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OLEOCHEMICAL AND SURFACTANTS
US/INS/90/010

INDONESIA

Final report

PART III

Project document:Establishment of the Indonesian Oleochemicals and Surfactants Institute (IOSI)

Prepared for the Government of the Republic of Indonesia
by the United Nations Industrial Development Organization

by

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Vienna

UNITED NATIONS DEVELOPMENT PROGRAMME

Project of the Government of the Republic of Indonesia

PROJECT DOCUMENT

Title: **Establishment of the Indonesian Oleochemicals and Surfactants Institute (IOSI)**

Number: ... /INS/93/---/A/01/37 **Duration:** Three years

Sector (Govt. Class.):
Industry
Services
Sub-sector (Govt. Class.)
Chemical Industry

(UNDP Class. and code):
Industrial Development
0510
(UNDP Class. and code):
Industrial Development 510

Government Implementing Agency: **Ministry of Industry Department of Basic Industries**

UNDP and cost-sharing financing

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IPF $

Other

Government

Total US $ 6,467,000

Executing Agency: Industrial Development Organization (UNIDO)
Estimated starting date: January 1994

Government inputs: Rupiahs 12,000,000 (in kind)
(local currency)

Brief description: The project is intended to transfer modern know how and instrumentation in R&D programme of the oleochemicals and surfactants industry in Indonesia. It is to be achieved through organization of the Indonesian Oleochemicals & Surfactants Institute (IOSI), similar in functions to the Malaysian Rubber Institute addressing the following issues:

- information collection and dissemination in the field of oleochemicals and surfactants for industrial companies and Government.The worldwide production/consumption data of all derivatives will be collected, trends assessed, prices/costs compared and production feasibility evaluated. The technology library will be established, including technological profiles, the published recipes and formulations, etc.;

- elaboration and adoption of elaborated by ISO and other international organizations of the analytical methods related to identification of main components and impurities in products in order to help industry in improvement of the products quality and act as an analytical expert for local as well as for imported products;

- to participate in definition and drafting of the standards and regulations for Indonesia in cooperation with National Bureau of Standards for Indonesian Government;

- establishment of the control and testing of the biodegradability and toxicity of oleochemicals and surfactants.
Also the microbiological and chemical conformity of products particularly designed for cosmetics, personal care, biocides, food additives, etc.;

- assistance in the technology development and adoption with aim the products quality improvement, license selection, and new products and formulations development. The small pilot scale of basic unit processes used in the field of oleochemicals and surfactants technology (i.a. hydrogenation, esterification, neutralization, ethoxylation, sulfonation, condensation) will be established and access ensured to all enterprises to test their concepts or develop technology.

- training of the staff of existing and newly established enterprises in the field of technology, product quality testing, as well as in production safety and hygiene (good managerial practices).

Signed: Date:

_____ _____
on behalf of the Government

_____ _____
on behalf of the
Executing Agency

_____ _____
on behalf of the United
Nations Development Programme

Part A. Context

1. Description of subsector

Indonesia is one of the South-East Asian countries becoming a candidate to the group of NICs (Newly Industrialized Countries). The country fulfills all necessary conditions for industrial development and may be characterized by the following:

- large scale local market allowing for establishment of economic size installations;
- abundance of hydrocarbon resources;
- abundance of natural resources of agricultural origin;
- stable and advantageous system attracting foreign investments;
- satisfactory infrastructure and well established banking system.

However, this "embarrass de richesse" poses high responsibility on shoulders of decision makers. The options for development are not obvious, and selection of investment projects priorities requires numerous studies and neutral assessment. On the one hand it could be advantageous to follow the established way of development of the petrochemical industry and add more value to the hydrocarbon resources. However, on the other hand agriculture employs over 50% of the population and introduction of agro-products processing industrial structure may have positive impact on the increase of farmers income as well as on the industrialization process. The selection of the most advantageous option is also important from the point of view of international competition.

The export promotion strategy initiated in 1983 may bring positive results in the long term only when commodities will be produced accordingly to the modern technology and competitive in terms of costs of used raw materials and manpower.

One obvious candidate for project selection priority exercise is the branch of surfactants and detergents. All the natural raw materials exist in Indonesia and could be processed to high value added products for local consumption and export. However, the development of the petrochemical industry gives also opportunity to follow the strategy of utilizing petrochemical transformation technologies.

1.1 Availability of the raw materials

Indonesia produces palm oil, palm kernel oil and coconut oil. The historical data on the production are given in Table 1.

Table 1 Historical data on natural oils production

Years / Products	1980	1985	1991
		Kt/year	
Crude palm oil (CPO)	720	1210	2600
Palm kernel oil (PKO)	126	260	260
Coconut oil (CNO)	830	900	1100

Source: EIU Country Report 1990
UNIDO experts' report 1992

The oils consumption for the year 1991 is as follows:

Table 2 Apparent consumption of natural oils (1991)

Products	CPO	PKO	CNO	Total
		Kt/year		
Production	2600	260	1100	3960
Import	38	17	7	62
Export	1168	136	198	1502
Apparent consumption	1470	141	909	2520

Source: UNIDO experts report 1992

The prices of natural oils are unstable and depend on annual crops in all producing countries as well as on world production of other natural oils (e.g.soya oil, sunflower oil, etc.) and may change monthly by 50%-80%.

Table 3 Palm oil prices changes

Years	1986	1987	1988	1990	1991	1992
			US $/t			
Palm oil	190(VIII)	390(XII)	500(I)	343(III)	285(Av.)	331

Source: EIU Country Report (1998)
Chemical Marketing Reporter (March 1990)
UNIDO experts' report

Coconut oil is traditionally more expensive by 30%.

The domestic consumption of natural oils in 1991 has been divided between food and cooking (72%) and industrial uses (28%).

