

DEMAND FORECAST ON UREA, THE PHILIPPINES

ANNEX II
Tab. 1-2-20

	1975	1976	1977	1980	1985	1990
	(Urea 000 ton)					
Fertilizer:						
Food crop sector	85.2	N.A.	N.A.			
Export crop sector	58.7	N.A.	N.A.			
Total	143.9	174.8	227.8	256.3	329.1	402.0
Industrial:						
Urea-formaldehyde adhesive	6.3	4.3	6.3	11.5	14.3	17.2
Total:	150.2	179.1	234.1	267.8	343.4	419.2

Note: 1975-1977: Actual or estimated.

NITROGEN FERTILIZER SUPPLY/DEMAND PROJECTION, THE PHILIPPINES

(N 000 ton)

	1975*)	1976*)	1977*)	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Capacity/Production													
Planters Products	NH3	76	76	76	76	76	76	76	76	76	76	76	76
	Cap. (A)	32	30	20	23	23	23	23	23	23	23	23	23
	Prod. (B)	42	39	27	30	30	30	30	30	30	30	30	30
	(B)/(A) %												
Maria Cristina	NH3	25	25	25	25	25	25	25	25	25	25	25	25
	Cap.	6	4	2	7	7	7	7	7	7	7	7	7
	Prod. (B)	26	15	9	28	28	28	28	28	28	28	28	28
	(B)/(A) %												
New Project (1984/7)	NH3									74	148	148	148
	Cap.									48	100	111	118
	Prod. (B)									65	68	75	80
	(B)/(A) %												
Total	Cap.	101	101	101	101	101	101	101	101	175	249	249	249
	Prod.	38	33	22	30	30	30	30	30	78	129	141	148
Industrial Use	Cap.	3	2	3	5	5	6	6	6	6	7	7	7
	Prod.	35	31	19	25	25	24	24	24	72	122	134	141
Supply Capability	Cap.	135	156	180	194	208	233	245	257	269	280	292	304
	Prod.	-100	-125	-161	-169	-183	-209	-221	-233	-197	-158	-158	-163

See notes of Tab. 1-1-31.

UREA SUPPLY/DEMAND PROJECTION, THE PHILIPPINES

ANNEX II
Tab. 1-2-22

	1975 [*]	1976 [*]	1977 [*]	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
(Product 000 ton)													
Capacity/Production													
Planters Products	Urea Cap. (A)	68	68	68									
	Prod. (B)	24	14	-									
	(B)/(A) %	35	21	-									
New Project (1984/7)	Urea Cap. (B)/(A) %												
	Cap. Prod.	68	68	68						150	300	300	300
		24	14	-						98	203	225	240
		6	4	6	10	11	12	12	13	14	14	15	15
Total	Cap. Prod.	18	10	-6	-10	-11	-12	-12	-13	84	189	210	225
Industrial Use		144	175	228	236	245	256	270	284	313	329	344	358
Supply Capability		-126	-165	-234	-246	-256	-268	-282	-297	-229	-140	-134	-133
Demand													
Balance													

For notes of this table, see notes of Tab. 1-1-31.

LAND UTILIZATION OF THAILAND BY REGION 1975 - 1976

ANNEX II
Tab. 1-3-1

Region	Farm holding land			
	Total land 000 ha	000 ha	% of total farm holding land in res- pective region	of which: Paddy land 000 ha % of farm holding land
Northern	17,001	3,811	20.5	2,497 65.5
North-Eastern	17,023	8,074	43.4	5,723 70.9
Central	10,358	4,399	23.7	2,691 61.2
Southern	7,019	2,302	12.4	811 35.2
Thailand Total	51,401	18,586	100.0	11,722 63.1

Source: Agricultural Statistics of Thailand,
Crop Year 1976/77

GROSS DOMESTIC PRODUCT BY INDUSTRIAL ORIGIN, THAILAND
(IN 1962 CONSTANT PRICES)

ANNEX II
Tab. 1-3-2

	1960		1970		1975	
	Mil. Bahts	% of GDP	Mil. Bahts	% of GDP	Mil. Bahts	% of GDP
Agriculture, Forestry and Fisheries	21,400	38.2	36,174	30.0	44,954	27.5
of which: Crops	15,873	28.3	25,139	20.8	31,595	19.3
Mining and Quarrying	610	1.1	1,792	1.5	1,936	1.2
Manufacturing	7,320	13.1	20,607	17.1	33,026	20.2
Construction	2,725	4.9	7,019	5.8	7,186	4.4
Commercial	8,845	15.8	20,995	17.4	24,680	15.1
G D P	56,069	100.0	120,728	100.0	163,205	100.0

Source: Office of National Economic and Social
Development Board, National Income of
Thailand

ECONOMICALLY ACTIVE POPULATION 11 YEARS OF AGE AND OVER,
BY INDUSTRY, THAILAND

ANNEX II
Tab. 1-3-3

	(1,000 persons)	
	1960	1970
	(%)	(%)
Agriculture, forestry, hunting and fishing	11,334	13,202
	83.8	79.9
Mining and quarrying	29	87
	0.2	0.5
Manufacturing	471	683
	3.5	4.1
Construction	68	182
	0.5	1.1
Commerce	770	850
	5.7	5.1
Total	13,519	16,507
	100.0	100.0

Note: Number of persons classified under an item "Activities not adequately described or unknown" is excluded.

Source: Statistical Yearbook, Thailand

TOTAL EXPORTS AND EXPORT OF AGRICULTURAL PRODUCTS, THAILAND

ANNEX II
Tab. 1-3-4

(Million Bahts)

	1965		1970		1975	
		(%)		(%)		(%)
Total Exports	12,941	100.0	14,772	100.0	48,438	100.0
Agricultural Exports	10,827	83.7	11,368	77.0	32,924	68.0
Rice and Rice Products	4,334	33.5	2,517	17.0	5,581	11.5
Maize and Maize Products	1,003	7.8	1,969	13.3	5,705	11.8
Cassava and Cassava Prod.	676	5.2	1,223	8.3	4,596	9.5
Sugar and Sugar Products	138	1.1	406	2.7	6,183	12.8
Sub-total	6,151	47.6	6,115	41.3	22,065	45.6
Rubber	1,999	15.4	2,250	15.2	3,473	7.2
Kenaf	1,102	8.5	709	4.8	641	1.3
Livestock Products	128	1.0	134	0.9	213	0.4
Fishery Products	146	1.1	332	2.2	1,754	3.6
Forestry Products	381	2.9	294	2.0	1,000	2.1

Source: Agricultural Statistics of Thailand,
Crop Year 1976/77

RICE: PRODUCTION AND EXPORT, THAILAND

ANNEX II
Tab. 1-3-5

	Production (A) (000 ton)	Export (B) (000 ton)	(A-B) (000 ton)	Population (000 persons)
1963/65 Average	11,313	1,736	9,577	29,870
1968/70 Average	11,128	1,052	10,076	35,173
1973/75 Average	13,566	923	12,643	40,780
1963/65 - 1968/70 (%)	-0.33	-9.53	1.02	3.32
Average annual growth rate 1968/70 - 1973/75 (%)	4.04	-2.58	4.64	3.00
1963/65 - 1973/75 (%)	1.83	-6.12	2.82	3.16

Source: Agricultural Statistics of Thailand,
Crop Year 1976/77

SUPPLY/DEMAND OF NITROGEN FERTILIZERS, THAILAND ANNEX II
Tab. 1-3-6

(N 000 ton)

	Supply			Consumption	
	Production	Import	Total	Ferti- lizer	Industrial use
1960	-	9	9	9	-
1961	-	10	10	10	-
1962	-	12	12	12	-
1963	-	17	17	17	-
1964	-	19	19	19	-
1965	-	16	16	16	-
1966	1	25	26	26	-
1967	9	40	49	48	1
1968	7	47	54	52	2
1969	5	45	50	48	2
1970	11	40	51	48	3
1971	10	41	51	47	4
1972	8	66	74	69	4
1973	6	64	70	64	5
1974	7	60	67	62	5
1975	4	74	78	73	5
1976*	7	114	121	103	5
1977*	9	109	118	82	5

Notes: 1. Fertilizer consumption was calculated using a formula as follows:

$$\text{(Fertilizer consumption)} = \text{(Production)} + \text{(Import)} - \text{(Industrial use)}$$

2. When the consumption in 1976 and in 1977 was calculated, the increase in inventory was reduced from the above formula. The increase in inventory was estimated as follows:

1976 12,478 N ton
1977 30,304 N ton

Source: Division of Agricultural Economics

PRODUCTION CAPACITIES AND ACTUAL PRODUCTION OF NITROGEN FERTILIZERS,
BY PRODUCERS, THAILAND

ANNEX II
Tab. I-3-7

Name of Producer	Chemical Fertilizer Company (CFC)				Thai Central Chemical Co. (TCCC)			
	Urea		AS		NPK			
Year	Capacity Production	%	Capacity Production	%	Capacity Production	%	Capacity Production	%
1966			60,000	4,315	7.2			
1967	26,000	6,885	26.5	27,459	45.8			
1968	26,000	7,043	27.1	19,838	33.1			
1969	26,000	5,028	19.3	12,012	20.0			
1970	26,000	12,629	48.6	27,134	45.2			
1971	26,000	10,219	39.3	27,756	46.3			
1972	26,000	5,400	20.8	25,600	42.7			
1973	26,000	3,965	15.3	19,226	32.0			
1974	26,000	5,083	19.6	23,900	39.8			
1975	26,000	2,600	10.0	15,800	26.3	100,000	85,820	85.8
1976	26,000	3,300	12.7	25,200	42.0	120,000	123,146	102.6

ACTUAL AND PROJECTED DEMAND FOR UREA AND
NITROGEN FERTILIZER, THAILAND

ANNEX II
Tab. 1-3-8

	N 000 ton		Urea 000 ton		
	Actual + Study Forecast	AFS (1976)	Actual + Study Forecast	DAE	AFS (1976)
1965	16*				
1966	26*				
1967	48*				
1968	52*				
1969	48*				
1970	48*				
1971	47*				
1972	69*				
1973	64*		5*		
1974	62*		8*		
1975	73*		4*		
1976	103*	85	8*		119
1977	82*	97	8*	10	141
1978	123	107	10	12	159
1979	131	119	12	15	181
1980	139	131	16	18	203
1981	148	144	22	22	222
1982	156	156	29	26	249
1983	165	167	37		266
1984	174	183	46		279
1985	182	196	56		290
1986	190		66		
1987	198		77		
1988	205		88		
1989	213		100		
1990	220		113		

Sources: AFS: Agrar-Und Hydrotechnik GmbH,
"Fertilizer Market Study,
ASEAN Region", (1976)

DAE: Provided by Division of Agri-
cultural Economics, Ministry
of Agriculture and Co-operations,
Thailand

Note: *: Actual

ACTUAL AND PROJECTED PLANTED AREA OF PADDY, THAILAND

ANNEX II
Tab. 1-3-9

(000 ha)

	Actual											Projected		
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1980	1985	1990
North Region	1,511	1,454	1,531	1,605	1,597	1,472	1,515	1,839	1,662	1,921	1,727	H 1,926	2,095	2,265
												L&M 1,837	1,912	1,973
North East Region	3,141	2,426	2,858	3,238	3,274	3,435	1,959	3,552	3,309	4,003	3,802	H 4,023	4,490	4,957
												L&M 3,757	3,956	4,120
Central Region	2,230	2,206	2,265	2,146	2,086	2,107	2,298	2,479	2,397	2,409	2,424	H 2,527	2,666	2,805
												L&M 2,445	2,503	2,551
South Region	551	572	574	595	538	512	617	493	614	564	623	H, 595	610	624
												L&M		
Total	7,433	6,658	7,228	7,584	7,495	7,526	6,389	8,363	7,982	8,897	8,576	H 9,071	9,861	10,651
												L&M 8,634	8,981	9,268

Notes: H: High Case
M: Moderate case
L: Low Case

Source: Actual: "Agricultural Statistics of Thailand,
Crop Year 1976/77"

TYPES OF FERTILIZERS ESTIMATED
TO HAVE BEEN USED,
BY CROP AND BY REGION, THAILAND

ANNEX II
Tab. 1-3-10

Paddy	16-20-0 18-22-0 20-20-0			
Vegetables	1/3 of Ammonium sulphate Urea 2/5 of other complex fertilizers			
Sugar Cane	(North)	(Northeast)	(Central)	(South)
	1/3 of Ammonium sulphate 12-10-18 1/3 of 13-13-21 1/3 of other complex fertilizers	1/3 of Ammonium sulphate 12-10-18 1/3 of 13-13-21	1/3 of Ammonium sulphate 12-10-18 1/3 of 13-13-21 1/3 of other complex fertilizers	-
Tobacco	6-18-24+3MgO			
Corn	2/3 of 12-24-12			
Rubber	(North & Northeast)		(Central & South)	
	-		11-8-4+3MgO 10-16-9+2.5MgO 18-11-5+2.5MgO 14-3-9+2.5MgO	
Others	(North)	(Northeast)	(Central)	(South)
	1/3 of Ammonium sulphate 2/3 of 13-13-21 12-12-17+2MgO 1/3 of 12-24-12 4/15 of other complex fertilizers	1/3 of Ammonium sulphate 2/3 of 13-13-21 12-12-17+2MgO 1/3 of 12-24-12 3/5 of other complex fertilizers	1/3 of Ammonium sulphate 2/3 of 13-13-21 12-12-17+2MgO 1/3 of 12-24-12 4/15 of other complex fertilizers	2/3 of Ammonium sulphate 13-13-21 12-12-17+2MgO 1/3 of 12-24-12 3/5 of other complex fertilizers

FORECAST ON DEMAND FOR NITROGEN FERTILIZER, PADDY, THAILAND

ANNEX II
Tab. 1-3-11

	Actual or Estimated										Projected		
	1970	1972	1973	1974	1975	1976	1980	1985	1990				
North Region													
A. Planted Area (000 ha)	1,597	1,515	1,839	1,662	1,921	1,727	1,837	1,912	1,973				
B. Average Dosage (N kg/ha) (Potential Dosage = 34 N kg/ha)	0.5	0.4	0.4	0.4	0.6	0.7	0.8	0.9	1.2				
C. Actual/Projected Demand (N 000 t)	0.8	0.7	0.7	0.7	1.1	1.1	1.5	1.7	2.4				
North East Region													
A. Planted Area (000 ha)	3,274	1,959	3,552	3,309	4,003	3,802	3,757	3,956	4,120				
B. Average Dosage (N kg/ha) (Potential Dosage = 26 N kg/ha)	3.6	6.7	3.0	2.6	3.6	4.5	4.4	5.3	6.4				
C. Actual/Projected Demand (N 000 t)	11.6	13.1	10.8	8.7	14.4	17.1	16.5	21.0	26.4				
Central Region													
A. Planted Area (000 ha)	2,086	2,298	2,479	2,397	2,409	2,424	2,445	2,503	2,551				
B. Average Dosage (N kg/ha) (Potential Dosage = 30 N kg/ha)	9.0	4.6	10.4	9.1	9.6	12.1	12.3	15.3	18.5				
C. Actual/Projected Demand (N 000 t)	18.7	10.6	25.8	21.7	23.2	29.4	30.1	38.3	47.2				
South Region													
A. Planted Area (000 ha)	538	617	493	614	564	623	595	610	624				
B. Average Dosage (N kg/ha) (Potential Dosage = 23 N kg/ha)	4.0	4.3	3.9	2.7	3.6	3.9	3.9	4.2	4.5				
C. Actual/Projected Demand (N 000 t)	2.2	2.7	1.9	1.6	2.0	2.4	2.3	2.6	2.8				
Total													
Actual/Projected Demand (N 000 t)	33.3	27.1	39.2	32.7	40.7	50.0	50.4	63.6	78.8				

Notes: 1. As for the planted area, see Tab. 1-3-9

2. Up to 1976: (B) = (C)/(A)

3. (Projected demand) = (A) x (B)

Sources: 1. Planted area: "Agricultural Statistics of Thailand, Crop Year 1976/77"

2. Actual demand: Division of Agricultural Economics, "Fertilizer Statistics" (in Thai).

FORECAST ON DEMAND FOR NITROGEN FERTILIZER, PADDY, THAILAND
 - HIGH CASE AND LOW CASE

ANNEX II
 Tab. 1-3-12

	High Case			Low Case		
	1980	1985	1990	1980	1985	1990
North Region						
A. Planted Area (000 ha)	1,926	2,095	2,265	1,837	1,912	1,973
B. Average Dosage (N kg/ha)	0.8	0.9	1.2	0.7	0.9	1.1
C. Projected Demand (N 000 t)	1.5	1.9	2.7	1.3	1.7	2.2
North East Region						
A. Planted Area (000 ha)	4,023	4,490	4,957	3,757	3,956	4,120
B. Average Dosage (N kg/ha)	4.4	5.3	6.4	4.0	4.0	4.0
C. Projected Demand (N 000 t)	17.7	23.8	31.7	15.0	15.8	16.5
Central Region						
A. Planted Area (000 ha)	2,527	2,666	2,805	2,445	2,503	2,551
B. Average Dosage (N kg/ha)	12.3	15.3	18.5	12.3	15.3	18.5
C. Projected Demand (N 000 t)	31.1	40.8	51.9	30.1	38.3	47.2
South Region						
A. Planted Area (000 ha)	595	610	624	595	610	624
B. Average Dosage (N kg/ha)	3.9	4.2	4.5	3.7	3.7	3.7
C. Projected Demand (N 000 t)	2.3	2.6	2.8	2.2	2.3	2.3
Total	52.6	69.1	89.1	48.6	58.1	68.2

See notes of Tab. 1-3-11.

