it is not authorized to make any commitment on behalf of the Government of Germany or UNIDO.

8. Timetable and report of the mission

A detailed time table for the mission is given below. Individual appointments will be arranged by the respective office of the UNIDO Country Director. The mission will attempt to complete its work within the given time frame and upon completion brief the authorities concerned on initial findings and conclusions. A draft report will be made available for these discussions by the mission. The final version of the report will be submitted to UNIDO for further distribution to the Government of Germany and of the recipient country within three weeks after completion of the assignment. The mission will provide advice on the approach taken to the second mission which should take place under the umbrella project.

28 Feb. - 1 March 1991	Briefing at UNIDO Headquarters
2-3 March 1991	Travel to Bangkok
4-8 March 1991	US/GLO/87/125 Castor Meal Detoxification briefings with UCD, interviews with counterpart staff, government officials, end users, etc.; preparation of draft report; final debriefing with all parties concerned prior to departure;
9 - 10 March 1991	Travel to Manila
11 - 15 March 1991	US/PHI/85/109 Leather Goods Institute briefings with UCD, interviews with counterpart staff, government officials, end users, former and present trainees, etc.; preparation of draft report; final debriefing with all parties concerned prior to departure; Start preparation of synthesis report on issues general to both projects;
16 - 17 March 1991	Travel to Vienna Final debriefing at UNIDO Headquarters with presentation of project reports and draft synthesis study (within three weeks upon return); briefing of second mission members on approaches taken in ex-post evaluation (timing to be determined).

The above schedule was slightly changed in so far as the visit to US/GLO/87/-125 was postponed by two weeks and took place after the visit to US/PHI/85/-105.

LIST OF PEOPLE MET

THE PHILIPPINES

PROJECT COUNTERPART:

National Manpower and Youth Council (NMYC)

Mr. Jose D. Lacson, Director General
Mr. Antonio L. Pacificador, Deputy Director General

Office for Manpower Skills Development (OMSD)

Ms. Milagros D. Hernandez, Executive Director

Specialized Training Centers (STC)

Mr. Alfredo A. Regondola

Footwear and Leather Goods Industries Center (FLIC)

Mr. Daniel B. Alano, Officer in charge

Government of the Philippines

Dr. Alcestis Guiang, Department of Education, Culture and Science,
(BTVE-DECS), University of Life, Pasig, Metro Manila

Ms. Irma C. Corales, Director, National Economic and Development Authority
(NEDA)

Mr. Rodolfo Valentino, Municipal Mayor, Municipality of Marikina, Metro
Manila

Mr. Dean Luis P. Gonzales, Municipal Administrator

Mr. Alcestis M. Guiang, Director, Bureau of Technical and Vocational
Education

Mrs. Lucita P. Reyes, Director, Toys, Gifts, Furniture and Housewares
Department, Department of Trade and Industry, Board of Investors

Marikina Footwear and Development Council

Ing. Guillermo Dela Paz, Vice Chairman

Marikina Footwear and Leather Goods Manufacturers Credit Corporative
Inc.

Mr. Tereso V. Pasco, Sr., Architect
Mr. Tereso J. Pasco, Jr., Civil Engineer

European Chamber of Commerce of the Philippines

Mr. Henry Schumacher, Executive Vice President
Ms. Santiago, Assistant

Centre for International Trade Expositions and Missions (CITEM)

Mrs. Felicitas R. Agoncillo-Reyes, Vice President-Corporate Services
Department
Mr. Araceli Maria Pinto-Mansor, Executive Director
Mr. Maritess C. Jocson, Assistant Chief, Trade and Industry Specialist
Mr. Stephen M. Cabalquinto, Trade and Industry Development Specialist

Development Bank of the Philippines

Mr. Isidro A. Sobrecarey, Vice President

Asian Development Bank (AsDB)

Dr. Heinz Buehler, Alt. Executive Director for Austria, Federal
Republic of Germany and the United Kingdom

International Labour Organization (ILO)

Mr. Hans C. Haan, Chief, Technical Adviser, Rural Employment and Income-
generation through Out-reach Training

Mr. Rudiger Hobohm, Advisor Apprenticeship, Training

United Nations Development Programme (UNDP)

Mrs. Lilia S. Mendoza, Programme Officer

PRIVATE INDUSTRIES:

Emanuel's Leathergoods Inc.

Mr. Manuel M. Siggaoat, President
Mr. Nelia V. Siggaoat, V/P-Operation
Mr. Mirofe M. Mitra-Mojica, Export Manager

Goodfit Manufacturing Corporation

Mr. Brig Gen Levy M Malto (Ret), President and General Manager

HQ Link Philippines, Inc.