Production forecasts for the natural oils are based on the acreage of the palms and age of plantations. Actually the production capacities accordingly to the Ministry of Agriculture would allow following production of oils:

Table 4 Natural oils production capacities

Years / Products	1991	1992	1993	1994	1995	Full capacity
			Kt/year			
CPO	2600	3200	4000	4800	5500	4800
PKO	260	320	400	480	550	480 (960)
CNO	1100	1300	1350	1450	1550	3200

Source: UNIDO experts report

The full production capacity takes into account the actual acreage of plantations and average yields. In case of PKO the yields may reach 960 Kt/year if export of kernels would be stopped. For purpose of conservative projection by the year 2000 the following figures of available natural oils would be used:

- CPO 4800 Kt/year
- PKO 600 Kt/year 1/
- CNO 1600 Kt/year 2/

1/ unsatisfactory recovery still considered
2/ 50% of the CNO is consumed by producers without reaching market

This amount will be distributed as follows:

Table 5 Projection of natural oils consumption distribution by the year 2000

Products	CPO	PKO	CNO	Total
		Kt/year		
Production	4800	600	1600	7000
Food & cooking	1520	100	800	2420
Export & industrial uses	3280	500	800	4580

Source: JSRD experts' own calculations

At present (1991) the food & cooking use of oils has been recorded at the level of 1800 Kt/year. Taking into account Indonesian population growth as well as projected GDP/capita growth a 3% annual growth has been projected of the food & cooking consumption pattern (from 1800 Kt/year to total 2420 Kt/year by the year 2000).

The split of oils consumption is hypothetical. It is acknowledged that PKO and CNO have higher prices and their fatty acids composition is much more favorable for the industrial use. On the other hand the high content of unsaturated acids (oleic an linolenic) in the palm oil makes it more healthy for human consumption.

For the purpose of exports projection evaluation three scenarios have been developed:

- stable export amount (this is maximum investment scenario in the field of oleochemicals in Indonesia.). Scenario I.
- growth of exports at the rate 2 % per year. Scenario II.
- market share of Indonesia will remain constant. Scenario III. This is a minimum investment scenario.

The result of calculation is given in the table below:

Table 6 Projections of the natural oils exports by the year 2000

Products	CPO	PKO	CNO	Total
		Kt/year		
Total available	3280	500	800	4580
Scenario I				
Export	1170	136	200	1506
Industrial use	2110	364	600	3074
Scenario II				
Export	1400	160	240	1800
Industrial use	1880	340	560	2780
Scenario III				
Export	1800	200	240	2240
Industrial use	1480	300	560	2340

Source: Own JSRD experts' projections

According to the projections of Oil World by the year 2000 the worldwide consumption of natural oils will reach 105 million tons, from which 22 million tons would be palm and kernel oils and 5 million tons would be coconut oil. Therefore, in projected maximum export scenario Indonesian part will be 7.5% (present 9.1%) and 4.8% respectively (present 4.7%). Therefore, availability of oleo-raw materials structured by useful fractions would be for all three scenarios as follows:

Table 7 Structure of oleo-raw materials by the year 2000

Fractions	Scenario		
	I	II	III
		Kt/year	
Saturated:			
C_8-C_{10}	100	95	90
C_{12}	480	450	430
C_{14}-C_{15}	175	160	150
C_{16}	980	880	690
C_{18}	85	75	60
Unsaturated:			
C_{18}-oleic	940	830	675
C_{18}-linoleic	210	190	150

Source: Own JSRD experts' calculations

The consumption pattern of the surfactants and their precursors - oleochemicals, should consider following outlets:

- consumption by the population in form:
  - -- of soaps
  - -- detergents' powders
- major industrial uses of surfactants:
  - -- crude oil extraction industry
  - -- textile industry
  - -- pulp and paper industry
  - -- cosmetics industry
  - -- paints and lacquers industry
  - -- pesticides and fertilizer industry
  - -- rubber industry
  - -- plastic processing industry
  - -- food additives industry

Consumption of soaps and detergents powders is well correlated with the value of the GDP/capita.

Table 8 Consumption forecast for surfactants

Product	Consumption		Consumption	
	1992	2000	1992	2000
	kg/capita		Kt/year	
Soaps	2.3	2.5	420	520
Powders	1.3	4.0	240	832
Shampoos	0.5	0.7	90	146

Source: Experts data and consultants' own calculations

The projection of the consumption in relation to the GDP/capita is based on statistical data of 37 countries of different level of economical development. The industrial consumption depends on the development of given branch of industries and its chances for development in future years. Therefore, the most reliable projection of input material consumption is that related to the MVA of given industrial branch. The ideal situation would be if input-output tables would be available for these branches of industries for the year 1990, however this is not a case of Indonesia.

Table 9 Projection of the consumption of oleochemicals and surfactants in Indonesia (without soaps)

Branch SITC	MVA/capita US $ 1990	MVA/capita US $ 2000	MVA US $ 2000	Consumption of surfactants kg/US $ by year 2000	Kt/year
(311)	4.2	15.0	3120	0.007	22
(321+323)	5.0	11.0	2288	0.029	66
(341+342)	1.2	4.0	832	0.026	22
(351+352)	5.3	12.0	2496	0.17	420
(355)	.	.	.	.	50
(356)	.	.	.	.	15
Oil extraction	.	.	.	.	5
Total					600

Source: UNIDO Global Report 1992/1993 and own consultants' calculations

To establish a projection of production the foreign trade hypothesis is necessary. The foreign trade projections are very difficult to made, because the decisions of thousands of investors are not known beforehand, as well as the export success depends on marketing strategy and efforts, much more than can emerge from perfectly prepared market study. In general around 900,000 t/year of surfactants and about 2,200,000 t/year of oleochemicals is traded at present on the world market. Indonesia will produce about 7% of natural oils supplied world wide by the year 2000, therefore can be considered as one of leading producers of natural oils. The comparative advantage of local market, allowing for establishment of higher capacity units and favorable economic conditions, highly populated markets of China, India, Pakistan, Bangladesh, Thailand etc. allow to predict that at active marketing strategy Indonesia can export about 100,000 t/year of surfactants and more than 300,000 t/year of oleochemicals. The more detailed projection of exports requires regional market study, which was not expected to be provided by this report.

By using the consumption and foreign trade data we can provide the following projection of the production profile of the oleochemicals and surfactants industry in Indonesia by the begin of the next millennium as a result of implementation of Repelita VI and Repelita VII.