AGRICULTURAL PRODUCT/FERTILIZER PRICE RATIO,
THAILAND

ANNEX II
Tab. 1-3-13

	1972	1973	1974	1975	1976
Rice	33.03	50.23	41.41	48.47	63.82
Sugar Cane	5.95	5.76	3.88	5.48	16.02
Rubber	0.20	0.18	0.15	0.16	0.21

Notes: 1. The above ratio is calculated on the price of the following fertilizers:

Rice : 16-20-0
Sugar Cane: Ammonium sulphate
Rubber : 16-20-0

2. The ratio is calculated on the following unit prices:

Fertilizer: baht/kg
Rice : baht/kwien
Sugar Cane: baht/ton
Rubber : baht/kg

Sources: 1. Fertilizer prices:
Jumrush Intachaisri (Division of Agricultural Economics), "An Answer to the Question on Price and Subsidy Policy of Fertilizer" (1978)

2. Prices of Agricultural Products:
"Agricultural Statistics of Thailand, Crop Year 1976/77"

FORECAST ON DEMAND FOR NITROGEN FERTILIZER, OTHER CROPS, THAILAND

ANNEX II
Tab. 1-3-14

	Actual or Estimated							Projected		
	1970	1972	1973	1974	1975	1976	1978	1980	1985	1990
Vegetables										
A. Planted Area (000 ha)	89	103	100	94	93	92	104	112	121	
B. Average Dosage (N kg/ha)	72.3	26.3	63.5	90.0	87.9	108.8	115.7	116.0	116.0	
(Potential Dosage = 145 N kg/ha)										
C. Actual/Projected Demand (N 000 t)	6.4	2.7	6.3	8.5	8.2	10.0	12.0	13.0	14.0	
Sugar Cane										
A. Planted Area (000 ha)	138	181	259	310	391	499	654	861	1,031	
B. Average Dosage (N kg/ha)		30.1	26.5	25.3	29.5	51.1	55.9	62.1	63.6	
(Projected Dosage = 75 N kg/ha)										
C. Actual/Projected Demand (N 000 t)		5.4	6.9	7.8	11.5	25.5	36.6	53.5	65.6	
Tobacco										
A. Planted Area (000 ha)	24	44	38	46	32	53	61	77	93	
B. Average Dosage (N kg/ha)		24.7	30.9	34.2	48.3	22.5	25.0	25.0	25.0	
(Potential Dosage = 25 N kg/ha)										
C. Actual/Projected Demand (N 000 t)		1.1	1.2	1.6	1.6	1.2	1.5	1.9	2.3	
Corn										
A. Planted Area (000 ha)	829	997	1,148	1,240	1,312	1,285	1,439	1,601	1,733	
B. Average Dosage (N kg/ha)			0.1	0.1	0.1	0.1	0.1	0.1	0.1	
(Potential Dosage = 60 N kg/ha)										
C. Actual/Projected Demand (N 000 t)			0.1	0.1	0.1	0.1	0.1	0.2	0.2	
Rubber										
A. Planted Area (000 ha)	1,276	1,340	1,372	1,406	1,406	1,456	1,548	1,638	1,711	
B. Average Dosage (N kg/ha)		3.0	3.8	3.3	3.8	3.4	4.0	4.5	5.1	
(Potential Dosage = 60 N kg/ha)										
C. Actual/Projected Demand (N 000 t)		4.0	5.2	4.6	5.3	4.9	6.2	7.4	8.7	
Total										
Actual/Projected Demand (N 000 t)			19.7	22.6	26.7	41.7	56.4	76.0	90.8	

Notes: 1. Up to 1976: (B) = (C)/(A)

2. (Projected demand) = (A) x (B)

Sources: 1. Planted area: "Agricultural Statistics of Thailand, Crop Year 1976/77"

2. Actual demand: Division of Agricultural Economics, "Fertilizer Statistics" (in Thai)

DEMAND FORECAST ON NITROGEN FERTILIZER, MISCELLANEOUS CROPS, THAILAND

ANNEX II
Tab. 1-3-16

	1973	1974	1975	1976	1980	1985	1990
- N Fertilizer Requirement							
Fruits	28.4	28.9	29.5	30.1	32.5	35.7	39.3
Other Crops	34.7	39.8	41.1	44.3	56.5	71.6	86.6
Total (A)	63.1	68.7	70.6	74.4	89.0	107.3	125.9
- Actual Consumption (B)	7.3	7.7	11.7	18.7			
C (=B/A): %	11.6	11.2	16.6	25.1			
Projected C (Ĉ): %					36.1	39.6	40.0
- Projected Demand (A x Ĉ)					32.1	42.5	50.4

Note: N fertilizer requirements are computed using the following potential dosages (N kg/ha):

Fruits	60.0	Coconut	8.2
Cassava	50.0	Cotton	31.3
Kenaf	22.6	Groundnut	15.6
Soybean	15.6		

See sources of Tab. 1-3-14.

SUMMARY OF DEMAND FORECAST ON NITROGEN FERTILIZER, THAILAND

ANNEX II
Tab. 1-3-17

	1973	1974	1975	1976	1980	1985	1990
						(N 000 ton)	
Paddy:							
North East	0.7	0.7	1.1	1.1	1.5	1.7	2.4
Central	10.8	8.7	14.4	17.1	16.5	21.0	26.4
South	25.8	21.7	23.2	29.4	30.1	38.3	47.2
Total	1.9	1.6	2.0	2.4	2.3	2.6	2.8
	39.2	32.7	40.7	50.0	50.4	63.6	78.8
Vegetables	6.3	8.5	8.2	10.0	12.0	13.0	14.0
Sugar Cane	6.9	7.8	11.5	25.5	36.6	53.5	65.6
Tobacco	1.2	1.6	1.6	1.2	1.5	1.9	2.3
Corn	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Rubber	5.2	4.6	5.3	4.9	6.2	7.4	8.7
Others	7.3	7.7	11.7	18.7	32.1	42.5	50.0
Grand Total: Estimate	65.8	61.2	77.3	107.9	138.9	182.1	219.6
Actual	64.5	62.1	73.4	103.1			

For notes of this table, see notes of Tab. 1-1-25.

SUMMARY OF DEMAND FORECAST ON NITROGEN FERTILIZER, THAILAND
- HIGH CASE AND LOW CASE

ANNEX II
Tab. 13-18

	High Case				Low Case			
	1980	1985	1990	1980	1985	1990	1980	1990
Paddy:								
North Region	1.5	1.9	2.7	1.3	1.7	2.2	1.3	1.7
North East Region	17.7	23.8	31.7	15.0	15.8	16.5	15.0	15.8
Central Region	31.1	40.8	51.9	30.1	38.3	47.2	30.1	38.3
South Region	2.3	2.6	2.8	2.2	2.3	2.3	2.2	2.3
Total	52.6	69.1	89.1	48.6	58.1	68.2	48.6	58.1
Vegetables	12.0	13.0	14.0	12.0	13.0	14.0	12.0	13.0
Sugar Cane	44.1	72.8	99.0	33.4	43.9	49.9	33.4	43.9
Tobacco	1.5	1.9	2.3	1.5	1.9	2.3	1.5	1.9
Corn	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.2
Rubber	6.2	7.4	8.7	6.2	7.4	8.7	6.2	7.4
Others	32.1	42.5	50.0	32.1	42.5	50.0	32.1	42.5
Grand Total	148.6	206.9	263.3	133.9	167.0	193.3	133.9	167.0

FORECAST ON DEMAND FOR FERTILIZER UREA, THAILAND

ANNEX II
Tab. 1-3-19

(N 000 ton)

	Actual					Projected		
	1973	1974	1975	1976	1980	1985	1990	
Vegetables								
Total N Fertilizer Demand (A)	6.3	8.5	8.2	10.0	12.0	13.0	14.0	
Urea Demand (B)	2.1	3.8	2.0	3.6				
Proportion of Urea: (B)/(A) (%)	33.3	44.7	24.4	36.0				
Projected (B)/(A): (=C)					35.0	45.0	60.0	
Projected Demand for Urea (A)x(C)					3.7	5.9	8.4	
Paddy								
Total N Fertilizer Demand (A)	39.2	32.7	40.7	50.0	50.4	63.6	78.8	
Projected Proportion of Urea As Straight Fertilizer (B): % of (A)					5.0	15.0	25.0	
As Constituent of Complex Fertilizer: % of ((A) less (E)) = (D)					-	5.0	10.0	
Projected Demand for Urea As Straight Fertilizer (E): (A) x (B)					2.5	9.5	19.7	
As Constituent of Complex Fertilizer: (A - E) x (D)					-	2.7	5.9	
Others								
Total N Fertilizer Demand (A)	7.3	7.7	11.7	18.7	32.1	42.5	50.0	
Projected Proportion of Urea (B)					4.5	18.0	36.0	
Projected Demand for Urea: (A) x (B)					1.4	7.6	18.0	
Total Demand for Urea	2.1	3.8	2.0	3.6	7.5	25.7	52.0	

Source: Actual demand: Division of Agricultural Economics,
"Fertilizer Statistics" (in Thai).

DEMAND FORECAST ON UREA, THAILAND

ANNEX II
Tab. 1-3-20

	1975	1976	1977	1980	1985	1990
	(Urea 000 ton)					
Fertilizer:						
Vegetables	4.3	7.8	N.A.	7.8	12.8	18.3
Paddy						
Straight Fert.				5.4	20.7	42.8
Raw material for				0	5.9	12.8
Complex Fert.						
Others				3.0	16.5	39.1
Total	4.3	7.8	N.A.	16.2	55.9	113.0
Industrial:						
Urea-formaldehyde adhesive	4.3	3.9	4.3	5.0	5.9	6.3
Monosodium L-glutamate	8.0	6.7	7.0	10.9	14.8	18.7
Total	12.3	10.6	11.3	15.9	20.7	25.0
Total:	16.6	18.4	N.A.	32.1	76.6	138.0

Note: 1975-1977: Actual or estimated.

Source: Actual demand: Division of Agricultural Economics, "Fertilizer Statistics" (in Thai).

NITROGEN FERTILIZER SUPPLY/DEMAND PROJECTION, THAILAND

ANNEX II
Tab. 1-3-21

		(N 000 ton)												
		1975 [*]	1976 [*]	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Capacity/Production														
CFC	NH3 Cap. (A)	27	27	27	27	27	27	27	27	27	27	27	27	27
	Prod. (B)	5	7	7	7	7	7	7	7	7	7	7	7	7
	(B)/(A) %	17	25	26	26	26	26	26	26	26	26	26	26	26
New Plant (1985/7)	NH3 Cap.											135	270	270
	Prod.											88	182	203
	(B)/(A) %											65	68	75
Total	Cap. Prod.	27	27	27	27	27	27	27	27	27	27	162	297	297
Industrial Use	Cap. Prod.	5	7	7	7	7	7	7	7	7	7	95	189	209
	Cap. Prod.	6	5	5	6	7	7	8	8	9	9	10	10	10
	Cap. Prod.	-1	2	2	1	0	0	-1	-1	-2	-2	85	179	199
Supply Capability	Cap. Prod.	65	208	110	120	130	139	148	156	165	174	182	190	198
Demand	Cap. Prod.	-66	-106	-108	-119	-130	-139	-149	-157	-167	-176	-97	-11	1
Balance	Cap. Prod.													

See notes of Tab. 1-1-31.

UREA SUPPLY/DEMAND PROJECTION, THAILAND

ANNEX II
Tab. 1-3-22

	1975*)	1976*)	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
(Product 000 ton)													
Capacity/Production													
CFC													
Urea Cap. (A)	26	26	26	26	26	26	26	26	26	26	26	26	26
Prod. (B)	3	3	4	4	4	4	4	4	4	4	4	4	4
(B)/(A) %	10	13	16	16	16	16	16	16	16	16	16	16	16
Total	26	26	26	26	26	26	26	26	26	26	26	26	26
Cap. Prod.	3	3	4	4	4	4	4	4	4	4	4	4	4
Industrial Use	12	11	11	14	15	16	17	18	18	20	21	22	22
Supply Capability	-9	-8	-7	-10	-11	-12	-13	-14	-14	-16	-17	-18	-18
Demand	4	8	8	10	12	16	22	29	37	46	56	66	77
Balance	-13	-16	-15	-20	-23	-28	-35	-43	-51	-62	-73	-84	-95

For notes of this table, see notes of Tab. 1-1-31.

LAND USE, MALAYSIA, IN 1974

ANNEX II
Tab. I-4-1

	West Malaysia *a)		Sarawak *b)		Sabah *c)		Total Malaysia
	000 ha	% of total Malaysia	000 ha	% of total Malaysia	000 ha	% of total Malaysia	
Total area	13,152	40.1	12,315	37.5	7,368	22.4	32,835
Area under crops *2)	3,013	81.5	395 *4)	10.7	290	7.8	3,698
Area under forest	6,940 *3)	35.4	9,428	48.0	3,256	16.6	19,624
Other area *2)	3,199	33.6	2,492	26.2	3,822	40.2	9,513

Notes: *1): Data for 1975 are not available.

*2): Estimated.

*3): Provisional.

*4): The area under sago and pepper are as of 1973.

Sources: *a): Statistical Handbook of Peninsular Malaysia, 1976

*b): Statistical Handbook of Sarawak, 1976

*c): Annual Statistical Bulletin, Malaysia, 1975

GROSS DOMESTIC PRODUCT AND EXPORTS, MALAYSIA

ANNEX II
Tab. 1.4-2

	1970	1972	1974	1976
Gross Domestic Product in 1970 Constant Price (Mil. ringgits)	10,238	10,338	12,426	13,828
Average annual growth rate (%)	N.A.	0.5	9.6	5.5
Exports (Mil. ringgits)	5,163	4,854	10,195	14,482
% of GDP	50.4	43.4	59.8	N.A.

- Sources: 1. The Treasury Malaysia, Economic Report 1974/75
 2. Annual Statistical Bulletin Malaysia 1975
 3. Monthly Statistical Bulletin, Peninsular Malaysia, Nov. 1977
 4. Preliminary Figures of External Trade, Sarawak, Nov. 1977
 5. Monthly Statistics, Sabah, Nov. 1977

EXPORT OF MAJOR COMMODITIES, MALAYSIA

ANNEX II

Tab. 1-43

(Mil. ringgits)

	1950	1960	1965	1970	1975	
<u>Total Malaysia *1)</u>						%
Rubber			1,461.8	1,723.7	2,025.5	22.0
Palm Oil			107.3	264.3	1,317.1	14.3
Timber			357.7	851.7	1,060.5	11.5
Tin and tin-in-concentrates			871.8	1,013.3	1,206.1	13.1
Petroleum, crude and partly refined			86.7	201.5	861.0	9.3
Total Exports			3,782.5	5,163.1	9,218.6	100.0
<u>West Malaysia *2)</u>						%
Rubber	1,810.0	1,829.0		1,663.0		39.6
Palm Oil	32.0	61.0		253.0		6.0
Timber	18.0	55.0		249.0		5.9
Tin and tin-in-concentrates	442.0	507.0		1,013.0		24.1
Total Exports	2,610.0	2,927.0		4,192.0		100.0

Sources: *1): 1965, 1970: The Treasury Malaysia, "Economic Report 1974-75"
 1975: Dept. of Statistics, Malaysia, "Annual Statistical Bulletin 1975"

*2): 市村真一編「東南アジアの経済発展」(創文社) 1973
 (S. Ichimura, "Economic Development in Southeast Asia", (Sobun-sha: Tokyo) 1975)

NUMBER OF LOW-INCOME HOUSEHOLDS IN RURAL AREA, WEST MALAYSIA

ANNEX II
Tab. 1.4.4

(1,000)

Year	1970		1975	
	Number of total households	Number of low-income households	Number of total households	Number of low-income households
Rubber farmer	350	226 (65%)	396	234 (59%)
Oil palm farmer	7	2 (30)	10	1 (9)
Coconut farmer	32	17 (53)	34	17 (50)
Paddy farmer	140	123 (88)	148	114 (77)
Other farm-employee	138	126 (92)	158	124 (78)
Fishermen	38	28 (73)	42	26 (63)
Estate employee	148	59 (40)	127	60 (47)
Total	853	581 (68)	915	576 (65)

Source: Third Malaysian Plan

GROSS DOMESTIC PRODUCT BY INDUSTRIAL ORIGIN, MALAYSIA
(IN 1970 CONSTANT PRICES)

ANNEX II
Tab. 1-4-5

	1970	1975
	Mil. ringgit % of GDP	Mil. ringgit % of GDP
Gross Domestic Product	10,708	15,315
Agriculture, Forestry and Fisheries	3,432	4,563
Mining and Quarrying	613	612
Manufacturing	1,307	2,197
Construction	481	711
	100.0	100.0
	32.1	29.8
	5.7	4.0
	12.2	14.3
	4.5	4.6

Source: Ministry of Finance, "Economic Report 1971/77"