Mrs. Baby S. Primavera, General Manager
Mr. Michael C. Blancas, Sales Manager

COJAC - Cora Jacob Leather Goods

Mrs. Erlinda Bundoc, Executive Vice President
Mr. Gerhard Niegel, Technical Adviser, Leather Goods Service Centre (LGSC)

Rudolf Valentino Shoes

Mr. Menchit B. Valentino

S.O.G. MFG. Corp.

Mr. Manuel P. Samson, President

SGV Consulting

Mr. Dado Sibayan, responsible for the medium-term study on leather and leather goods prepared for the BOI/DTI (telephone interview)

and a number of small- and medium size footwear manufacturers located in Marikina and Laguna

THAILAND

PROJECT COUNTERPART:

Thai Castor Oil Industries Co. Ltd.

Mr. Tavorn Tantiponganant, Managing Director
Mr. Tartree Sittajarnpong, Marketing Manager
Mr. Prasard Chirapatsakul, Plant Director

Kasetsart University

Mr. Kasidit Uechiewcharnkit, Animal Science Department, Faculty of Agriculture

Ministry of Agriculture

Dr. Dakran, Department for Agriculture Economics

Board of Investment

Mr. Walter H. Haskamp, THAI-German Investment Promotion Service

Embassy of the Federal Republic of Germany

Mr. Albert Graf, Counsellor

ESCAP

Mr. Ilg, Regional Adviser on Export Promotion, International Trade and Tourism Division

Mr. Alain G. Vaes, Team Leader, Fertilizer Advisory, Development and Information Network for Asia and the Pacific (FADINAP), ESCAP Agriculture and Rural Development Division

Mr. Enno Heijndermans, Associate Expert (Chemical Engineer), Fertilizer Advisory, Development and Information Network for Asia and the Pacific (FADINAP), ESCAP Agriculture and Rural Development Division

Food and Agriculture Organization of the United Nations (FAO)

Mr. Alastair Hicks, Agricultural Engineer/Agro Industries, Regional Office for Asia and the Pacific

Mrs. Norma Bethke, Programme Officer (Thai Affairs Section), Regional Office for Asia and the Pacific

Mr. Mauri E. Uotila, Regional Dairy Development Officer, Regional Office for Asia and the Pacific

United Nations Development Programme (UNDP)

Mr. Johann Stuyt, Programme Officer

United Nations Industrial Development Organization (UNIDO)

Mr. Roeland Kortas, Programme Officer

PRIVATE INDUSTRY:

Charoen Pokphand Group

Mr. Harlan W. Hochstetler, Assistant Vice President, Nutrition and Research Feed Technology

Mr. Sithong Vatcharangkulpipat, Manager, Oil-Seeds Department, Bangkok Produce Merchandising Co.Ltd.

Laemthong Corporation Ltd.

Dr. Jung Kuo

ANALYSIS OF THE PROJECT DOCUMENT (1)

US/PHI/85/109 Footwear and Leather Goods Industries Center

151. It should be noted that the Project Formulation Framework which dictates a chapter on risk factors/critical assumptions and an explicit description of pre- and end-of-project status was introduced after the subject project had been formulated and approved. Therefore, these issues are not explicitly contained in the project document but partly submerged in the text.

152. The development objective of the project is to contribute to the national economy and that of the region by upgrading and developing the leather, footwear and leather goods industry by improving its productivity and competitiveness, particularly as a source of non-traditional export products, and to prepare the FLIC for the role of a regional center. The immediate objective qualifies the project to have an institution strengthening function and aims at expanding and strengthening the counterpart's capacities and capabilities in the areas of training, product development, applied research and quality control and extension services to industries.

153. The development objective is rather broad. The magnitude and importance of the leather based subsector has not been weighed against its share in the national economy and an impression is created that the leather goods sector is one of the main driving forces in the economic development process of the Philippines. Adequate parameters to assess the expected/actual impact of the project on the country's economic performance were not established. The contribution of the project to the attainment of the development objective depends, inter alia, on the number of enterprises FLIC can reach and the degree of impact on their performance it can attain. The expected outreach and impact has neither been determined/quantified nor assessed against FLIC's capacities.

154. The outputs are specified as particular units of a modified FLIC. The existing structure of the Center is not described in the project document, hence the base line for the project is missing. Particularly for the conduct of the evaluation, it is difficult to assess the envisaged and actually attained changes as compared to the situation at the beginning of the project. In view of the institution building character of the project it had been preferable to use the module approach¹ for each unit. Only two of the mentioned categories, i.e. services to be provided (in non-quantified terms) and the staff strength were defined in detail. Output (b) is described as fully trained staff, however, without specifying the number of trained staff and their field of specialization. Output (c) is specified as training materials at accredited level and output (d) envisages the accreditation of the competence of the Center for technical training in footwear manufacturing and technology and possibly the same in leather goods. These outputs should have been integrated into an institution building module as they concern various components of a functional institution, i.e. output (b) belongs to

¹ In the module approach following criteria are specified for each organizational unit: services to be provided, permanent national staff (staff strength and qualification), methodologies used for providing the services, facilities/buildings, equipment, end users of the services, and permanent management and financing of the unit after project completion.

category "permanent staff", output (c) to "methodologies", and (d) to "(type/quality of) services".