Table 10 Production projection of oleochemicals and surfactants by the year 2003/2004

Product	Apparent consumption	Export	Import	Production
		Kt/year [1/]		
Oleochemicals				
Fatty acid mix	30	150	-	180
Stearic acid	25	150	-	175
Oleic acid	15	150	-	165
Esters:				
Methylesters	40	60	-	100
Butyl oleate	3	20	-	23
Butyl stearate	6	20	-	23
Diglycol laureate	2	20	-	22
Diglycol stearate	4	20	-	24
Esters total	55	140		195
Sorbitan monostearate	12	10	-	22
Sorbitan tristearate	10	10	-	20
Sorbitans	22	20	-	42
Fatty alcohols	20	160	-	180
Fatty acid amides	2	20	-	40
Fatty acid amines	4	15	-	19
Soaps	520	250	-	770
Metallic soaps	35	120	-	155
Aluminium Stearate	10	35		45
Magnesium Stearate	12	30		42
Zinc stearate	13	55		48
Surfactants				
LABS	140	90		230
FAE	75	80		155
SLS	70	60		130
SLES	90	60		150
NPES	30	20		50
TEA lauryl sulfate	5	20		25

Legend to the table 10
LABS-linear alkylbenzene sodium sulfate
FAE-fatty alcohols etoxylate
SLS-sodium fatty alcohol sulfate
SLES-sodium fatty alcohol etoxylate sulfate
NPES-sodium nonylphenoletoksylate sulfate
TEA-trietanolamine

The wide range of products and their application in a major industrial branches in Indonesia indicates importance of the technology development and product quality for further oleochemicals and surfactants industry development.

2. Host country strategy

The Indonesian development strategy as many of South-East Asian (SEA) countries primary was oriented at import substitution. In

decade of 70-ties Indonesia denoted high rate of the economic growth that was largely fueled by crude oil extraction and exports. Just before 1980 the oil sector contributed about one quarter of GDP, over 60% of Government revenues and about 80% of merchandise export. However, owing to the oil price decrease and rapid growth of interest rates the cost of debt service increased quickly and negative growth has been recorded. Following the drastic policy measures like devaluation of rupiah, cutting subsidies and postponing the development projects and liberalization of foreign trade, equilibrium of economy has been regained and in 1985 positive GDP growth was restored. Important reforms has been enacted in tax and other financial fields. However, in 1986 oil prices again dropped and US dollar was depreciated against other major currencies which intensified again Indonesia's debt service problem. Again policy measures has been enacted, like rupiah devaluation, Government budget cuts and positive change to export promotion policy have been denoted. In 1987 export bans and quotas as well as import control of about 400 commodities were removed and abolishment of export licenses was undertaken. Also positive changes promoting capital inflow in the investment law were enacted. During last years Indonesian economy grew slightly over 6% per year reflecting increasing investment in Indonesia in the field of textile and civil construction. The low cost and abundant supply of labour in Indonesia are attracting lot of investment in labour oriented industries such as textiles. Having in mind that any macroeconomic data have value in relation to similar parameters of other countries, below information is given for several SEA countries.

Historical trend of the results of the export oriented strategy of development applied in SEA countries is given below:

Table 11 Economy transformation features in SEA countries

Country	GDP growth (1965-1990) % per year	Contribution of industry to GDP in %		Ratio in world exports %		Trade balance US $ million	
		1978	1990	1978	1990	1975	1990
Indonesia	**6.3**	**9**	**14**	**0.03**	**0.24**	**2333**	**5969**
Korea Rep.	9.3	24	30	0.78	1.97	-2193	8885
Malaysia	6.6	17	19	0.18	0.37	277	4559
Philippines	4.1	25	25	0.12	0.21	-1482	-1696
Thailand	6.7	18	21	0.11	0.27	- 903	-3499
Taiwan Pr.	9.0	38	43	0.87	1.95	- 643	10739

Source: Global report UNIDO 1992/1993
UNCTAD Handbook of International Trade and Development Statistics, New York 1991

The data indicate healthy economic growth and efficiency of export promotion strategies. Indonesia still has a low contribution of industry to GDP and lower than expected ratio in world export. The data on actual (1990) economic situation are given in table 12.

Table 12 Macroeconomic features of the SEA countries development (1990)

Country	Population mln	GDP per capita US $	MVA(3) US $	Ratio of export to GDP %	Ratio of investment to GDP %
Indonesia	**180.5**	**728**	**70**	**6.9**	**36.9**
Korea Rep.	43.6	3559	2103	35.9	37.0
Malaysia	17.2	2422	510	22.6	32.3
Philippines	62.5	670	116	10.1	22.5
Thailand	55.6	1221	427	9.0	36.8
Taiwan Pr.	20.3	4277	2730	50.8	22.4

Source: Global report UNIDO 1992/1993
Macroeconomic Structural Issues in the Asia-Pacific Economies

Indonesia among the SEA countries has largest population, nearly equal to total of other mentioned countries and nearly lowest GDP per capita and manufacturing value added.

However, due to the necessity of export promotion, rupiah is undervaluated and GDP per capita in terms of purchasing parity power is about 3 times higher then in terms of official rate of exchange. Similar situation has been observed in Korea Rep. and Taiwan Pr. in early seventies. Large rate of investment in the GDP and economic growth rate shows that Indonesia has taken a part in competition to become the next NIC in the region.

It is obvious that strategy of development imposed certain pattern on the selection of the technologies. Countries with high rate of manufacturing export must aim at the advanced technologies. The qualitative assessment of the features in technology status quo in SEA countries is given in table 13.