LABOUR EMPLOYMENT BY INDUSTRY, MALAYSIA

ANNEX II
Tab. 1-4-6

	1970		1975	
	1,000 persons	% of total employment	1,000 persons	% of total employment
Agriculture, Forestry and Fisheries	1,786.8	53.5	1,936.8	49.3
Minig and Quarrying	87.3	2.6	86.6	2.2
Manufacturing	289.9	8.7	398.2	10.1
Construction	90.6	2.7	113.2	2.9
Total employment	3,339.5	100.0	3,927.8	100.0
Total labour force	3,606.8		4,225.0	
Unemployed labour forces	267.3		297.2	
Rate of unemployment (%)	7.4		7.0	

Source: "Third Malaysian Plan"

IMPORTS BY END USE, MALAYSIA

ANNEX II
Tab. 14-7

	1966		1970		1975	
	Million ringgit	% of total imports	Million ringgit	% of total imports	Million ringgit	% of total imports
Total Imports	3,372	100.0	4,295	100.0	8,618	100.0
Consumers' Goods	1,339	39.7	1,212	28.2	1,747	20.3
Capital Goods	794	23.5	1,151	26.8	2,740	31.8
Intermediate Goods	1,075	31.9	1,572	36.6	3,726	43.2
Imports for Re-export	164	4.9	360	8.4	405	4.7

AII-219

Source: The Treasury Malaysia, "Economic Report"

NUMBER OF RUBBER ESTATE BY SIZE AND
BY NATIONALITY OF OWNER,
WEST MALAYSIA, 1973

ANNEX II
Tab. 1-4-8

ha	Malaysian	Non-Malaysian	Total
- 202	1,103	158	1,261
203 - 404	158	75	233
405 - 809	112	101	213
810 - 1,213	29	57	86
1,214 - 2,023	19	59	78
2,024 and over	12	25	37
Total	1,433	475	1,908

Source: Rubber Statistical Handbook
Malaysia 1973

AREA OF RUBBER PLANTED BY ESTATES,
 BY NATIONALITY OF ESTATE OWNER,
 WEST MALAYSIA, 1973

ANNEX II
 Tab. 1-4-9

	Malaysian	British	Other Non-Malaysian	Total
ha	281,918	219,543	87,972	589,433
% of total	48	37	15	100

Source: Rubber Statistical Handbook
 Malaysia 1973

AREA OF OIL PALM PLANTED BY ESTATES,
BY NATIONALITY OF ESTATE OWNER,
WEST MALAYSIA, 1973

ANNEX II
Tab. 1-4-10

ha	Malaysian	Non-Malaysian	Total
- 40	4,226	885	5,111
41 - 202	32,189	8,588	40,777
203 - 404	28,931	17,209	46,140
405 - 809	47,606	41,452	89,058
810 - 1,213	30,181	78,196	108,377
1,214 - 2,023	56,977	80,897	137,874
2,024 and over	68,741	182,927	251,668
Total	268,851	410,154	679,005
(% of Total)	(39.6)	(60.4)	(100.0)
<hr/>			
Number of estates	341	165	506
(% of Total)	(67.4)	(32.6)	(100.0)

Source: Oil Palm, Coconut and
Tea Statistics 1973

ESTIMATES OF DISTRIBUTION OF SMALLHOLDING AREA
BY CROP IN WEST MALAYSIA

ANNEX II
Tab. 1-4-11

(000 ha)

	1968-69		1969-70	
	Estimate	% of total	Estimate	% of total
Permanent Crops				
Rubber	779.6	52.6	744.1	50.1
Coconut	165.9	11.2	128.0	8.6
Non-Fruit	24.4	1.7	28.3	1.9
Fruit	81.7	5.5	91.2	6.2
Temporary Crops				
Paddy	416.3	28.1	470.1	31.7
Others	13.5	0.9	22.8	1.5
Total	1,481.4	100.0	1,484.5	100.0

Source: National Crop Survey 1967/68-1969/70, Estimates of Area Under Principal Crops in Smallholdings

PLANTED AREA BY MAJOR CROP, MALAYSIA

ANNEX II
Tab. 14-12

	1966		1970		1975	
	000 ha	% of total	000 ha	% of total	000 ha	% of total
Rubber	2,051.0	64.2	2,019.4	57.5	1,991.9	50.2
West Malaysia						
Estate	733.8		646.5		589.4*	
Smallholding (A)	1,040.5		1,077.3		1,104.5*	
Total (B)	1,774.3		1,723.8		1,693.9*	
(A)/(B) (%)	59		62		65	
Oil Palm	142.0	4.4	309.2	8.8	653.2	16.5
West Malaysia						
Estate	103.7		193.4		274.8*	
Smallholding (A)	19.0		76.7		161.0*	
Total (B)	122.7		270.1		435.8*	
(A)/(B) (%)	16		28		37	
Coconut	276.8	8.7	310.4	8.8	336.7	8.5
Paddy	571.8	17.9	702.6	20.0	757.2	19.1
Other Crops	154.2	4.8	170.0	4.9	225.4	5.7
Total	3,195.8	100.0	3,511.6	100.0	3,964.4	100.0

Note: *Area in 1973

- Sources: 1. Annual Statistical Bulletin, Malaysia 1975
 2. Statistical Handbook of Peninsular Malaysia 1976
 3. Statistical Handbook Sarawak 1976
 4. Oil Palm, Coconut and Tea Statistics 1973
 5. Rubber Statistical Handbook Malaysia 1973

SUPPLY/DEMAND OF NITROGEN FERTILIZER IN MALAYSIA

ANNEX II
Tab. 14-13

(N 000 ton)

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
- West Malaysia											
Production (A)	-	8.0*	17.0*	24.5*	28.5*	29.1	36.3	40.6	39.6	34.2	37.7
Import (B)	40.3	33.9	20.9	27.1	33.2	25.2	31.6	46.2	63.3	22.5	59.6
Export (C)	0.9	0.6	2.1	3.7	2.1	4.3	4.8	5.3	2.7	5.5*	3.1
Domestic Supply (A+B-C)	39.4	41.3	35.8	47.9	59.6	50.0	63.1	81.5	100.2	51.2	94.2
Industrial Use	2.1	2.3	2.5	2.7	2.9	3.1	3.2	3.5	3.7	3.9	4.3
(Less) Industrial Use Consumption	37.3	39.0	33.3	45.2	56.7	46.9	59.9	78.0	96.5	47.3	89.9
- Sabah											
Supply	0.5	0.8	0.6	1.0	1.6	2.8	2.3	2.5	3.7	1.1	0.9
Consumption	0.5	0.8	0.6	1.0	1.6	2.8	2.3	2.5	3.7	1.1	0.9
- Sarawak											
Supply	2.5	3.0	3.1	3.1	3.7	3.4	3.1	3.7	3.7*	2.9	2.2
Consumption	2.5	3.0	3.1	3.1	3.7	3.4	3.1	3.7	3.7	2.9*	2.2
- Total											
Consumption	40.3	42.8	37.0	49.3	62.0	53.1	65.3	84.2	103.9	51.3	93.0

Notes: 1. *Estimated

2. Consumption in Sabah and in Sarawak are assumed to be equivalent to respective supply.

Sources: 1. Final Report of the Part "B" of the Downstream Study of the Master Plan Study for the Petroleum Resources in Malaysia, Volume 2 Market Study (Report for PETRONAS prepared by C. Itoh & Co., Ltd, 1977)

2. "Peninsular Malaysia Annual Statistics of External Trade, Imports, 1976"

3. "Peninsular Malaysia Annual Statistics of External Trade, Exports, 1976"

PRODUCTION CAPACITIES AND ACTUAL PRODUCTION OF NITROGEN FERTILIZERS
BY PRODUCER, MALAYSIA

ANNEX II
Tab. 1-4-14

(Product 000 ton)

<u>Name of Producers</u> Products	<u>Chemical Co. of Malaysia</u>		<u>Federal Fertilizer Co.</u>			
	<u>AN & NPK</u>	<u>AS</u>	<u>AS</u>	<u>1971</u>		
<u>Date of Start-up</u>	<u>1967</u>		<u>1971</u>			
Year	Capacity*	Production	%	Capacity	Production	%
1971	265.0	AN 30.3 NPK 138.6	63.7	60.0	10.0	16.7
1972	265.0	43.6 166.2	79.2	60.0	14.0	23.3
1973	265.0	61.0 165.6	85.5	60.0	15.4	25.7
1974	265.0	22.2 223.8	92.8	60.0	20.7	34.5
1975	265.0	30.1 144.7	72.8	60.0	23.0	38.3

Note: *Aggregate capacity of AN plant and NPK plant.

Source: Final Report of the Part "B" of the Down-stream Study of the Master Plan Study for the Development of Petroleum Resources in Malaysia, Volume 2 Market Study (Report for PETRONAS prepared by C. Itoh & Co., LTD, 1977)

ACTUAL AND PROJECTED DEMAND FOR UREA
AND NITROGEN FERTILIZER, MALAYSIA

ANNEX II
Tab. 1-4-15

	N 000 ton			Urea 000 ton		
	Actual + Study Forecast	C. Itoh	AFS (1976)	Actual + Study Forecast	C. Itoh	AFS (1976)
1966	40*			5*		
1967	43*			10*		
1968	37*			17*		
1969	49*			20*		
1970	62*			34*		
1971	53*			29*		
1972	65*			41*		
1973	84*			60*		
1974	104*			89*		
1975	51*			18*		
1976	93*	95	101	72*	80	117
1977	95	103	106	74	89	132
1978	98	111	110	77	101	146
1979	101	119	115	81	112	160
1980	104	127	121	85	124	174
1981	109	134	124	92	134	189
1982	113	142	126	98	146	203
1983	117	149	128	104	157	217
1984	121	156	131	110	168	231
1985	125	163	133	117	179	246
1986	129			122		
1987	131			127		
1988	134			132		
1989	136			137		
1990	138			141		

Sources: C. Itoh: C. Itoh & Co., Ltd., "The
Master Plan Study for the
Development of Petroleum Re-
sources in Malaysia", (1977)

AFS: Agrar-Und Hydrotechnik GmbH,
"Fertilizer Market Study, ASEAN
Region", (1976)

Note: *: Actual

PLANTED AREA OF PADDY, WEST MALAYSIA

ANNEX II
Tab. 1-4-16

	Actual										Projected	
	1967	1968	1969	1970	1971	1972	1973	1974	1980	1985	1990	
- Planted Area (000 ha)												
Wet Paddy	420	458	479	512	532	558	581	588	680	687	692	
Main Season	356	367	383	380	373	361	369	371	375	377	379	
Off Season	64	91	96	132	159	197	212	217	305	310	313	
Dry Paddy	21	21	23	22	20	14	10	9	-	-	-	
- Irrigated Area Ratio (%)												
Region I	27.6	34.9	33.6	55.9	54.6	67.8	70.4	90.5	94.3	95.0	95.0	
Region II	68.2	66.6	76.8	81.5	80.4	77.0	83.8	78.3	84.4	84.5	85.0	
Region III	11.0	15.7	18.6	20.6	23.6	28.2	57.5	56.8	72.6	74.7	75.0	
Total	31.0	35.7	38.1	50.5	50.5	57.6	69.3	77.6	85.6	86.6	86.8	
- Double Cropping Area Ratio of Irrigated Area (%)	57.7	69.5	65.8	68.8	84.6	94.7	82.8	75.3	95.0	95.0	95.0	

Notes: Region I: Perlis, Kedah, Pulau Pinang, and Selangor
 II: Perak, Negeri Sembilan, Melaka, and Johor
 III: Kelantan, Terengganu, and Pahang

Sources: Actual: 1. "Monthly Statistical Bulletin Peninsular Malaysia, Nov. 1977"
 2. "Crop Cutting Survey for Estimating Yield Rate on Padi in Peninsular Malaysia 1964/65 - 1973/74"

PROJECTED PLANTED AREA OF PADDY, WEST MALAYSIA
 - HIGH CASE AND LOW CASE

ANNEX II
 Tab. 14-17

	High Case				Low Case			
	1980	1985	1990	1980	1985	1990	1985	1990
- Planted Area (000 ha)								
Wet Paddy	688	698	702	643	663	681	663	681
Main season	375	377	379	375	377	379	377	379
Off season	356	358	360	356	358	360	358	360
- Irrigated Area Ratio (%)								
Region I	94.3	95.0	95.0	94.3	95.0	95.0	95.0	95.0
Region II	84.4	84.5	85.0	80.2	81.5	82.9	81.5	82.9
Region III	80.0	84.2	84.9	72.6	74.7	75.0	74.7	75.0
Total	87.8	89.5	89.8	84.7	85.9	86.3	85.9	86.3
- Double Cropping Area Ratio of Irrigated Area (%)	95.0	95.0	95.0	84.4	88.4	92.3	88.4	92.3

FORECAST ON DEMAND FOR NITROGEN FERTILIZER, PADDY, IN WEST MALAYSIA

ANNEX II
Tab. 1-4-18

	Actual or Estimated										Projected		
	1968	1969	1970	1971	1972	1973	1974	1980	1985	1990			
Region I													
Irrigated Area													
A. Planted Area (000 ha)	77	76	138	140	182	197	256	332	337	338			
B. Fertilized Area Ratio (%)	82.4	87.2	93.0	89.7	93.4	95.5	93.7	96.8	97.0	97.0			
C. Dosage (N kg/ha)	35.7	38.2	42.4	39.1	48.4	45.8	35.6	51.3	54.8	57.0			
(Potential Dosage = 60 N kg/ha)													
D. Actual/Projected Demand (N 000 t)	2.3	2.6	5.4	4.9	8.2	8.6	8.6	16.5	17.9	18.7			
Non-irrigated Area													
A. Planted Area (000 ha)	143	153	109	116	87	83	27	20	18	18			
B. Fertilized Area Ratio (%)	71.7	78.8	87.2	87.2	75.1	79.6	90.0	92.6	94.1	94.7			
C. Dosage (N kg/ha)	35.7	38.2	42.4	39.1	48.4	45.8	35.6	51.3	54.8	57.0			
(Potential Dosage = 60 N kg/ha)													
D. Actual/Projected Demand (N 000 t)	3.7	4.6	4.0	4.0	3.1	3.0	0.9	1.0	0.9	1.0			
Region II													
Irrigated Area													
A. Planted Area (000 ha)	64	78	88	90	91	103	97	130	131	133			
B. Fertilized Area Ratio (%)	48.0	65.3	72.3	73.5	76.2	78.8	83.7	86.7	87.0	87.0			
C. Dosage (N kg/ha)	20.0	32.9	34.7	33.7	39.9	23.4	27.9	40.5	45.6	49.8			
(Potential Dosage = 50 N kg/ha)													
D. Actual/Projected Demand (N 000 t)	0.6	1.7	2.2	2.2	2.8	1.9	2.3	4.6	5.2	5.7			
Non-irrigated Area													
A. Planted Area (000 ha)	32	23	20	22	27	20	27	24	24	23			
B. Fertilized Area Ratio (%)	20.8	70.1	40.0	73.6	58.6	56.6	38.7	76.1	81.4	83.6			
C. Dosage (N kg/ha)	20.0	32.9	34.7	33.7	39.9	23.4	27.9	40.5	45.6	49.8			
(Potential Dosage = 50 N kg/ha)													
D. Actual/Projected Demand (N 000 t)	0.1	0.5	0.3	0.5	0.6	0.3	0.3	0.7	0.9	1.0			

Continued on next page.

FORECAST ON DEMAND FOR NITROGEN FERTILIZER, PADDY, IN WEST MALAYSIA
(CONT'D.)

ANNEX II
Tab. 1-4-18

	Actual or Estimated										Projected		
	1968	1969	1970	1971	1972	1973	1974	1980	1985	1990			
Region III													
Irrigated Area													
A. Planted Area (000 ha)	22	27	32	39	48	103	103	163	169	170			
B. Fertilized Area Ratio (%)	14.7	54.8	72.9	75.7	69.9	73.4	56.9	76.9	77.0	77.0			
C. Dosage (N kg/ha) (Potential Dosage = 45 N kg/ha)	10.3	9.4	10.1	11.6	12.4	18.8	30.4	25.5	33.8	41.7			
D. Actual/Projected Demand (N 000 t)	-	0.1	0.2	0.3	0.4	1.4	1.8	3.2	4.4	5.5			
Non-irrigated Area													
A. Planted Area (000 ha)	118	120	125	125	123	76	78	61	57	57			
B. Fertilized Area Ratio (%)	36.6	43.6	53.3	63.1	55.0	54.0	45.8	63.0	67.2	70.1			
C. Dosage (N kg/ha) (Potential Dosage = 45 N kg/ha)	10.3	9.4	10.1	11.6	12.4	18.8	30.4	25.5	33.8	41.7			
D. Actual/Projected Demand (N 000 t)	0.4	0.5	0.7	0.9	0.8	0.8	1.1	1.0	1.3	1.7			
Total	Actual/Projected Demand (N 000 t)	7.1	10.0	12.8	12.8	15.9	15.0	27.1	30.7	33.6			

Notes: 1. Region I: Perlis, Kedah, Pulau Pinang, and Selangor
 II: Perak, Negeri Sembilan, Melaka, and Johor
 III: Kelantan, Terengganu, and Pahang

2. (D) = (A) x $\frac{(B)}{100}$ x (C)

Sources: See sources of Tab. 1-4-16.