155. A number of external factors are mentioned in annexes to the document, however, their influence on the project's implementation and its success were not analyzed and reflected in project planning and design. Annex 4 of the project document provides a critical analysis of the status of the leather based industries in the Philippines with its problems centering around the local production of hides and skins which has continuously been declining. The impact of this factor on leather processing industries and subsequently the project was not considered within the context of the project.

156. The end users (target group) of FLIC's activities and services seem to cut across the entire footwear and leather goods sector of which some details are contained in the afore-mentioned Annex 4. Neither the main target group nor a distinction between the various end users and their various needs (type and duration of training, extension services) have been specified. A general provision was made that the center would strengthen its linkage and relation to footwear and leather goods industries. Any institution building/strengthening project needs to analyze and consider in detail its end users and their needs as these dictate the institution's service portfolio and modalities.

157. The chapter on special considerations gives inadequate information and refers rather to the institutional framework and Government/counterpart contributions. Instead, the project's potentials for TCDC and the integration of women in industrial development should have been reflected.

ANALYSIS OF THE PROJECT DOCUMENT (2)
US/GLO/87/125 Castorbean Meal Detoxification

158. In analyzing the project document (PRODOC) it should be noted that the format does not contain a section on risk factors, therefore, critical assumptions are not explicitly covered. Also, the pre- and end-of-project status' are not described and presented in the document as it is foreseen in the Project Formulation Framework (PFF) which was introduced after the subject project had been formulated and approved.

159. The development objective is the large-scale commercial production of detoxified and deallergized castorbean meal for use as a protein animal feed component in mixed, compounded animal feed and safe in handling by those sensitive to CB-1A allergen. The immediate objective is stated as the demonstration of a fully operational castorbean meal detoxification and deallergenization unit to be installed into existing production processes of TCOI. The internal logic, per se, between development and immediate objective is consistent, i.e. the attainment of the immediate objective could potentially contribute to the achievement of the development objective.

160. Since the project was developed as a follow-up to the research and development phase (US/GLO/77/033) and was concerned with the industrial-scale application of technology, it was not particularly designed to fit a national industrial development plan. Nonetheless, Thailand is suffering a shortage of animal feed, therefore, the project's potential to increase the availability of an animal feed protein source indicate the project's relevance to the national development.

161. External or risk factors have not been considered in the PRODOC; e.g. it is assumed that the process is commercially viable without stating whether relevant investigations (feasibility study) have been undertaken. Other factors which are important for project success and sustainability, such as raw material availability, influence of pesticides on the quality of the end product, impact of the technology on the immediate factory surrounding, etc. have not been covered.

162. The project's output is formulated in misleading terms and had been more adequately described as "a capacity to detoxify and de-allergenate 17,000 tons of castorbean meal per annum". The castor oil production is not an output of the project but a regular activity of TCOI.

163. The end users are mentioned under the heading "4. Project Outputs" though in rather general terms. Potential target groups seemed to be animal feed mixing and compounding industries and fertilizer producers/sales organization. However, neither actual/potential demand for either of the products nor requisite product specifications were described. Activities, to be undertaken by UNIDO or the counterpart, to investigate on marketing aspects were not included in project.

164. The project has several aspects relevant to special considerations, i.e. TCDC, co-operation with non-governmental organizations (NGOs), environment and health issues and women. Two of these are listed under the adequate heading, the third is submerged into the chapter on project outputs, the last is not mentioned at all.

165. The project's TCDC potential is contained in placing a technology at the disposal of a Thai company for dissemination to other developing countries. However, means to ensure the dissemination and application of the technology by the "world-wide castor oil industry" is not described in detail in the PRODOC but left to be interpreted.

166. The environment/health indications have been clearly indicated in the PRODOC even if not specifying the magnitude of the problem. The contribution to addressing and solving the issue is implied in the project's success as that would result in detoxic castorbean meal free of allergen.

167. Although the project meets internal evaluation requirements, reference hereto under paragraph 7. of the PRODOC has been misleading as it implies an end-of-project report would suffice. Since the project duration is more than 24 months and the budget is above US\$ 400,000 a Project Performance Evaluation Report (PPER) should have been submitted annually.