Table 13 Technology development level in SEA countries

Country	Technology pattern			
	Raw materials oriented	Labour oriented	Capital oriented	Science oriented
Indonesia	++	++	+	-
Korea Rep.	-	+	++	++
Malaysia	+	++	+	-
Philippines	+	+++	+	-
Thailand	+	+++	+	-
Taiwan Pr.	-	+	++	++

Source: Global report UNIDO 1992/1993
Macroeconomic Structural Issues in the Asia-Pacific Economies
Remark: Number of positive signs shows intensity of the technology applied

Strategical priorities in the manufacturing sector of Indonesia are related to the high rates of the economic growth and strong export promotion. The state promotes the recovery and expansion of the economic infrastructure, encouraging the technological revalorization. Large part of the GDP will be invested in the future years therefore the big efforts are made to coordinate investments ensuring maximum efficiency. For Indonesia there are the following targets of industrial development for the decade of 90-ties:

- to overpass the level of US $ 1200 of GDP per capita;
- to increase the export ratio to GDP to 15%-18%;
- to increase the ratio of manufactured products in total export to 55%-65%;

The parallel usage of agricultural and mineral resources should be promoted taking into account importance of the agro-industries for well-being of over 70% of population as well as the price dumping of petrochemical products on SEA countries markets by industrialized world. Chemical industry is one of subsectoral priorities with special emphasis on the development of the down-processing operations of the available raw materials and commodities (e.g. fine chemicals). Indonesia started the programme of self-reliance in the basic chemicals and technological development, local know-how improvement as well as full investment scheme independent implementation.

Indonesian Government has established industrialization targets for the Repelita V national plan and in particular for basic chemical industries:

- growth rate 13% per year;
- export of manufactured products 1.2 US $ billion;
- employment of 35,000 people;
- total investment of US $ 5.6 billion.

Priority sectors in organic chemical industry are the following:

- up-stream petrochemical industries (olefines and aromatics);
- pulp and paper industries
- rubber goods and tire industries;

- agro-based chemical industries:
  - -- oleo chemicals based industries;
  - -- cassava and molasses based industries.

The growth of production and diversification of range of products is an evidence of healthy economic environment in Indonesia for the natural resources processing. Through the reasonable custom duties regulations, Government keeps the local industry competitive and export oriented.

Following the strategical priorities of the complex industrialization, further development of the chemical industry is envisaged as providing important inputs for other subsectors and sectors of the national economy like agriculture, energy production and efficient consumption, as well as engineering subsector development.

3. Prior and ongoing assistance

Prior and ongoing technical assistance is related to the level and sophistication of the country industry. Technical assistance projects are mainly developing high quality products/technologies and/or establishing self-reliant Research Centres and engineering institutions. Several projects are related to the techno-economic evaluation of the specific investment projects (opportunity and feasibility studies).

During the last years projects supporting the strategy development and policies establishment to specify priorities in the chemical industry development process were not implemented except the study on "OLEOCHEMICALS AND SURFACTANTS".

4. Institutional framework for subsector

The basic mandate for the preparation of the development plans, strategies and respective Government policies is given to the Ministry of Industry. The MOI is also using self-financing organizations like engineering companies, research national institutions to evaluate prospective projects of chemical industry development, before their submission for the approval and promotion.

However, the main strategy is to attract the private financial funds from inside and outside the country and for this purpose special policy measures need to be established for the promotion of the most efficient and well integrated projects within the national economy. The Department of Basic Chemical Industries has been selected as the counterpart organization to prepare the optional programme of the basic chemical industry development. The representatives of the Manufacturing Associations would be also involved, as well as the specialized faculties of the Universities and public R&D organizations (e.g. Center for Research and Development of Industrial Design and Engineering-CRDIDE at Pekayon).

Part B. Project justification

1. Problem to be addressed; the present situation

Problem to be addressed is to ensure stable technology development and know how transfer in the production of oleochemicals and surfactants industry in Indonesia competitive in quality and prices to the foreign products.

At present oleochemicals and surfactants industry operates in Indonesia. The volume of produced oleochemicals in 1991 and capacities of nearly to completion installations (1993/1994) are given in the following table:

Table 14 Apparent consumption of oleochemicals in Indonesia by the year 1994

Products	Production	Import	Export	Apparent consumption
		Kt/year		
Non-hydrogenated fatty acids	150	0.8	80	70.8
Stearic acid	104	0.2	80	24.2
Methylesters	20	-	15	5
Fatty alcohols	138	1.7	12	127.7
Toilet soaps	327	1.5	20	308.5
Other soaps	290	0.3	23	267.3
Metallic soaps	110	-	-	110(?)
Glycerin	99	5	8	96
Total	1238	9.5	238	1009.5

Source: Integrated table of UNIDO experts' report

Utilizing above raw materials and imported inputs the following surfactants are produced in Indonesia:

Table 15 Apparent consumption of surfactants in Indonesia (1991)

Products	Capacity	Production Kt/year	Import	Export	Apparent consumption
Alkylbenzene	120	90	-	-	90
ABS	96.6	66	2	2	66
SLS	17.2	11.7	0.8	10.3	2.2
Etoxylates	41.1	21	7.2	-	29.2

Source: Integrated table of UNIDO experts' report

Alkylbenzene is produced using propylene tetramer but from 1994 new installation would be operational producing alpha olefines from n-paraffines.

There is an obvious unbalance between products in table 14 (by the year 1994) and table 15 (by the year 1991) what means that oleochemicals are used in other branches of industries above the surfactants production.

Discussed above features of the Indonesian industry of oleochemicals and surfactants give good insight into the present industry development, however it is not possible to utilize these data to prepare projection of adequate structure of this industry for national consumption efficient satisfaction.

Therefore, other instruments have to be used to analyze optimum structure of this industry by the year 2000 to allow Government to apply necessary policy measures during the last in this millennium national plan e.g. Repelita VI and Repelita VII.

In period of 1989-1991 UNIDO has prepared a number of studies related to the oleochemicals and surfactants industry development in developing countries. Basic guide manual "INDUSTRY OF SURFACTANTS" has been prepared and distributed among all developing countries. Also national and regional seminars on the options and constraints of the oleochemicals industry development have been held e.g. in Brazil. Indonesian Government in 1990 asked UNIDO to prepare oleochemicals/surfactants industry development study. Owing to financial problems this study has been concluded in 1993 and a proposal for an economically feasible programme of the oleochemicals and surfactants development was elaborated. The basic indicators of the programme are given below:

Table 16 Economic indicators of the oleochemicals and surfactants industry development in Indonesia by the year 2004.