FORECAST ON DEMAND FOR NITROGEN FERTILIZER, PADDY, WEST MALAYSIA
- HIGH CASE AND LOW CASE

ANNEX II
Tab. 1-4-19

	High Case				Low Case			
	1980	1985	1990	1990	1980	1985	1990	1990
Region I								
Irrigated Area								
A. Planted Area (000 ha)	332	337	338	332	332	337	338	338
B. Fertilized Area Ratio (%)	99.3	99.8	100.0	95.0	95.0	95.0	95.0	95.0
C. Dosage (N kg/ha)	52.7	57.9	61.8	48.6	49.5	49.8	49.8	49.8
D. Projected Demand (N 000 t)	17.4	19.5	20.9	15.3	15.8	16.0	16.0	16.0
Non-irrigated Area								
A. Planted Area (000 ha)	20	18	18	20	18	18	18	18
B. Fertilized Area Ratio (%)	94.5	97.3	98.7	90.0	90.0	90.0	90.0	90.0
C. Dosage (N kg/ha)	52.7	57.9	61.8	48.6	49.5	49.8	49.8	49.8
D. Projected Demand (N 000 t)	1.0	1.0	1.1	0.9	0.8	0.8	0.8	0.8
Region II								
Irrigated Area								
A. Planted Area (000 ha)	130	131	133	130	131	133	133	133
B. Fertilized Area Ratio (%)	89.3	89.9	90.0	84.9	85.0	85.0	85.0	85.0
C. Dosage (N kg/ha)	41.2	47.4	52.8	39.5	43.1	45.6	45.6	45.6
D. Projected Demand (N 000 t)	4.8	5.6	6.3	4.4	4.8	5.2	5.2	5.2
Non-irrigated Area								
A. Planted Area (000 ha)	24	24	23	24	24	23	23	23
B. Fertilized Area Ratio (%)	78.5	85.2	88.1	73.6	77.6	79.1	79.1	79.1
C. Dosage (N kg/ha)	41.2	47.4	52.8	39.5	43.1	45.6	45.6	45.6
D. Projected Demand (N 000 t)	0.8	1.0	1.1	0.7	0.8	0.8	0.8	0.8
Region III								
Irrigated Area								
A. Planted Area (000 ha)	163	169	170	163	169	170	170	170
B. Fertilized Area Ratio (%)	79.7	80.0	80.0	75.0	75.0	75.0	75.0	75.0
C. Dosage (N kg/ha)	25.8	35.0	44.2	25.0	32.3	38.4	38.4	38.4
D. Projected Demand (N 000 t)	3.4	4.7	6.0	3.1	4.1	4.9	4.9	4.9
Non-irrigated Area								
A. Planted Area (000 ha)	61	57	57	61	57	57	57	57
B. Fertilized Area Ratio (%)	63.7	68.7	72.4	62.1	65.4	67.3	67.3	67.3
C. Dosage (N kg/ha)	25.8	35.0	44.2	25.0	32.3	38.4	38.4	38.4
D. Projected Demand (N 000 t)	1.0	1.4	1.8	0.9	1.2	1.5	1.5	1.5

See notes of Tab. 1-4-18.

DIFFERENCES IN PROJECTED DOSAGE AND DEMAND FOR NITROGEN FERTILIZER, PADDY, ANNEX II
 WEST MALAYSIA - STUDY PROJECTION AND C. ITOH'S PROJECTION Tab. 1-4-20

	Estimated						Projected			
	1970		1972		1974		1980		1985	
	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
- Planted Area										
Main Season (000 ha)	380	373	361	369	371	372	375	377	377	381
Off Season (000 ha)	132	132	197	197	217	217	305	263	310	281
Total (000 ha)	512	505	558	566	588	589	680	640	687	662
- Average Dosage per ha of Planted Area (N Kg/ha)	25.0	29.3	29.2	35.3	25.7	41.9	39.9	66.3	44.7	92.4
- Demand (N 000 ton)	12.8	14.8	16.3	20.0	15.1	24.7	27.1	42.4	30.7	61.2

Notes: (A): Study Projection
 (B): C. Itoh's Projection

Sources: C. Itoh's Projection:
 "The Master Plan Study for the Development of
 Petroleum Resources in Malaysia" (1977)

FORECAST ON DEMAND FOR NITROGEN FERTILIZER, RUBBER, IN WEST MALAYSIA

ANNEX II
Tab. 1-4-21

	Actual or Estimated										Projected		
	1968	1969	1970	1971	1972	1973	1974	1975	1980	1985	1990		
Estates													
Mature													
A. Planted Area (000 ha)	518	523	522	514	499	489	475	(464)	412	366	326		
B. Average Dosage (N kg/ha)	10.1	18.0	20.9	19.4	19.7	24.7	(24.2)	(25.4)	(30.5)	34.3	36.7		
C. Actual/Projected Demand (N 000 t)	5.2	9.4	10.9	10.0	9.8	12.1	11.5		12.6	12.6	12.0		
Immature													
A. Planted Area (000 ha)	160	140	125	118	111	100	99		52	32	20		
B. Average Dosage (N kg/ha)	19.8	20.4	20.6	20.2	17.9	19.4	(19.7)	(19.7)	19.7	19.7	19.7		
C. Actual/Projected Demand (N 000 t)	3.2	2.9	2.6	2.4	2.0	1.9	2.0		1.0	0.6	0.4		
Smallholders													
Mature in FELDA													
A. Planted Area (000 ha)	12	22	29	28	41	47	51		99	138	179		
B. Average Dosage (N kg/ha)	10.1	18.0	20.9	19.4	19.7	24.7	(24.2)	(25.4)	(30.5)	(34.3)	(36.7)		
C. Actual/Projected Demand (N 000 t)	0.1	0.4	0.6	0.7	0.8	1.2	1.2		3.0	4.7	6.6		
Immature													
A. Planted Area (000 ha)	369	310	287	267	267	256	257	266	168	121	82		
B. Average Dosage (N kg/ha)	15.8	16.3	16.5	16.2	14.3	15.5	(15.8)	(15.8)	15.8	15.8	15.8		
C. Actual/Projected Demand (N 000 t)	5.8	5.1	4.7	4.3	3.8	4.0	4.1		2.7	1.9	1.3		
Total	Actual/Projected Demand (N 000t)	14.3	17.8	18.8	17.4	16.4	19.2		19.3	19.8	20.3		

Notes: 1. Actual: (B) = (C)/(A)
2. Projected: (C) = (A) x (B)

Sources: 1. "Monthly Statistical Bulletin Peninsular Malaysia, Nov. 1977"
2. "Rubber Statistical Handbook Malaysia 1973"

FORECAST ON DEMAND FOR NITROGEN FERTILIZER, OIL PALM, IN WEST MALAYSIA

ANNEX II
Tab. 1-4-22

	Actual or Estimated											Projected		
	1968	1969	1970	1971	1972	1973	1974	1975	1980	1985	1990			
Mature in Estates and Schemes														
A. Planted Area (000 ha)	93	117	141	176	216	260	303	364	559	700	813			
B. Dosage (N kg/ha)	44.2	41.8	48.8	60.0	61.4	55.1			60.0	60.0	60.0			
C. Actual/Projected Demand (N 000 t)	4.1	4.9	6.9	10.6	13.3	14.3	18.2		33.5	42.0	48.8			
Immature														
A. Planted Area (000 ha)	106	122	129	130	150	175	232	217	229	205	175			
B. Dosage (N kg/ha)	34.1	30.1	27.7	30.7	28.8	26.9			35.0	35.0	35.0			
C. Actual/Projected Demand (N 000 t)	3.6	3.7	3.6	4.0	4.3	4.7			8.0	7.2	6.1			
Total	7.7	8.6	10.5	14.6	17.6	19.0			41.5	49.2	54.9			
Actual/Projected Demand (N 000 t)														

Notes: 1. Actual: (B) = (C)/(A)

2. Projected: (C) = (A) x (B)

Sources: 1. "Monthly Statistical Bulletin Peninsular Malaysia, November 1977"

2. "Oil Palm, Coconut and Tea Statistics 1973"

SUMMARY OF DEMAND FORECAST ON NITROGEN FERTILIZER, MALAYSIA

ANNEX II
Tab. 1-4-23

(N 000 ton)

	1968	1969	1970	1971	1972	1973	1974	1980	1985	1990
- West Malaysia										
Paddy	7.1	10.3	12.8	13.0	16.3	16.3	15.1	27.1	30.7	33.6
Rubber: Estates: Mature	5.2	9.4	10.9	10.0	9.8	12.1	11.5	12.6	12.6	12.0
Innate	3.2	2.9	2.6	2.4	2.0	1.9	2.0	1.0	0.6	0.4
Smallholders: FELDA	0.1	0.4	0.6	0.7	0.8	1.2	1.2	3.0	4.7	6.6
Innate	5.8	5.1	4.7	4.3	3.8	4.0	4.1	2.7	1.9	1.3
Total	14.3	17.8	18.8	17.4	16.4	19.2	18.8	19.3	19.8	20.3
Oil Palm: Mature	4.1	4.9	6.9	10.6	13.3	14.3	18.2	33.5	42.0	48.8
Innate	3.6	3.7	3.6	4.0	4.3	4.7	6.7	2.7	7.2	6.1
Total	7.7	8.6	10.5	14.6	17.6	19.0	24.9	36.2	49.2	54.9
Others	8.6	8.5	14.6	1.9	9.6	12.3	10.1	11.7	13.0	14.3
Estimate	37.7	45.2	56.7	46.9	59.9	66.8	68.9	94.3	112.7	123.1
Actual	33.3	45.2	56.7	46.9	59.9	78.0	96.5			
- Sabah	0.6	1.0	1.6	2.8	2.8	2.5	3.7	6.1	8.4	10.6
- Sarawak	3.1	3.1	3.7	3.4	3.1	3.7	3.7	3.9	4.2	4.5
Grand Total: Estimate	41.4	49.3	62.0	53.1	65.3	73.0	76.3	104.3	125.3	138.2
Actual	37.0	49.3	62.0	53.1	65.3	84.2	103.9			

For notes of this table, see notes of Tab. 1-1-25.

SUMMARY OF DEMAND FORECAST ON NITROGEN FERTILIZER, MALAYSIA
- HIGH CASE AND LOW CASE

ANNEX II
Tab. 1-4-24

(N 000 ton)

	High Case			Low Case		
	1980	1985	1990	1980	1985	1990
- West Malaysia						
Paddy	28.4	33.2	37.2	25.3	27.5	29.2
Rubber	19.3	19.8	20.3	9.3	19.8	20.3
Oil Palm	36.2	49.2	54.9	36.2	49.2	54.9
Others	11.7	13.0	14.3	11.7	13.0	14.3
Sub-total	95.6	115.2	126.7	92.5	109.5	118.7
- Sabah	6.1	8.4	10.6	6.1	8.4	10.6
- Sarawak	3.9	4.2	4.5	3.9	4.2	4.5
Grand Total	105.6	127.8	141.8	102.5	122.1	133.8

CONSUMPTION OF UREA BY CROP, WEST MALAYSIA

ANNEX II
Tab. 1-4-25

(N 000 ton)

	1968	1969	1970	1971	1972	1973	1974	1975
Total Consumption of Urea (1)	10.1	11.8	18.7	16.1	21.9	30.2	41.9	12.2
Paddy						(24.1)**	(26.7)**	(29.3)**
Total Nitrogen Fertilizer (2)	7.1	10.3	12.8	13.0	16.3	16.3	15.1	
of which:								
Urea (3)=(2)x(4)	3.7	5.9	8.1	8.5	12.0	11.4	11.8	
(% of Total N Fertilizer*)	51.9	57.4	63.0	65.5	73.6	69.8	78.2	
Complex Fertilizer	3.4	4.4	4.7	4.5	4.3	4.9	3.3	
(5)=(2)-(3)								
Industrial Urea (6)	2.5	2.7	2.9	3.1	3.2	3.5	3.7	
Oil Palm								
Total Nitrogen Fertilizer (7)	7.7	8.6	10.5	14.6	17.6	19.0	24.9	
of which:								
Urea (8)=(1)-(3)-(6)	3.9	3.2	7.7	4.5	6.7	9.2	11.2	
(% of Total N Fertilizer)	50.6	37.2	73.3	30.8	38.1	48.4	45.0	

Notes: * Source: Crop Cutting Survey for Estimating Yield Rate of Padi in Peninsular Malaysia 1964/65 - 1973/74

** Figures in the parentheses are computed by linear regression on data in 1968 through 1972.

DEMAND FORECAST ON UREA, MALAYSIA

ANNEX II
Tab. 1-4-26

(Urea 000 ton)

	1972	1973	1974	1980	1985	1990
Fertilizer:						
West Malaysia						
Paddy	26.1	24.8	25.7	48.9	56.7	63.0
Raw material for Complex Fertilizer	0	0	0	0	2.0	3.9
Total	26.1	24.8	25.7	48.9	58.7	66.9
Oil Palm	14.6	20.0	24.4	36.5	49.8	55.4
Others	0	0	0	0	5.7	12.4
Sabah	0	0	0	0	2.8	6.3
Total	40.7	44.8	50.1	85.4	117.0	141.0
Industrial:						
Urea-formaldehyde adhesive	7.0	7.6	8.0	13.0	17.8	22.2
Total:	47.7	52.4	58.1	98.4	134.8	163.2

Notes: 1. 1972-1974: Actual or estimated.

2. Actual consumption in 1972 and in 1974 is estimated taking into account the increase in inventory.

NITROGEN FERTILIZER SUPPLY/DEMAND PROJECTION, MALAYSIA

ANNEX II
Tab. 1-4-27

		(N 000 ton)												
		1975 [*]	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Capacity/Production														
ESSO Malaysia	NH3 Cap. (A)	43	43	43	43	43	43	43	43	43	43	43	43	43
	Prod. (B)	37	41	41	41	41	41	41	41	41	41	41	41	41
	(B)/(A) %	85	95	95	95	95	95	95	95	95	95	95	95	95
PETRONAS (1983/1)	NH3 Cap.									352	352	352	352	352
	Prod.									264	282	317	317	317
	(B)/(A) %									75	80	90	90	90
Total	Cap. Prod.	43	43	43	43	43	43	43	43	352	352	352	352	352
		41	41	41	41	41	41	41	41	264	282	317	317	317
Industrial Use		4	4	5	5	6	6	6	7	7	8	8	9	9
Supply Capability		37	37	36	36	35	35	35	34	257	274	309	308	308
Demand		79	85	95	98	100	104	108	112	117	121	125	130	134
Balance		-42	-48	-59	-62	-65	-69	-73	-78	-140	-153	-184	-178	-174

See notes of Tab. 1-1-31.

UREA SUPPLY/DEMAND PROJECTION, MALAYSIA

ANNEX II
Tab. I-4-28

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Capacity/Production														
PETRONAS (1983/1)														
Urea Cap. (A)	-	-	-	-	-	-	-	-	496	496	496	496	496	496
Prod. (B)	-	-	-	-	-	-	-	-	372	397	446	446	446	446
(B)/(A) %									75	80	90	90	90	90
Total									496	496	496	496	496	496
Cap. Prod.									372	397	446	446	446	446
Industrial Use	8	9	10	11	12	13	14	15	16	17	18	19	20	20
Supply Capability	-8	-9	-10	-11	-12	-13	-14	-15	356	380	428	427	426	426
Demand	49	61	84	87	92	97	104	112	119	128	136	144	152	152
Balance	-57	-90	-94	-98	-104	-110	-118	-127	237	252	292	283	274	274

For notes of this table, see notes of Tab. I-1-31.

DEMAND FORECAST ON UREA, SINGAPORE

ANNEX II
Tab. 1-5-1

	(Urea 000 ton)				
	1975	1976	1977	1980	1985 1990
Fertilizer:	2.2	2.2	2.2	2.2	2.2
Industrial:					
Urea-formaldehyde adhesive	4.3	6.5	8.7	15.2	15.2
Total:	6.5	8.7	10.9	17.4	17.4

Note: 1975-1977: Actual or estimated.