Option	Investment cost US $ million	SRR	MVA US $ million	MVA/GPV
MAXNAT	3172	0.392	2071	0.307
MININV	1152	0.526	894	0.368
RATIO	1728	0.488	1289	0.350
LOCSUP	1150	0.476	832	0.370

Source: JSRD Report UNIDO, August 1993
Legend
MAXNAT: Natural oils, maximum demand projection
MININV: Investment limited US $ 1 billion
RATIO: High profitability at limited investment expenditures
LOCSUP: Import substitution option
SRR: Simple rate of return (profit before taxes over investment cost)
MVA: Manufacturing value added
GPV: Gross production value

In the study it has been stressed that intensive development of the complex branch of industry, related to the agriculture in supply of raw materials and wide consumers market as well as large industrial application of oleochemicals and surfactants practically by all industry, require serious attention in the field of products quality and technology development. Establishment of the Indonesian Oleochemicals and Surfactants Institute (IOSI) has been proposed. Two large R&D development Centres from France proposed their support and assistance in the centre establishment (Institute des Corps Gras and Center for International Cooperation in Agricultural Research for Development).

1.1 Linkage with regular programme funding possibilities.

There are numerous initiatives aiming at the improvement of the situation in the field of agricultural products beneficiation and increased consumption.

The FAO programme of optimization of utilization of industrial inputs in agriculture has shown in Asia large scale benefits.

Not only the growth of the production has been observed, but also stabilization of yields and produced amounts which is of vital importance for any industry development using agricultural products as raw materials.

The UNIDO programme of small and medium scale industry establishment considers the development of agro-industries and numerous projects, also in Asia, have been implemented showing the possibility to establish at village level industries of pre-processing of agricultural products e.g increasing the yields of palm and coconut oils.

These efforts have large scale social and economic implications, therefore numerous donor countries as well as the non-

governmental organizations
are involved in these programmes implementation .
The UNIDO project in Indonesia shows clearly that pattern, in which the industry development study is followed by the establishment of the technology center. The positive results of R&D efforts in rubber branch of agroindustry (Malaysian Rubber Institute) which has been established and developed with the assistance of the British Government and now is self-financing institution and large international authority in the field of production and processing of natural rubber, shows feasibility of such efforts. Indonesian Oleochemicals and Surfactants Institute has similar chances to contribute to the agro-industry development not only in Indonesia but also in other Asian countries.

Therefore, there are many funding possibilities of this programme:

- regular Regional Programme of UNDP;
- existing oleochemicals/surfactants industry own contribution;
- donor countries contribution;
- non-governmental organizations contribution;
- Indonesian Government contribution, etc.

2. Expected end of project situation

The world fatty acids and fatty alcohols overcapacities would prevent profitable use of Indonesia oleo-resources if production would be only oriented towards the above basic products. Therefore, wider range of products of higher value added should be produced supplying local and regional markets. These products would be produced also by small and medium scale industry, which requires strong technological support at va ery moderate cost.

The wider range of products and wider their application the quality requirements become an unavoidable necessity.

Export of the range of products requires adjustment to a world wide accepted specifications and development of the local standards. The specification control should be more severe in order to be able to cope with international regulations related to hygiene and safety.

Also problems related to the biodegradability and ecotoxicity would become more important for domestic and export markets. This is especially true for surfactants where such parameters as primary degradability, final degradability, biodegradability without air, toxicity for daphnies and other water fauna, etc. are strongly regulated by law in many countries. This research requires specialized laboratory servicing the full range of producers as well as the Government in regulations related matters.

To cope with the growing need for the specialized laboratory services the Indonesian Oleochemicals and Surfactants Institute will be established addressing the following issues:

- information collection and dissemination in the field of oleochemicals and surfactants for industrial companies and Government. The worldwide production/consumption data of all derivatives will be collected, trends assessed, prices/costs compared and production feasibility evaluated. The technology library will be established, including technological profiles,

the published recipes and formulations, etc.;

- elaboration and adoption of elaborated by ISO and other international organizations of the analytical methods related to identification of main components and impurities in products in order to help industry in improvement of the products quality and act as analytical expert for local as well as for imported products;

- to participate in definition and drafting of the standards and regulations for Indonesia in cooperation with National Bureau of Standards for Indonesian Government;

- establishment of the control and testing of the biodegradability and toxicity of oleochemicals and surfactants.

Also the microbiological and chemical conformity of products particularly designed for cosmetics, personal care, biocides, food additives, etc.;

- assistance in the technology development and adoption with aim at the products quality improvement, license selection, and new products and formulations development. The small pilot scale of basic unit processes used in the field of oleochemicals and surfactants technology (i.a. hydrogenation, esterification, neutralization, ethoxylation, sulfonation, condensation) will be established and access ensured to all enterprises to test their concepts or develop technology.

- training of the staff of existing and newly established enterprises in the field of technology, product quality testing, as well as in production safety and hygiene (good managerial practices).

The IOSI will be a members' organization of industrial enterprises. Every enterprise form Indonesia and abroad involved in the field of oleochemicals and surfactants production and application may become a member of the Institute and have an access to the results of work (excluding the bipartite research results carried out on the secrecy agreement basis).

2.1 IOSI's Services to Members

The IOSI will provide the following services to its members:

i. free of charge:
- regular edition of Newsletter;
- preparation of documentation review at the request;
- participation in the training workshops (see Aide-Memoire);
- organization of potential troubleshooting services;
- analytical services at the request of Government and Industrial Association;
- draft guidelines on the analytical methods and standards;
- tests of biodegradability and toxicity as well as bacteriological tests;
- legislative assistance;
- facilitated access to the regular UN system organizations publications related to the technology, environment, safety;
- facilitated access to the services offered by UN system organizations (e.g. fellowships, regional workshops);
- **direct communication between members.**

ii. at discount rates:
- experts identification services;
- access to the databank on the technological revamping and development options and selection of the investment project;
- demonstration projects (technology audits, formulations development, unit processes operation improvement, new products testing etc.);
- co-operative projects among Institute members (identified joint interest for similar technology for different applications);
- advisory services on the selection of the license and technology and conditions of its adaptation.

All these services intend to:
- ensure stable utilization of local oleo resources;
- improve the profitability of the industrial operations;
- establish and improve the legislative basis;
- ensure environmentally and consumers' safe industry development;

3. Target beneficiaries

The target beneficiaries will be oleochemicals and surfactants enterprises and investors looking for the implementation of the new technological processes and revamping the existing to the new quality products. By these means the industrial use of raw materials will grow and agriculture would have more stable outlet transforming

natural oils into high vale added products what would stabilize the prices of raw materials.

4. Project strategy and institutional arrangements

In principle IOSI will be organized at existing Government entity to use existing buildings and infrastructure. It has been proposed to use the facilities of the "Center for Research and Development of Industrial design and Engineering" owned by the Ministry of Industry at Pekayon. However, the IOSI should be a joint venture of Government and oleochemicals and surfactants producers associations like APOLIN, APROBSI etc. Also UNIDO will be involved in the IOSI establishment and operation. In fact the membership formula should be applied. All industrial enterprises producing or using in any form the oleochemicals and surfactants should become members of the Institute. The membership registration form is attached. Enterprises should pay symbolic membership fee, say 500 US $ per year.

The Institute will be governed by the Board of Trustees (BOT), composed of 11 persons elected by members; the Government will have 4 seats in BOT for the representatives of Bank, BOS, MOI and MOA and the UNIDO will have one seat in BOT. The BOT will approve the yearly R&D programme of the IOSI and annual budget. At the end of the year BOT will assess the operation of IOSI and its efficiency. The BOT will nominate Governor of the Institute. The Governor will nominate the Managers of Divisions after acceptance of selected persons by BOT. Wider description of IOSI organization is given in Annex I.

Financing of the activities of the IOSI would originate from the following resources:

- donors contribution (during first three years of operation);
- membership fees;
- a levy imposed on oleo raw materials purchased by industry from local producers as well as imported (similar as in case of ITERG France and PORIM in Malaysia);
- contracts with industry concluded on bilateral basis.

5. Reasons for assistance from UNDP/UNIDO

In numerous technical assistance projects to the developing countries UNIDO has shown the utility and usefulness of the establishment of the R&D development centres. UNIDO has ensured the qualified assistance of the individual consultants as well as specialized organizations from developed countries e.g INTREG (CIRAD) France.

6. Special considerations

None

7. Coordination arrangements

The coordination of the project will be carried out by MOI, Department of Basic Chemical Industries with the assistance of

CRDIDE, which will take the responsibility of the national counterpart organization.

8. Counterpart support capacity

CRDIDE is the public enterprise responsible for the development of the methodologies of design and engineering as well as is involved in practical execution of investment projects.
They have the necessary staff to organize the establishment of the IOSI, and also facilities to carry it out. Later the Government may like to decide another organizational set-up.

Part D. Immediate objective(s), outputs and activities

The project (IOSI) objectives are to promote and motivate implementation of chemical technologies in the field of oleochemicals and surfactants safe for consumer and environment to strengthen the linkages between agriculture and industry in production of high value added products for local consumption and export.

1. Immediate Objective 1

To establish an operational R&D Institute (IOSI).

1.1 Output 1
Organization and roster of cooperating enterprises/companies

Activities	To be completed by month	Responsible party
Activities for output 1		
1.1 Distribution of the membership questionnaire	1	Government/UNIDO Industry
1.2 Nomination of the Board of Trustees	2	Government/UNIDO Industry
1.3 Meetings of the Board of Trustees	3/9/15/22/28/34	IOSI BOT
1.4 Nomination of Governor and Managers	3	IOSI BOT
1.5 Recruitment of the personnel	6	IOSI
1.6 Training of the personnel	12	IOSI/UNIDO
1.7 Report on inception of operation of IOSI	36	IOSO/UNIDO

1.2 Output 2

Installed and operational analytical and process equipment
The IOSI will purchase equipment for the following Divisions:

(1) Documentation Division
The equipment will be computers with printing and copying facilities. Also necessary books on oleochemicals and surfactants will be purchased as well as specialized journals subscribed.

(2) Analytical and Quality Control Laboratory
The equipment will be standard to ensure the quality control of products and raw materials.

(3) Microbiological Laboratory
The equipment will be standard to provide services in the field of biodegradability, toxicity to aqueous fauna and microbiological impurities determination in cosmetics.

(4) Technology and Formulations Laboratory with Pilot Plant
The equipment will include standard chemical synthesis and formulation equipment as well as pilot scale equipment (vessels up to 1 m3, and columns up to 300mm diameter).

Activities	To be completed by month	Responsible party
Activities for output 2		
2.1 Preparation of the inquiries	6	IOSI/International experts
2.2 Selection of offers	9	IOSI/UNIDO
2.3 Delivery of the equipment and software	15	Subcontractor
2.4 Installation of the equipment	18	IOSI/UNIDO
2.5 Training period	21	UNIDO/International experts
2.6 Inception of the execution of R&D projects	21	IOSI
2.7 Services for the members	at request	IOSI

2. Immediate Objective 2

To transfer know how of the good managerial practices in oleochemicals and surfactants technology operation.

2.1 Output 1

Report of the Training Workshop on technological know how and good managerial practices of the oleochemicals and surfactants technology operation. (Two workshops.) Workshops will be organized for member's enterprises with the assistance of national and international experts. Local Academic Institutes will be also involved.

One workshop will be surfactants synthesis oriented, providing the newest stand of technology and new products on the market. The second workshop will be formulation oriented, indicating potential applications and principles of formulation development.