Sources: 1. FAO, "Annual Fertilizer Review"

2. "Fertilizer Market Study, ASEAN Region"

SUPPLY/DEMAND BALANCE FORECAST OF NITROGEN FERTILIZER, ASEAN REGION

ANNEX II

Tab. 1-6-1

(N 000 ton)

	1975/76	76/77	77/78	78/79	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88
INDONESIA													
CAPACITY	289	289	582	942	1099	1199	1499	1769	1769	1769	1769	1769	1769
SUPPLY	105	181	409	719	868	1017	1261	1489	1531	1558	1558	1557	1556
DEMAND	339	352	474	559	634	699	745	784	817	844	864	891	915
BALANCE	-134	-171	-65	160	234	318	516	705	714	714	694	666	641
PHILIPPINES													
CAPACITY	101	101	101	101	101	101	101	101	101	175	249	249	249
SUPPLY	35	31	19	25	25	25	24	24	24	72	122	134	141
DEMAND	135	156	180	194	208	221	233	245	257	269	280	292	304
BALANCE	-100	-125	-161	-169	-183	-196	-209	-221	-233	-197	-158	-158	-163
MALAYSIA													
CAPACITY	43	43	43	43	43	43	43	43	352	352	352	352	352
SUPPLY	37	37	36	36	35	35	35	34	257	274	309	308	308
DEMAND	79	85	95	98	100	104	108	112	117	121	125	130	134
BALANCE	-42	-48	-59	-62	-65	-69	-73	-78	140	153	184	178	174
THAILAND													
CAPACITY	27	27	27	27	27	27	27	27	27	27	162	297	297
SUPPLY	-1	2	2	1	0	0	-1	-1	-2	-2	85	179	199
DEMAND	65	108	110	120	130	139	148	156	165	174	182	190	198
BALANCE	-66	-106	-108	-119	-130	-139	-149	-157	-167	-176	-97	-11	1
SINGAPORE													
CAPACITY	0	0	0	0	0	0	0	0	0	0	0	0	0
SUPPLY	-2	-3	-4	-5	-6	-7	-7	-7	-7	-7	-7	-7	-7
DEMAND	1	1	1	1	1	1	1	1	1	1	1	1	1
BALANCE	-3	-4	-5	-6	-7	-8	-8	-8	-8	-8	-8	-8	-8
ASEAN TOTAL													
CAPACITY	460	460	753	1113	1270	1370	1670	1940	2249	2323	2532	2667	2667
SUPPLY	274	248	462	776	922	1070	1312	1539	1803	1895	2067	2171	2197
DEMAND	619	702	860	972	1073	1164	1235	1298	1357	1409	1452	1504	1552
BALANCE	-345	-454	-398	-196	-151	-94	77	241	446	486	615	667	645

SUPPLY/DEMAND PROJECTION OF UREA, ASEAN COUNTRIES

ANNEX II
Tab. 1-6-2

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
	(Product 000 ton)												
INDONESIA													
CAPACITY	525	525	1142	1903	2235	2378	2805	3275	3275	3275	3275	3275	3275
SUPPLY	394	363	829	1483	1801	2061	2421	2788	2858	2914	2913	2912	2911
DEMAND	676	686	932	1105	1257	1389	1483	1565	1633	1689	1732	1786	1835
BALANCE	-282	-323	-103	378	544	672	938	1223	1225	1225	1181	1126	1076
PHILIPPINES													
CAPACITY	68	68	-	-	-	-	-	-	-	150	300	300	300
SUPPLY	18	10	-6	-10	-11	-12	-12	-13	-13	84	189	210	225
DEMAND	144	175	228	236	245	256	270	284	298	313	329	344	358
BALANCE	-126	-165	-234	-246	-256	-268	-282	-297	-311	-229	-140	-134	-133
MALAYSIA													
CAPACITY	-	-	-	-	-	-	-	-	496	496	496	496	496
SUPPLY	-8	-9	-10	-11	-12	-13	-14	-15	356	380	428	427	426
DEMAND	49	81	84	87	92	97	104	112	119	128	136	144	152
BALANCE	-57	-90	-94	-98	-104	-110	-118	-127	237	252	292	283	274
THAILAND													
CAPACITY	26	26	26	26	26	26	26	26	26	26	26	26	26
SUPPLY	-9	-8	-7	-10	-11	-12	-13	-14	-14	-16	-17	-18	-18
DEMAND	4	8	8	10	12	16	22	29	37	46	56	66	77
BALANCE	-13	-16	-15	-20	-23	-28	-35	-43	-51	-62	-73	-84	-95
SINGAPORE													
CAPACITY	-	-	-	-	-	-	-	-	-	-	-	-	-
SUPPLY	-4	-7	-9	-11	-13	-15	-15	-15	-15	-15	-15	-15	-15
DEMAND	2	2	2	2	2	2	2	2	2	2	2	2	2
BALANCE	-6	-9	-11	-13	-15	-17	-17	-17	-17	-17	-17	-17	-17
ASEAN TOTAL													
CAPACITY	619	619	1168	1929	2261	2404	2831	3301	3797	3947	4097	4097	4097
SUPPLY	391	349	797	1441	1754	2009	2367	2731	3172	3347	3498	3516	3529
DEMAND	875	952	1254	1440	1608	1760	1881	1992	2089	2178	2255	2342	2424
BALANCE	-484	-603	-457	1	146	249	486	739	1063	1169	1243	1174	1105

SUPPLY/DEMAND PROJECTION OF UREA, ASEAN COUNTRIES
- PROJECTED BY EACH MEMBER COUNTRY

ANNEX II
Tab. 1-6-3

		(Urea, 000 ton)									
		1977	1978	1979	1980	1981	1982	1983	1984	1985	
Supply	Indonesia	763	1,205	1,676	1,951	2,302	2,588	2,674	2,730	2,773	
	B-C	763	1,212	1,789	1,881	2,209	2,694	2,778	2,836	2,879	
Malaysia	A	-	-	-	-	399	427	455	513	513	
	B-C	-	-	-	-	-	260	396	446	446	
Thailand	A	13	13	13	13	13	0	0	0	0	
	B	10	10	10	10	10	0	0	0	0	
Philippines	A	30	40	40	40	292	368	443	443	443	
	B	40	40	40	40	40	278	304	337	337	
Total	A	806	1,258	1,729	2,004	3,006	3,383	3,573	3,686	3,729	
	B-C	813	1,262	1,839	1,931	2,259	3,232	3,478	3,619	3,662	
Demand	Indonesia	1,087	1,242	1,350	1,520	1,689	1,860	2,011	2,156	2,303	
	A	132	146	160	174	189	203	217	231	246	
Malaysia	B-C	89	101	112	124	134	146	157	168	179	
	A	141	159	181	203	222	249	266	279	290	
Thailand	B	80	90	104	130	143	157	173	190	209	
	C	10	12	15	18	22	26	32*	38*	46*	
Philippines	A	226	272	314	359	407	456	511	572	638	
	B-C	226	255	287	323	362	512	561	615	676	
Singapore	A-B	11	13	15	17	17	17	17	17	17	
Total	A	1,597	1,832	2,020	2,273	2,525	2,785	3,023	3,255	3,495	
	B	1,493	1,702	1,868	2,114	2,345	2,692	2,919	3,146	3,384	
	C	1,423	1,623	1,779	2,002	2,224	2,561	2,778	2,994	3,221	
Balance	A	-791	-575	-291	-269	+482	+598	+550	+431	+234	
	B	-680	-440	-29	-183	-86	+540	+559	+473	+278	
	C	-610	-361	+60	-71	+35	+663	+700	+625	+441	

Notes: 1. In case data "C" is not available, data "B" is used as a substitution.

2. *Demand is calculated by using the same annual growth rate as that for until 1982.

Sources:

- A: Agrar-Und Hydrotechnik GmbH, "Fertilizer Market Study, ASEAN Region" (Final Report, Dec. 1976)
 B: "Feasibility Study on the ASEAN Ammonia-Urea Project, Aceh in Indonesia, as accepted at the 5th meeting of the ASEAN Economic Ministries", (Pattaya, Thailand, Sep. 2-4, 1977)
 C: Provided by each member countries during this study.

Indonesia : AFS
 Malaysia : C. Itoh
 Thailand : DAE
 Philippines : EPA

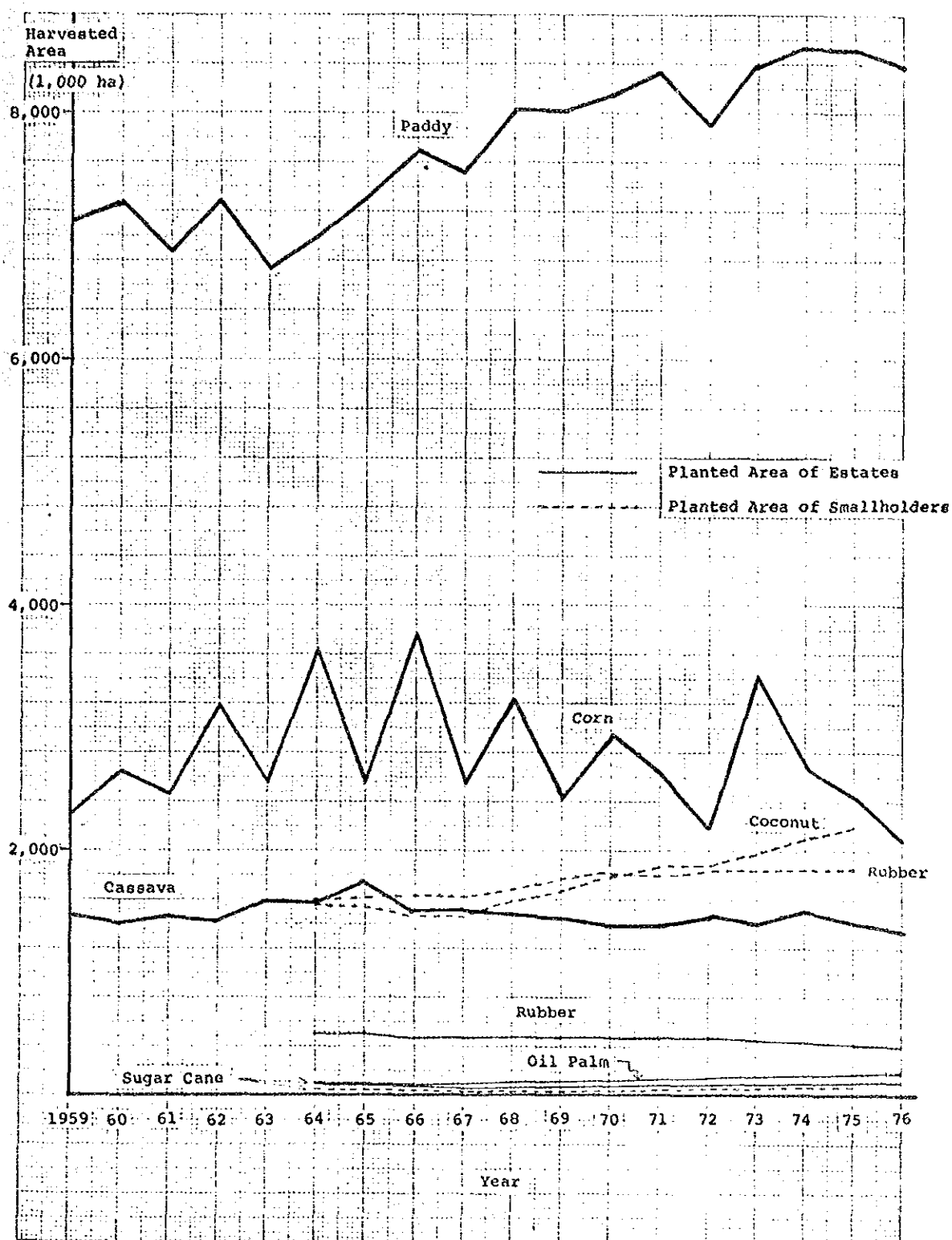
DIFFERENCES IN SUPPLY/DEMAND PROJECTION ON UREA, ANNEX II
 ASEAN COUNTRIES BETWEEN THE STUDY AND Tab. 1-6-4
 "FEASIBILITY STUDY ON THE ASEAN AMMONIA-UREA PROJECT,
 ACEH IN INDONESIA, AS ACCEPTED AT THE 5TH MEETING
 OF THE ASEAN ECONOMIC MINISTERS"

(Urea 000 ton)

		1982	1983	1984	1985
Supply	Indonesia	+94	+80	+78	+34
	Malaysia	-275	-40	-66	-18
	Thailand	-14	-14	-16	-17
	Philippines	-291	-317	-253	-148
	Singapore	-15	-15	-15	-15
	Total	-501	-306	-272	-164
Demand	Indonesia	-295	-378	-467	-571
	Malaysia	-34	-38	-40	-43
	Thailand	-128	-136	-144	-153
	Philippines	-228	-263	-302	-347
	Singapore	-15	-15	-15	-15
	Total	-700	-830	-968	-1,129
Balance	Indonesia	+389	+458	+545	+605
	Malaysia	-241	-2	-26	+25
	Thailand	+114	+122	+128	+136
	Philippines	-63	-54	+49	+199
	Singapore	0	0	0	0
	Total	+199	+524	+696	+965

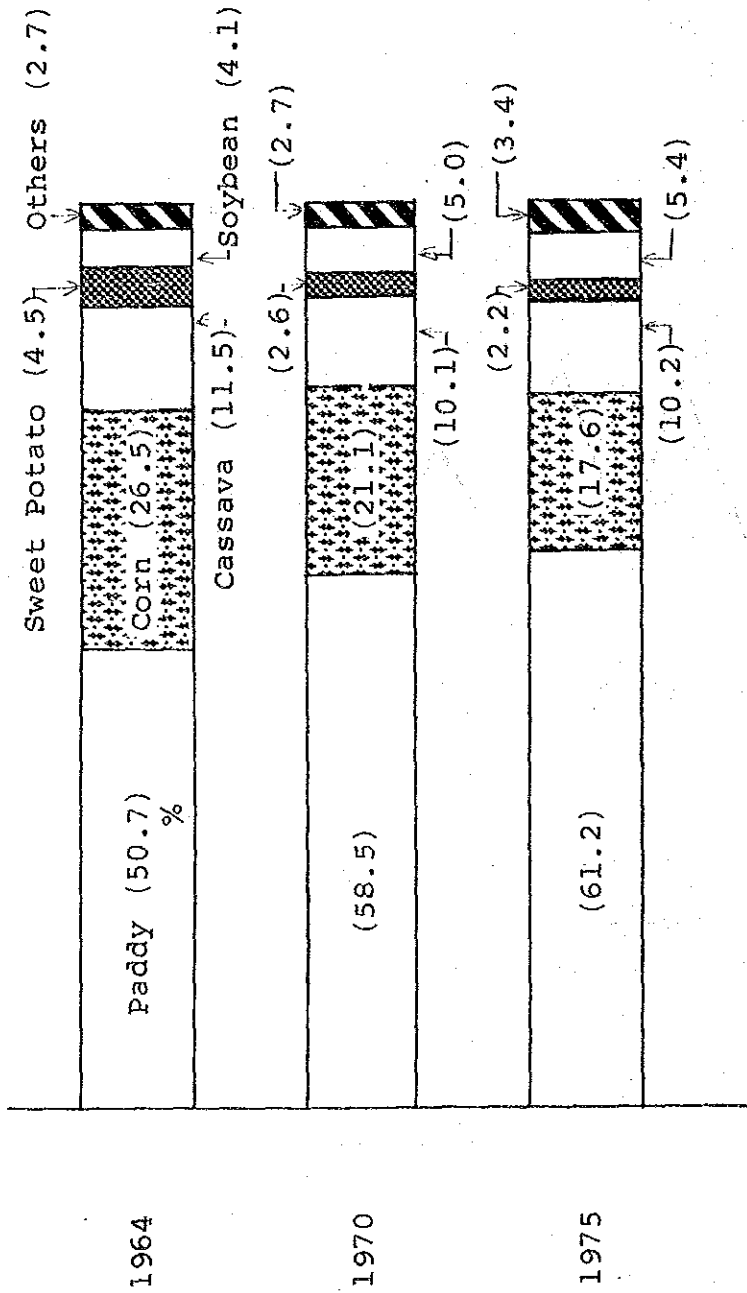
Computed from Tab. 1-6-2 and
 Tab. 1-6-3.

ANNEX II
Fig. 1-1-1



Source: Statistical Pocketbook of Indonesia, 1964/67-1977

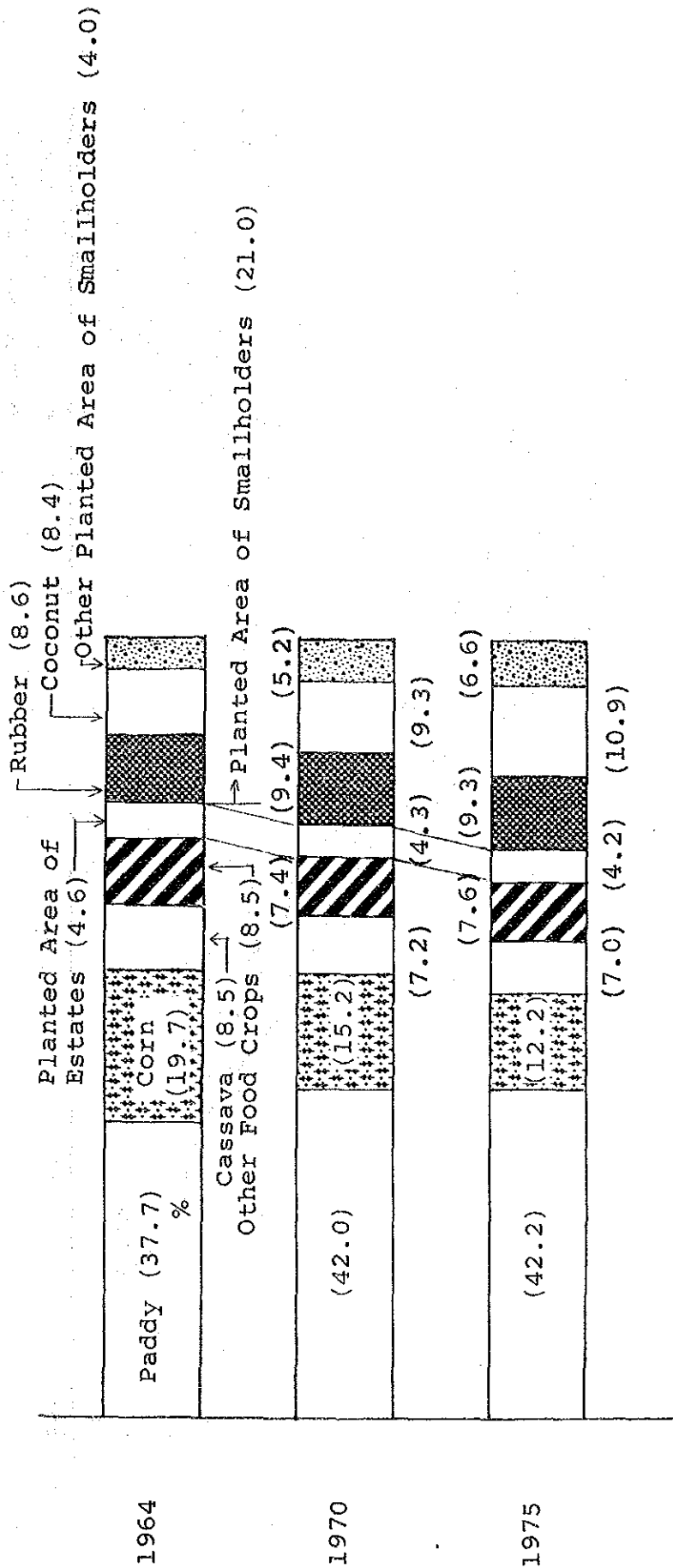
ASEAN ACEH Fertilizer Project
HARVESTED AREA BY CROP, INDONESIA
Japan International Cooperation Agency (JICA)



Source: Statistical Pocketbook of
Indonesia, 1964/67-1977

ASEAN ACEH Fertilizer Project
PERCENTAGE SHARE OF FOOD-CROP HARVESTED AREA, BY CROP, INDONESIA
Japan International Cooperation Agency (JICA)

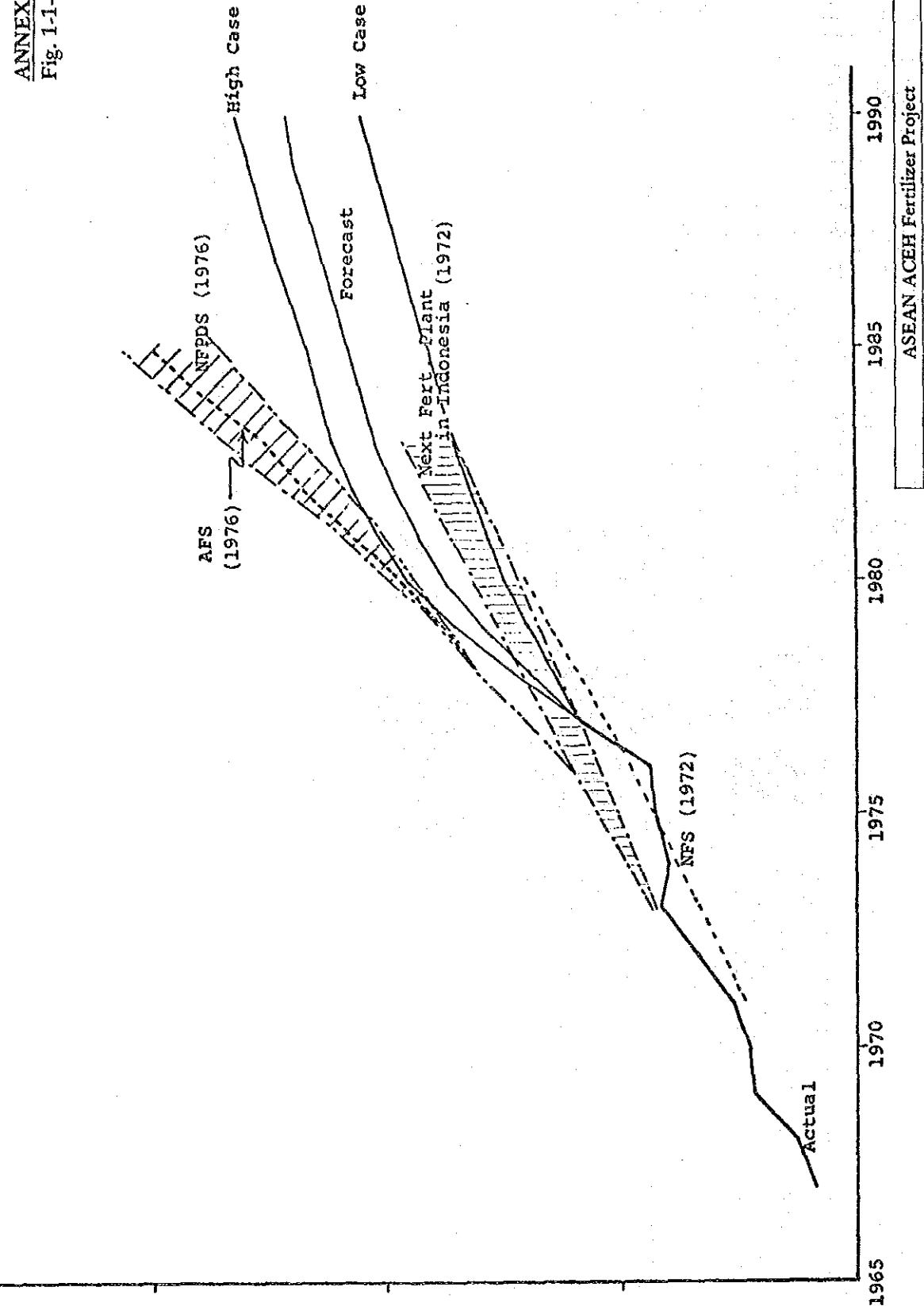
ANNEX II
Fig. 1-13



Source: Statistical Pocketbook of Indonesia, 1964/67-1977

ASEAN ACEH Fertilizer Project
PERCENTAGE SHARE OF HARVESTED AREA BY CROP, INDONESIA
Japan International Cooperation Agency (JICA)

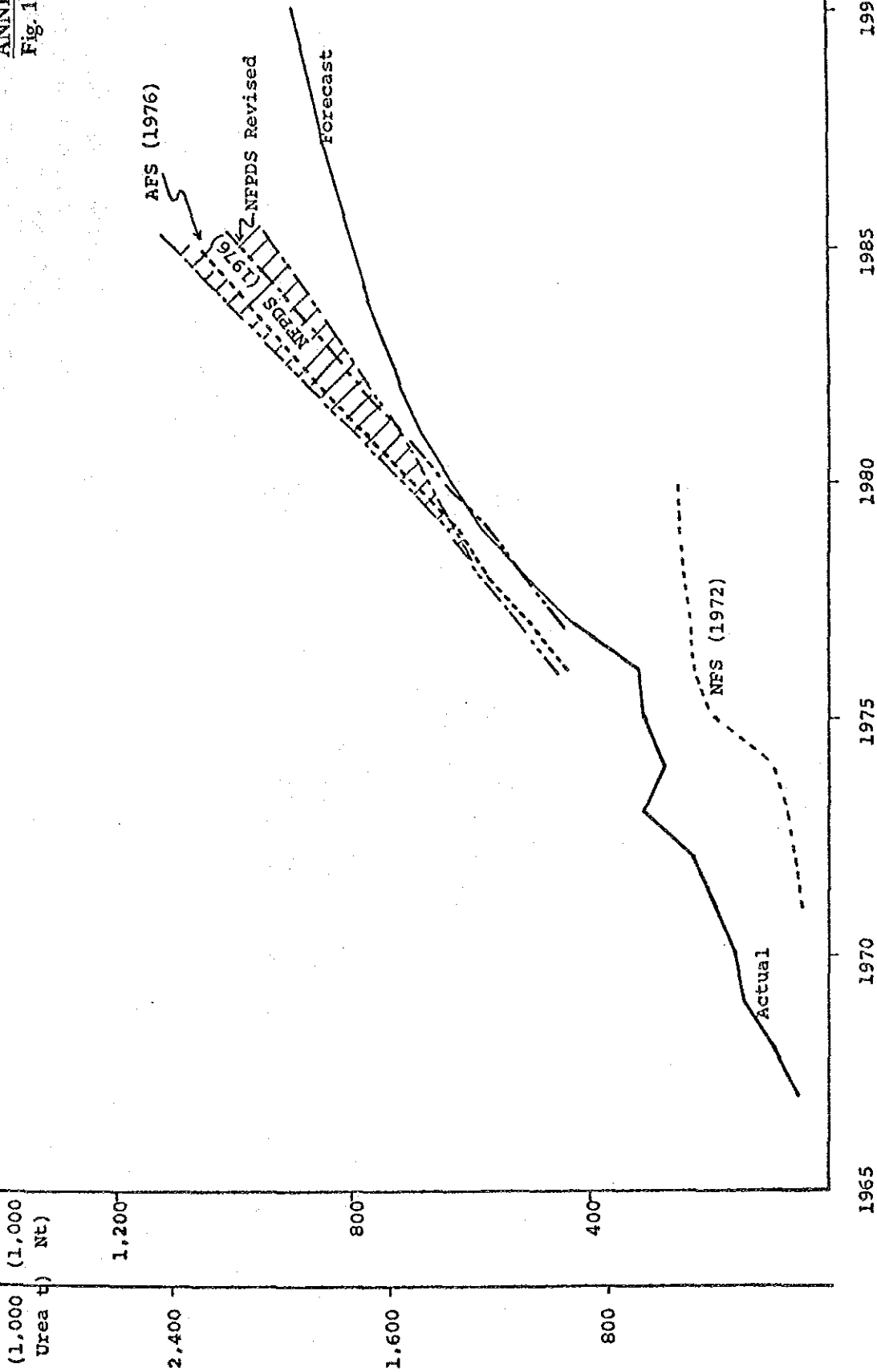
ANNEX II
Fig. 1-1-4



ASEAN ACEH Fertilizer Project
ACTUAL AND PROJECTED DEMAND FOR NITROGEN FERTILIZER, INDONESIA
Japan International Cooperation Agency (JICA)

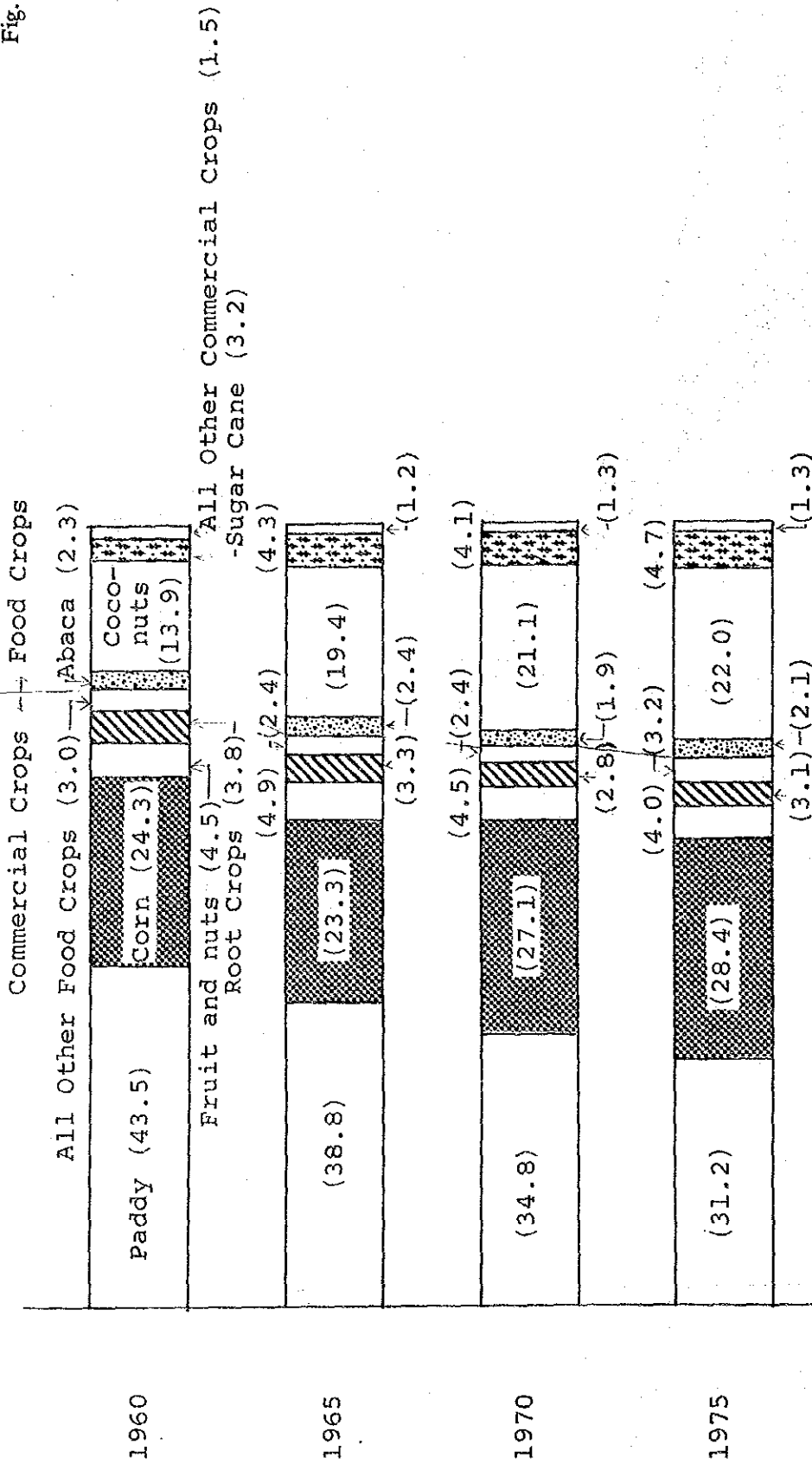
For sources of projections, see sources of Tab. 1-1-10.

ANNEX II
Fig. 1-1-5



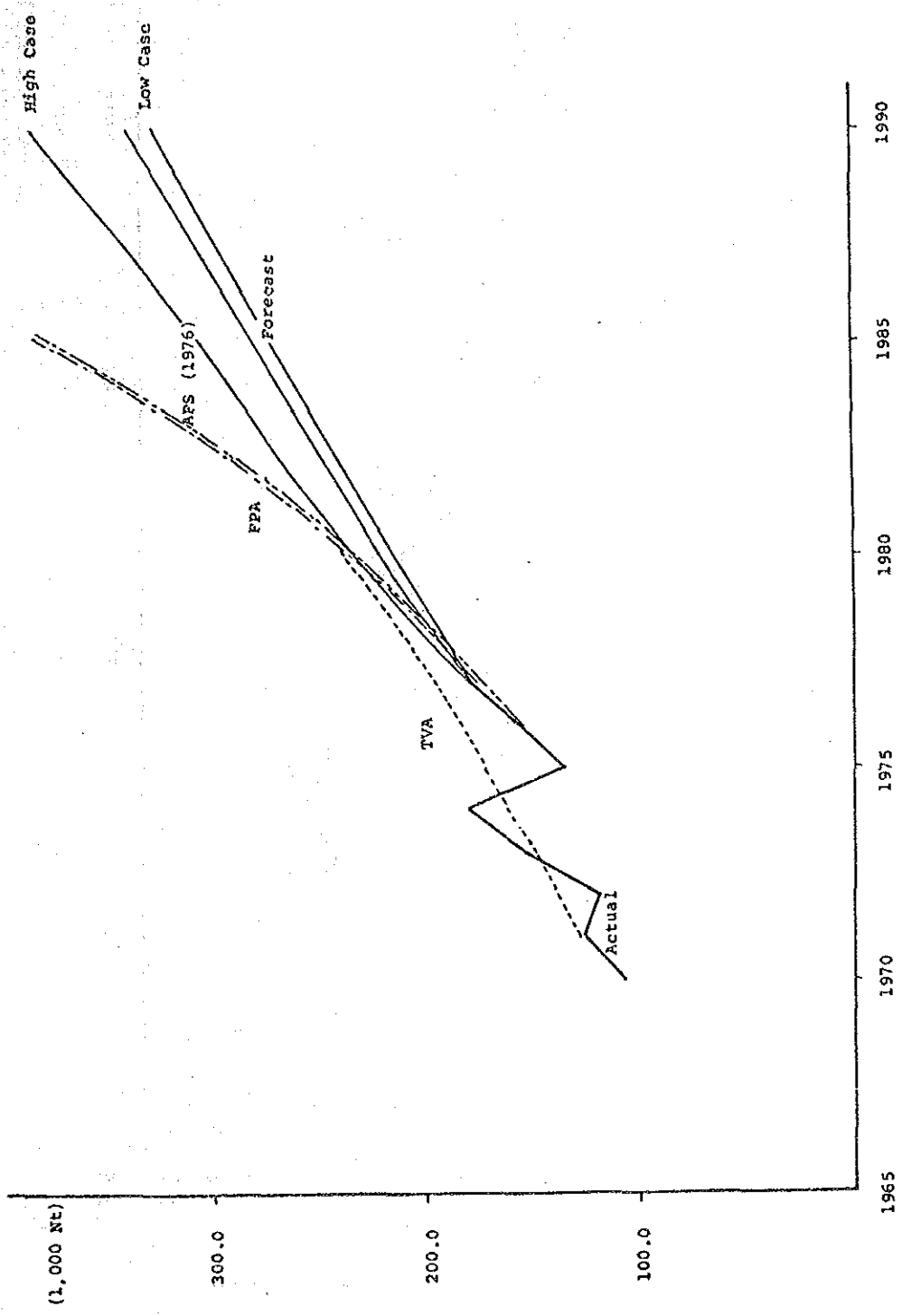
ASEAN ACEH Fertilizer Project
ACTUAL AND PROJECTED DEMAND FOR UREA, INDONESIA
Japan International Cooperation Agency (JICA)

For sources of projections, see sources of Tab. 1-1-11.