Activities	To be completed by month	Responsible party
Activities for output 1		
1.1 Preparation of the final Aide Memoire	15/21	IOSI/UNIDO
1.2 Distribution of Aide Memoire	16/22	IOSI
1.3 Nomination of participants by Governments	17/23	Enterprises
1.4 Recruitment of experts	16/22	UNIDO
1.5 Workshop activities	18/24	IOSI/UNIDO
1.6 Preparation of Workshop report	20/26	IOSI/UNIDO

2.2 Output 2

Advisory reports on technology development and revamping

Activities	To be completed by month	Responsible party
Activities for output 2		
2.1 Preparation of the Terms of Reference	as requested	IOSI
2.2 R&D	+8	IOSI
2.3 Preparation of the report on technological revamping options	+13	IOSI/UNIDO
2.4 Distribution of draft report to selected members	+14	IOSI/UNIDO
2.5 Collection of comments	+15	IOSI
2.6 Evaluation of the programme	+18	IOSI/UNIDO
2.7 Preparation of the project final report	36	NPD/CTA

2.3 Output 3

Information services to members and established data bank on technological processes

	To be completed by month	Responsible party
Activities for output 3		
3.1 Establishment of the library and documentation Division	16	IOSI/UNIDO
3.2 Edition of the Newsletter	monthly	IOSI
3.3 Design of the data bank	8	UNIDO/experts
3.4 Compilation of data received from field	9	IOSI
3.5 Dissemination of data	16-36	IOSI
3.6 Services to members	16-36	IOSI

2.4 Output 4

Analytical services and methodology development

Activities	To be completed by month	Responsible party
Activities for output 4		
4.1 Preparation of the analytical programme	6	UNIDO/experts
4.2 Training of personnel	9	UNIDO
4.3 Development of analytical guidelines	16	IOSI/experts
4.4 Preparation of drafts of national standards	26	IOSI/UNIDO
4.5 Services to members:	16-36	IOSI
4.5.1 Analytical	16-36	IOSI
4.5.2 Microbio	16-36	IOSI
4.5.3 Toxicity	16-36	IOSI

Part E. Inputs

(a) Government Inputs

National staff

a) National Project Coordinator
b) Secretarial and administrative support (3)
c) 15 engineers and economists
d) Building facilities :
   - laboratory (800 m2)
   - administrative (200 m2)

(b) UNDP/UNIDO Inputs

Given below budget presents all IOSI expenditures. The sources of financing will be discussed below.

Budget element	Unit	Amount	Unit cost US $	Total cost US $
International experts				
- Chief Technical Advisor(1)	m/m	6	15,000	90,000
- Experts:(2)				
-- surfactants technologist				
-- oleochemicals technologist				
-- analyst(3)				
-- industrial training specialist				
-- microbiologist(2)				
-- data bank specialist				
-- pilot plant engineer				
-- documentation specialist				
Total experts	m/m	24	15,000	360,000
National Experts(3):				
- Governor/National Project Director				
-- managers(4)				
-- scientists(7)				
-- technicians(10)				
-- pilot plant workers(12)	m/m	1224	3,000	3,720,000
Travel(4):				
Project travel				35,000
Agency staff travel				16,000
Subcontracts(5):				60,000
Technological advisory services(6):				240,000
Fellowships(7):	m/m	40	13,500	540,000
Equipment:				
Non Expendable Equipment(8):				1,260,000
Expendables (software, books)				350,000
Miscellaneous(9):				36,000
Total				6,467,000

Explanatory Notes

(1) Chief Technical Advisor is a project activities' coordinating specialist on behalf of the implementing agency (UNIDO or Government). During the period of the Centre establishment (first 3 years), he will spend the total amount of 6 m/m at the project site. The cost of the man-months includes the salary, daily subsisteace allowances, travel and miscellaneous costs.

(2) Eleven experts will advise IOSI's staff on the services provided to the members. They will visit IOSI or members' enterprises and will

prepare identification reports in their field of specialization. The cost of the man-months includes the salary, daily subsistence allowances, travel to Jakarta and/or to enterprise site, and miscellaneous costs.

(3) The national experts are the IOSI staff and provide services. They will be employed for the full period of the IOSI operation. The man-month cost of their services will cover salaries, social taxes, insurance, overheads, etc.

(4) To cover the cost of travel of the Board of Trustees members to the meetings in Jakarta or to the executing agency office. Six meetings are foreseen of three days duration each. It is also foreseen that the agency staff members will travel to contribute to the workshop program.

(5) To cover the cost of the feasibility study.

(6) The demonstration project reports in six enterprises (two oleochemicals and four in surfactants). The cases will be selected on the basis of the voluntary admission of the member enterprise if it would represent easily generalized case to be disseminated later among the other member enterprises. The cost of audit and advisory services by specialized experts are covered in the amount of 30 percent by the budget. The remaining part of the cost of demonstration project report will be shared by the enterprise itself and by the company providing the experts.

(7) It is foreseen to train 21 staff members abroad of total duration of trainin 40 m/m. Budget covers the travel cost, daily subsistence allowances as well as reasonable fee for the receiving organization. (6,000 US $/month/person).

(8) Necessary equipment will be purchased, as well as the necessary software (fax and photocopying machines and computer equipment).

(9) Publishing of the Newsletter, twelve editions, reports production and distribution, etc., will be covered by the budget.

c) Financial sources

The structure of financing depends on decisions of the Indonesian Government and donors interest. Below is given alternative budget financing:

(I) full coverage by the Indonesian counterpart
(II) partial financing by donors and UNDP.

Alternative I
During first three years of operation the cost of the establishment of the IOSI and its promotional services would cost about US $ 7 million e.g US $2.3 million per year. The membership fee in amount of US $500 per year from future members (it is expected that 60-70 enterprises would become members of the Institute) can not support the activities. Therefore it is proposed to impose the levy on each ton of oleoresources used by industry to cover the costs of IOSI

operation. The industrial use of oleoresources projected by the year 2000, shows consumption between 2,30-3.07 million tons of oleoresources. Therefore, the levy in amount of 1US $ pere ton of oil would cover all costs of the IOSI.

Alternative II
Taking into account interest of donor countries in establishment of the IOSI the following hypothesis for fund raising can be proposed:

Donor I: Costs of international experts and fellowships in amount of US $ 990,000
Donor II: Costs of equipment in amount of US $ 1,260,000

National experts costs: Levies. In this case the imposed levies should be established in amount of 0.6-0.7 US $ per ton of oleoresources used industrially.

UNDP: All administrative costs.

d) Self-financing period

After three years of piloting scheme of IOSI operation the annual cost budget will be as follows:

Budget element	Unit	Amount	Unit cost US $	Total cost US $
Personnel costs	m/m	408	3,000	1,224,000
Board of Trustees	1/			32,000
Depreciation	2/			252,000
Maintenance	3/			126,000
Utilities	4/			120,000
Rents	5/ m2	2000	1,500	30,000
Overheads	6/			240,000
Total				2,024,000

These costs can be covered from levies in amount of 0.5 US $ per ton of oleoresources used by industry and by contracts with industry in amount of about US $ 600,000-1,000,000.