ASEAN ACEH Fertilizer Project
PERCENT DISTRIBUTION OF HARVESTED
AREA BY MAJOR CROP, THE PHILIPPINES
Japan International Cooperation Agency (JICA)

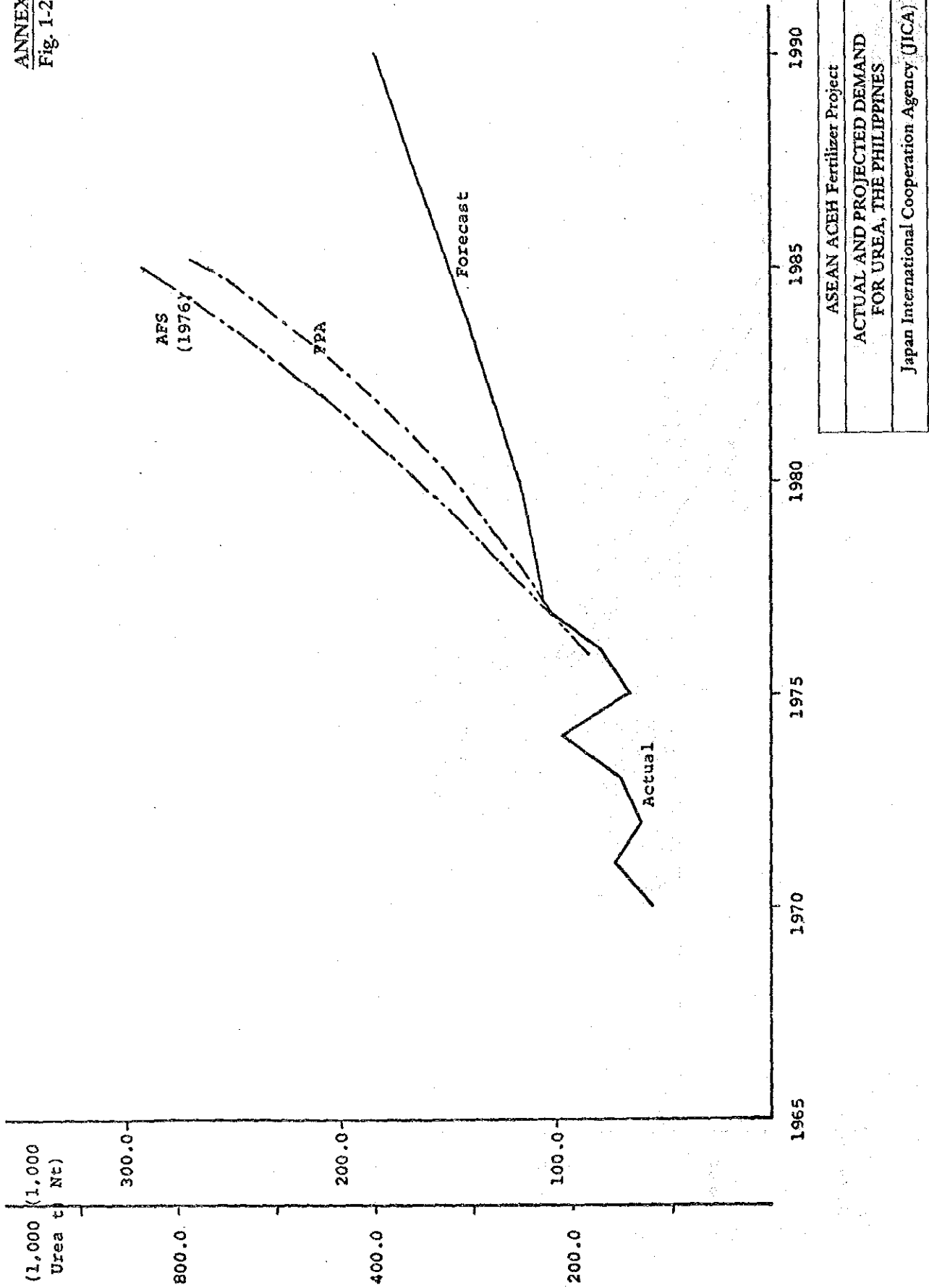
ANNEX II
Fig. 1-2-2



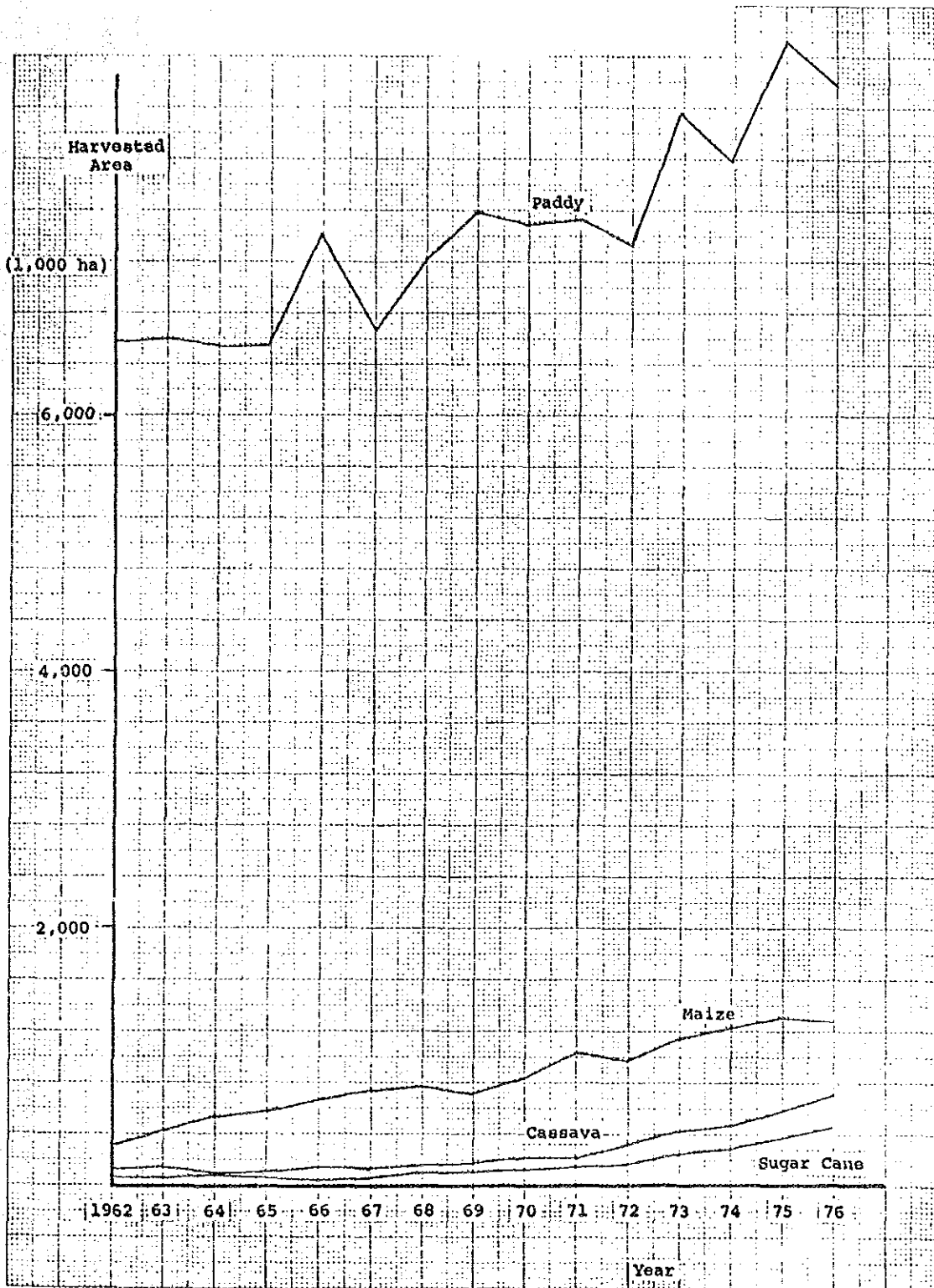
For sources of projections, see sources of Tab. 1-2-8.

ASEAN ACEH Fertilizer Project
ACTUAL AND PROJECTED DEMAND FOR NITROGEN FERTILIZER, THE PHILIPPINES
Japan International Cooperation Agency (JICA)

ANNEX II
Fig. 1-2-3



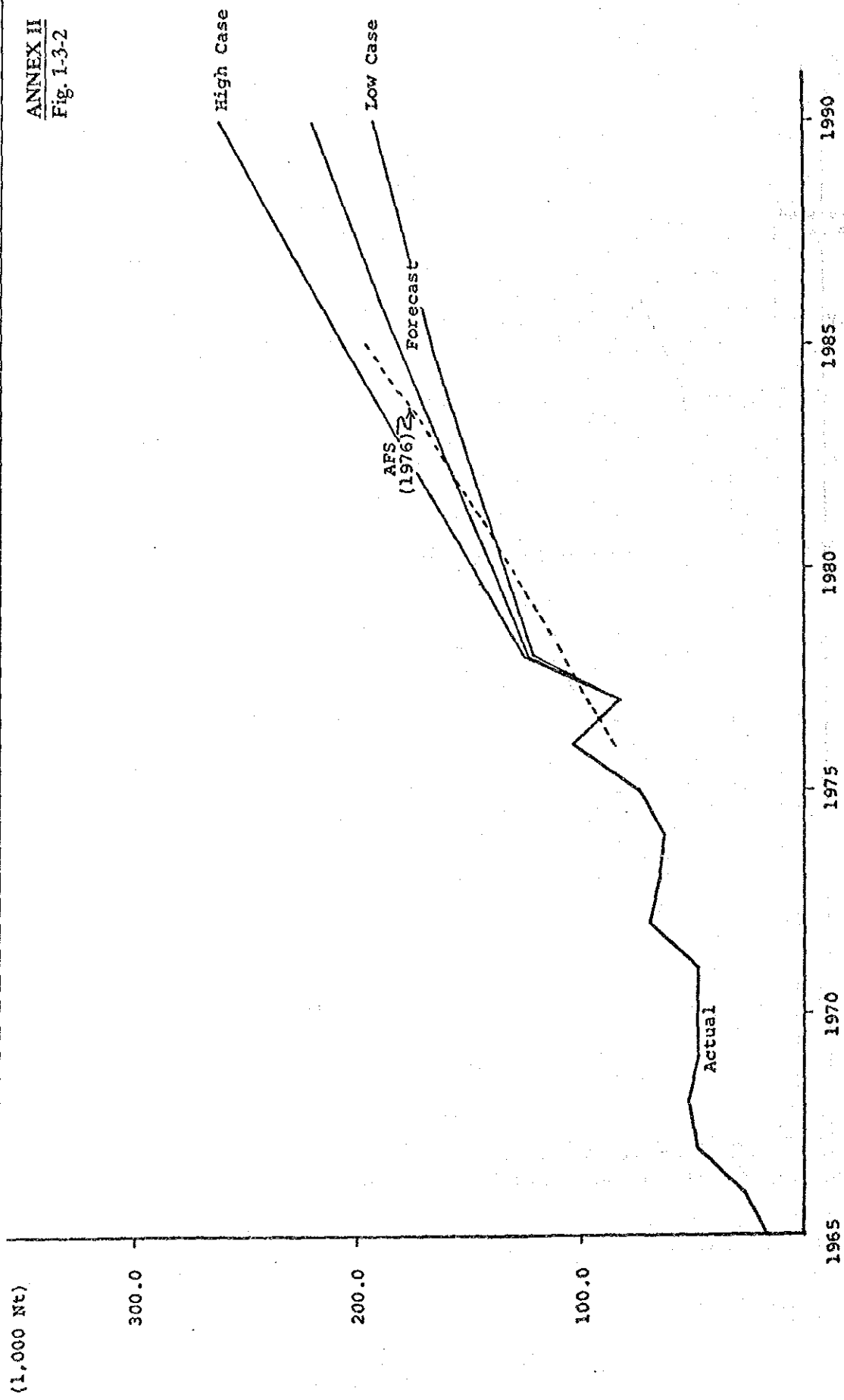
ANNEX II
Fig. 1-3-1



Source: Agricultural Statistics of Thailand, Crop Year 1976/77

ASEAN ACEH Fertilizer Project
HARVESTED AREA OF MAJOR CROPS, THAILAND
Japan International Cooperation Agency (JICA)

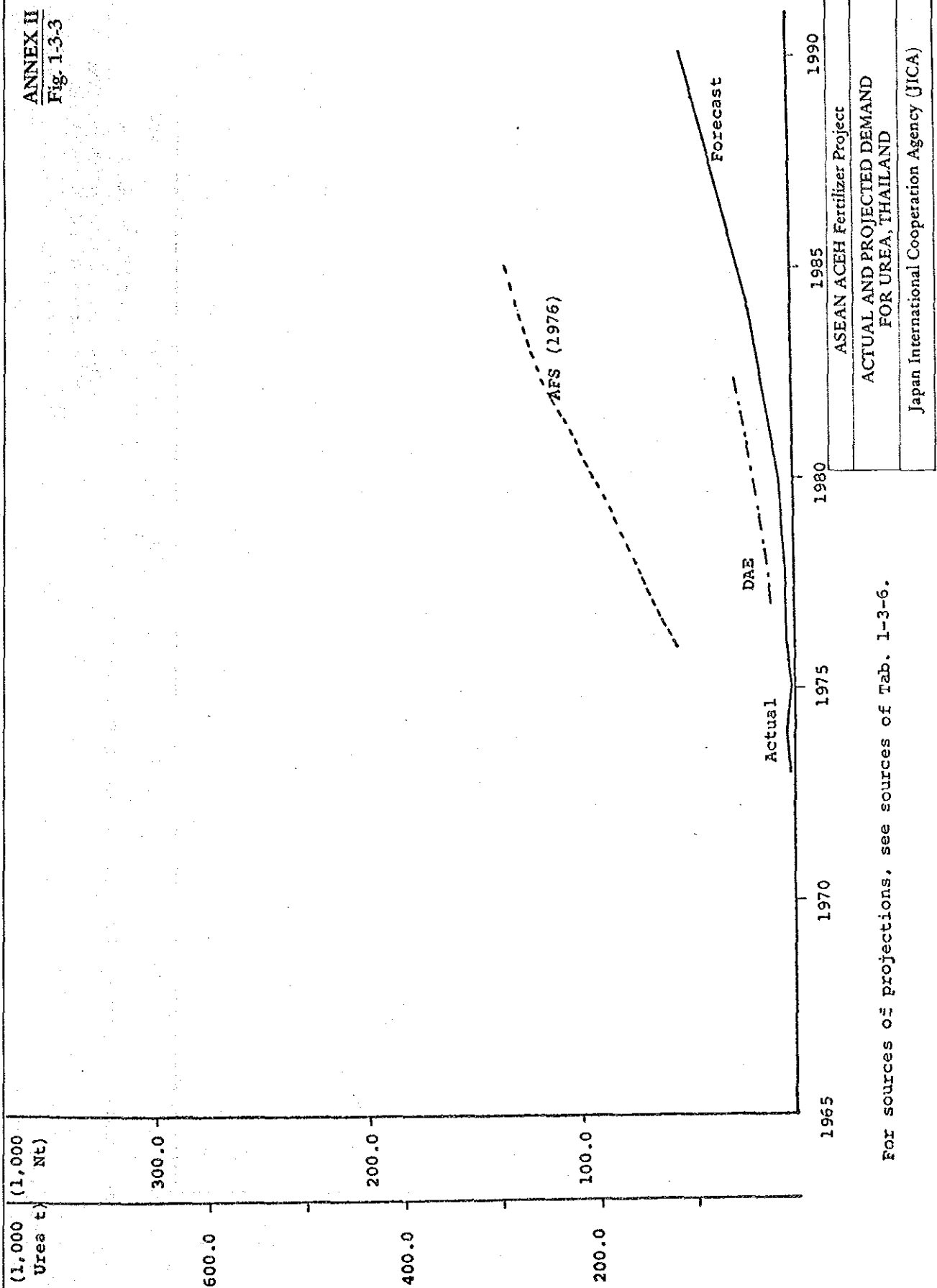
ANNEX II
Fig. 1-3-2



ASEAN ACEH Fertilizer Project
ACTUAL AND PROJECTED DEMAND FOR NITROGEN FERTILIZER, THAILAND
Japan International Cooperation Agency (JICA)

For sources of projections, see sources of Tab. 1-3-6.