Explanatory notes:

1/ Travel and salaries of Board of Trustees during meetings and their services contribution.
2/ Depreciation time 5 years for equipment specified.
3/ 50% of depreciation cost for spare parts and reparations
4/ Mainly pilot plant operation
5/ Rents for buildings and facilities
6/ Overheads 20% of personnel costs

e) Efficiency of the IOSI.

Efficiency of IOSI can be assessed ex-post, when number of

technologies, developed, revamped and sold would be known. However, taking into account the output value of the oleochemicals, and surfactants industry in Indonesia amounting about US $ 2 billion, the annual costs of R&D subcontracted to IOSI or received in form of documentation amounting 2 promiles of output, shows that IOSI concept is efficient. The actual R&D expenditures of leading surfactants' producers in developed countries vary from 3-%-7%.

Part F. Risks

Description of risk	Estimated likelihood
1. Factors which can over time cause major delays or prevent achievement of the project's outputs and objectives	
1.1 Delay in the international consultants recruitment	low (necessary high quality consultants were recruited by similar UNIDO projects)
1.2 Delay in the staff nomination	medium (Government may have difficulties to nominate required high caliber national staff).
1.3 Delay in the equipment purchase	low (UNIDO purchased necessary equipment for similar projects)
2. Factors which may at the outset cause major delays or prevent achievement of the project's outputs and objectives	
2.1 Delay in the staff nomination	medium (finally Government will be interested to staff the IOS

Part G. Prior obligations and prerequisites

(a) Prior obligations

The Project Document will be signed by UNDP, and UNDP assistance to the project will be provided only if the prior obligations stipulated above have been met to UNDP's satisfaction.

1. National Project Coordinator will be nominated
2. Cost-sharing facilities will be confirmed.

(b) Prerequisites

The Project Document will be signed by UNDP, and UNDP assistance to the project will be provided, subject to UNDP receiving satisfaction that the prerequisites listed above have been fulfilled, or are likely to be fulfilled. When anticipated fulfillment of one or more prerequisites fails to materialize, UNDP may, at its discretion, either suspend or terminate its assistance.

1. Nomination of the IOSI staff will be decided.

Part H. Project reviews, reporting and evaluation

(a) The project will be subject to standard review.
(b) A project terminal report will be prepared for consideration of all parties concerned.

Part I. Legal context

This Project Document shall be the instrument referred to as such in Article I of the Standard Basic Assistance Agreement between the Government of the Republic of Indonesia the United Nations Development Programme, signed by the Parties on

Part J. Budgets

As presented in Part E (b) and Annex I.

INDONESIAN OLEOCHEMICALS AND SURFACTANTS INSTITUTE (IOSI)
(UNIDO)

MEMBERSHIP CONFIRMATION

We.....
(Name and address of enterprise)
.....

.....
declare access as a member to the Indonesian Oleochemicals and Surfactants Institute.

The enterprise would fulfill all obligations stated in the Charter of IOSI (attached) and:

(a) expects to receive technical support in transformation of the operated technology
.....

.....
(list of technologies included)

(b) is ready to provide support in revamping of the technology
.....
(list of technologies included)
.....

The enterprise is interested in receiving regular Newsletters on oleochemicals and surfactants technology, trade, marketing and production as well as guidelines and other publications on the matter and wishes to train its managerial forces, as well as would be interested after consideration of conditions to receive advisory services on restructuring and revamping of chemical installations.

Signatures:

....
President of the Board (or equivalent) Chief Executive Officer

Date..... Location.....
Remarks:

ANNEX I.

LABORATORIES :

The Research center will comprise the following laboratories :

1- Laboratory of Analytical Chemistry and Quality Control of Fats

2- Laboratory of chemistry and formulation

3- Laboratory of environmental studies and microbiology

4- Pilot Laboratory for industrial applications :

formulation
detergency
leather treatment
papermaking industry
textile industry
Crude petrol extraction and derivatives
others...

The Laboratory of Analytical Chemistry and Quality Control of Fats is devised as a laboratory achieving total quality, where all routine determinations in fats & oils analysis will be performed. This conception will allow this laboratory to become an approved laboratory with a broad national acceptance. Its equipment will be standard equipment to be operated by qualified chemists, however sufficient to allow most standardized methods to be performed, and to ensure quality control of oleochemicals and detergents.

Estimations : 5 scientists of whom 2 are upper graduate and 3 technical staff.
Equipments 400,000 $

The Laboratory of Chemistry and Formulation, comprises standard equipment for chemistry from the 1 g range up to Kg end products. Efficient air extractor is at disposal and other ancillary devices.

Estimations : 3 scientists of whom two at least are upper graduate and one technician.
Equipments 120,000 $

The Laboratory of environmental studies and microbiology reponds to consumers demand for products both safer and more friendly to environment, and this new requirement is part of the performance of any new product or formula. Classical biodegradability tests will be performed for detergents, and efficiency of water depollution devices will be checked. The microbiological determinations will ensure safety control in high water content emulsions for cosmetics or other applications.

Estimations : 2 scientists with one skilled microbiologist and one technician.
Equipements 240,000 $

The Pilot laboratory for industrial applications will allow proper finalization and further evaluation of formulations within different possible applications , by comparison of their performances with those of standard products.

Equipments for mixing and formulating solid and liquid products in noticeable quantity are at disposal, and specific standardized trials are performed according to the industrial applications.

Estimations: 3 qualified technicians, trained in downstream oleochemicals using industries, and two staff for handling and maintenance.

Lab-scale pilot equipments 400,000 $(might be delayed until the center is fully operating)

recap :

Documentation	2 P	100,000 $
Analytical Chemistry	5 P	400,000 $
Chemistry & formulation	3 P	120,000 $
Environment microbiology	2 P	240,000 $
pilot laboratory	5 P	400,000 $
Total technical staff	17 P	
Equipments		1260,000 $ *

* prices in US dollars corresponding to delivery of equipments in France (local prices in Indonesia not yet available)