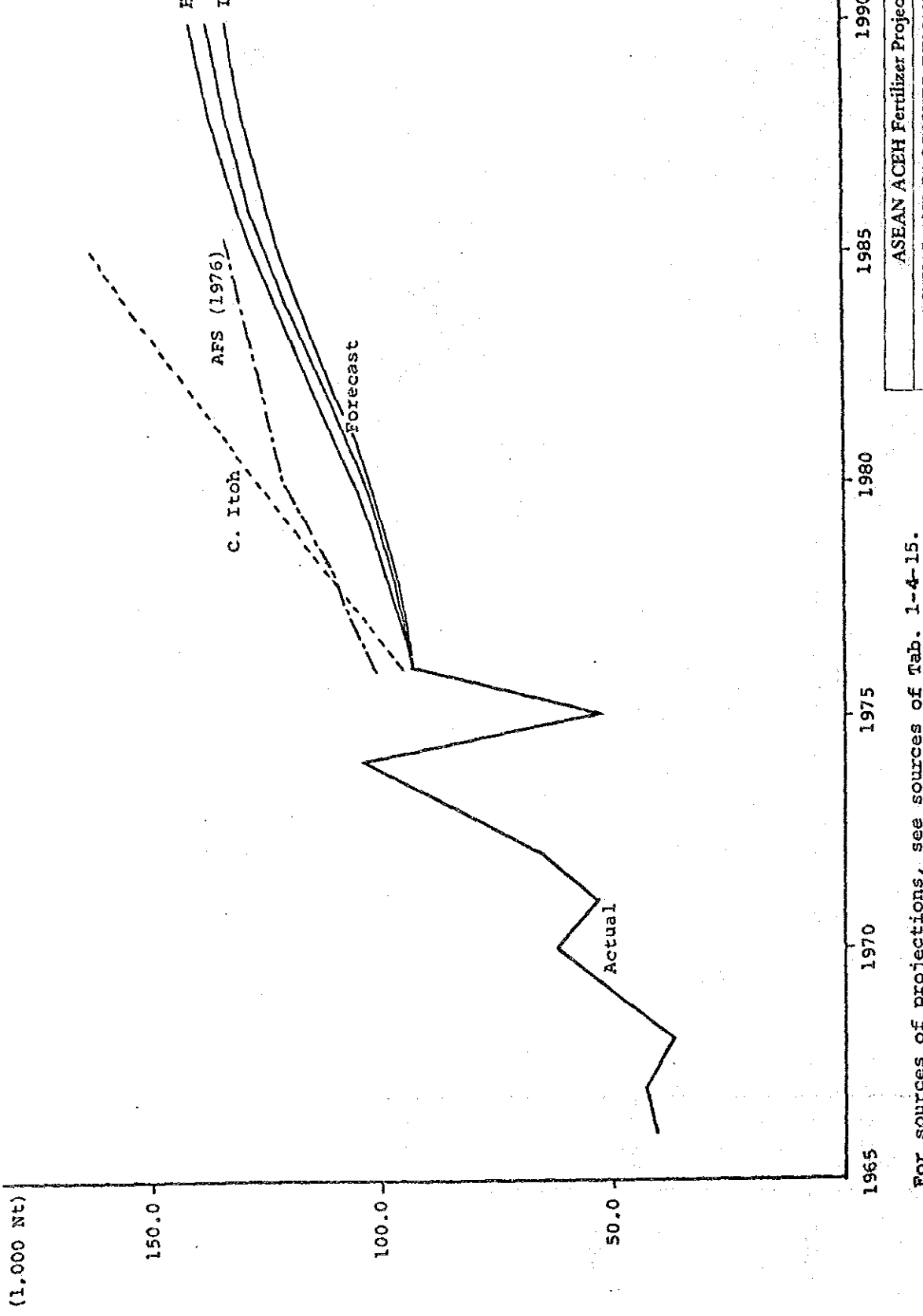
ANNEX II
Fig. 1-3-3



For sources of projections, see sources of Tab. 1-3-6.

ASEAN ACEH Fertilizer Project
ACTUAL AND PROJECTED DEMAND
FOR UREA, THAILAND
Japan International Cooperation Agency (JICA)

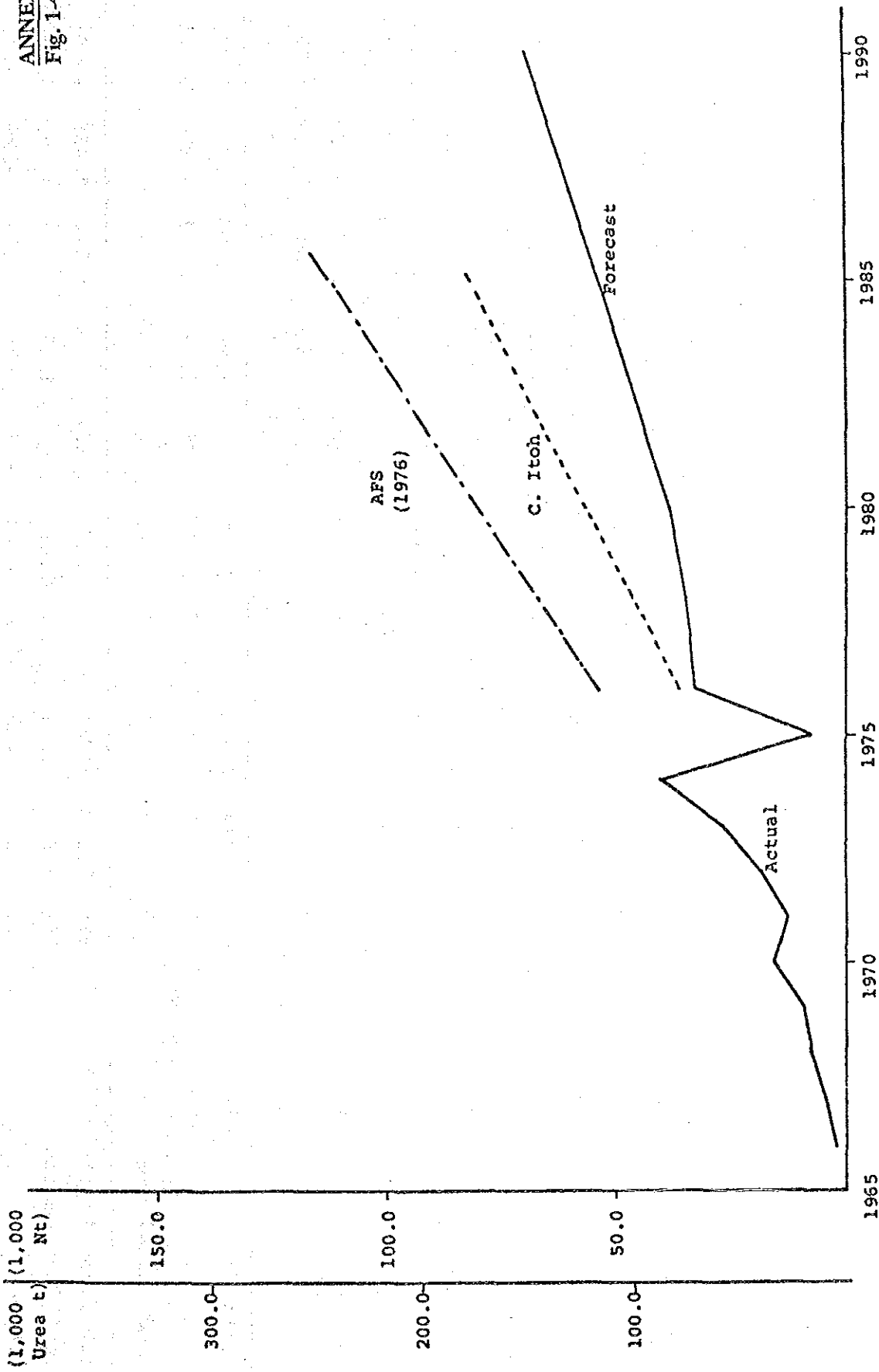
ANNEX II
Fig. 1-4-1



For sources of projections, see sources of Tab. 1-4-15.

ASEAN ACEH Fertilizer Project
ACTUAL AND PROJECTED DEMAND FOR
NITROGEN FERTILIZER, MALAYSIA
Japan International Cooperation Agency (JICA)

ANNEX II
Fig. 1-4-2



ASEAN ACEH Fertilizer Project
ACTUAL AND PROJECTED DEMAND
FOR UREA, MALAYSIA
Japan International Cooperation Agency (JICA)

For sources of projections, see sources of Tab. 1-4-15.

SUPPLY/DEMAND PROJECTION OF NITROGEN FERTILIZER, INDIA

ANNEX II
Tab. 2-2-1

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Existing											
Plants constructed before 1974	Cap. (A) 2,076	2,076	2,076	2,076	2,076	2,076	2,076	2,076	2,076	2,076	2,076
	Prod. (B) 1,238	1,238	1,238	1,238	1,238	1,238	1,238	1,238	1,238	1,238	1,238
	(B)/(A) % 60	60	60	60	60	60	60	60	60	60	60
Plants constructed after 1975	Cap. (A) 993	993	993	993	993	993	993	993	993	993	993
	Prod. (B) 672	695	695	695	695	695	695	695	695	695	695
	(B)/(A) % 68	70	70	70	70	70	70	70	70	70	70
Under construction	Cap. (A) 608	1,587	1,860	2,103	2,103	2,103	2,103	2,103	2,103	2,103	2,103
	Prod. (B) 152	579	1,032	1,322	1,436	1,472	1,472	1,472	1,472	1,472	1,472
	(B)/(A) % 25	36	55	63	68	70	70	70	70	70	70
Under planning	Cap. (A) -	-	-	-	-	228	953	2,140	2,536	2,536	2,536
	Prod. (B) -	-	-	-	-	57	306	856	1,419	1,716	1,775
	(B)/(A) %					25	32	40	56	68	70
Total	Cap. 3,677	4,656	4,929	5,172	5,172	5,400	6,967	7,708	7,708	7,708	7,708
	Prod. 2,062	2,512	2,965	3,255	3,365	3,462	3,711	4,261	4,824	5,121	5,180
Industrial use	53	55	57	60	62	64	67	70	73	75	78
Fertilizer Supply Capability	1,888	2,310	2,734	3,003	3,105	3,194	3,425	3,940	4,466	4,743	4,796
Fertilizer Demand	2,653	2,907	3,161	3,415	3,666	3,919	4,175	4,434	4,695	4,966	5,241
Balance	-765	-597	-427	-412	-561	-725	-750	-494	-229	-223	-445

SUPPLY/DEMAND PROJECTION OF NITROGEN FERTILIZER, INDIA
(CONT'D.)

ANNEX II
Tab. 2-2-1

Notes of Table 2-2-1

1. (Production) = (Capacity) x (B)/(A)
2. (Fertilizer Supply Capability) = [(Total production) - (Industrial Use) - (Loss)]

Loss is assumed to be 6% of total production less industrial use.

3. Capacity utilization ratios are assumed to be as follows:

- 1) Plants constructed before 1974: 60%
- 2) Other plants: 1st year of operation: 25%
2nd year of operation: 55%
3rd year and thereafter: 70%

CROPPED AREA, IRRIGATED AREA, AND HYV DIFFUSION RATE, INDIA

ANNEX II
Tab. 2-2-2

	Gross area 1975/76 000 ha	Irrig- ated area 1973/74 000 ha	Annual growth rate of gross area 1971/2-75/6 %	HYV area 1975/76 000 ha	Annual growth rate of HYV area 1973/4-76/7 %	Diffusion rate of HYV %
Rice	39,687	14,711	1.27	12,742	11.22	32
Wheat	20,111	10,729	1.24	13,458	10.05	67
Jowar	16,100	679	-1.04	1,958	32.03	12
Bajra	11,582	538	-0.41	2,897	-9.00	25
Maize	5,995	885	1.28	1,132	11.26	19
Ragi	2,571	310	1.48			
Small millets	4,629		0.73			
Barley	2,841	1,362	3.73			
Gram	8,373	1,221	1.44			
Fur	2,668		3.05			
Other pulses	13,623		3.43			
Groundnut	7,375	646	-0.46			
Cotton	7,460	1,618	-1.12			
Jute	586		-7.91			
Potato	639		7.69			
Sugarcane	2,789	2,142	4.30			
Tobacco	369	96	-5.26			
Rubber	224		4.57			
Tea	363		0.18			
Pepper	121		0.53			
Chillies	749		-0.28			
Total cropped area of major crops	148,856	40,249	1.40			
Cropped area total including other crops	169,503					

STANDARD RECOMMENDATION, KG/HA NUTRIENT, INDIA

ANNEX II

Tab. 2-2-3

Crop		Variety	Fertility	N	P ₂ O ₅	K ₂ O
Rice, Kharif	summer	local	medium	40	20	20
		HYV	medium	80	40	40
Rice, Rabi	winter	local	medium	50	25	25
		HYV	medium	110	50	50
Wheat	winter	local	rainfed	40	30	20
		HYV	irrigated	100	75	50
Jowar	summer	local	rainfed	50	25	-
		HYV	irrigated	100	75	75
Bajra	summer	local	rainfed	50	25	-
		HYV	irrigated	75	37	-
Maize	summer	local	rainfed	60	30	30
		HYV	irrigated	100	50	40
Radi	summer		rainfed	50	37.5	-
Barley	winter		rainfed	30	40	-
Gram	winter		rainfed	25	25	-
Fur	winter		rainfed	25	25	-
Groundnut	summer		rainfed	12	25	-
Cotton	summer	local	rainfed	50	25	25
		HYV	irrigated	100	50	50
Jute			medium	25	0	25
Potato			medium	100	100	100
Sugarcane			medium	200	100	100
Tobacco				200	50	50
Pepper				100	40	140
Chillies				75	25	50

POTENTIAL, ACTUAL AND PROJECTED DEMAND
FOR NITROGEN FERTILIZER, INDIA

ANNEX II
Tab. 2-2-4

(N 000 ton)

	Potential Demand (A)	Actual Demand (B)	(B)/(A) % (C)	Projected (C)	Projected Demand
1971/72	7,417	1,789	24.1		
1972/73	7,416	1,839	24.8		
1973/74	7,996	1,829	22.9		
1974/75	7,840	1,766	22.5		
1975/76	8,216	2,031	24.7		
1980/81	8,963			38.1	3,415
1985/86	9,372			50.1	4,695
1990/91	9,815			62.1	6,096

- Notes:
1. (Potential Demand) = Σ [(Cropped area) x (Standard Recommendation)]
 2. Projected (C) is calculated with the regression on logistic curve.
 3. (Projected Demand) = (Potential Demand) x (Projected (C))

CAPACITY, PRODUCTION, IMPORT AND DISTRIBUTION OF UREA, INDIA

ANNEX II

Tab. 2-2-5

(Urea 000 ton)

	Capacity (A)	Production (B)	(B)/(A)	Import	% of total nitrogen fertilizer imported	Distribution	% of total nitrogen fertilizer distributed
1970/71		1,096		779	75	1,701	60
71/72		1,236		550	53	2,226	62
72/73		1,415		1,058	73	2,430	64
73/74	2,791	1,407	50	1,034	72	2,280	65
74/75	3,273	1,734	53	1,244	65	2,684	67
75/76	4,220	2,197	52	1,469	71	2,917	70
76/77	4,819						

SUPPLY/DEMAND PROJECTION OF UREA, INDIA

ANNEX II
Tab. 2-2-6

(Urea 000 ton)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Existing											
Plants constructed before 1974	3,273	3,273	3,273	3,273	3,273	3,273	3,273	3,273	3,273	3,273	3,273
Plants constructed after 1975	1,964	1,964	1,964	1,964	1,964	1,964	1,964	1,964	1,964	1,964	1,964
	60	60	60	60	60	60	60	60	60	60	60
	1,546	1,546	1,546	1,546	1,546	1,546	1,546	1,546	1,546	1,546	1,546
	992	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
	64	70	70	70	70	70	70	70	70	70	70
Under construction											
	1,320	3,285	3,879	4,031	4,031	4,031	4,031	4,031	4,031	4,031	4,031
	330	1,217	2,154	2,665	2,799	2,822	2,822	2,822	2,822	2,822	2,822
	25	37	56	66	69	70	70	70	70	70	70
Under planning											
	-	-	-	-	-	437	1,262	2,262	2,762	2,762	2,762
	-	-	-	-	-	109	447	1,010	1,558	1,858	1,933
						25	35	45	56	67	70
Total											
Cap.	6,139	8,104	8,698	8,850	8,850	9,287	10,112	11,112	11,612	11,612	11,612
Prod.	3,286	4,263	5,200	5,711	5,845	5,977	6,315	6,878	7,426	7,726	7,801
Fertilizer Supply Capability	3,187	4,135	5,044	5,540	5,670	5,798	6,126	6,672	7,203	7,494	7,567
Demand	4,351	5,044	5,694	6,167	6,524	6,986	7,533	7,746	7,701	7,979	8,534
Balance	-1,164	-909	-650	-627	-854	-1,188	-1,407	-1,074	-498	-485	-967

Notes: See notes of ANNEX II/Tab. 2-2-1.
Loss is assumed to be 3% of total production.

CAPACITY, PRODUCTION, IMPORT AND CONSUMPTION OF NITROGEN FERTILIZER, INDIA

ANNEX II
Tab. 2.2-7

(N 000 ton)

	Capacity (A)	Production (B)	(B)/(A)	Import (C)	Consumption
1970/71		833		477	1,479
1971/72		949		481	1,789
1972/73		1,055		665	1,839
1973/74	2,204	1,050	48%	659	1,829
1974/75	2,625	1,187	45%	884	1,766
1975/76	3,024	1,508	50%	951	2,031
1976/77	3,069	1,857	62%	750	2,457

Sources: FAI, "Fertilizer Statistics"

FAI, "Fertilizer Production in India"

FAO, "Monthly Bulletin of Statistics"

NEW AMMONIA/UREA PLANTS IN INDIA

ANNEX II
Tab. 2-2-8

Status	Company	Location	Start-up year/month	NH ₃ (N.T/Y)	Capacity Urea (T/Y)	Remarks
Under Construction	1) FCI	Haldia (W. Bengal)	1979/1	152,000	167,400	
	2) FCI	Nangal (Punjab)	1977/12	152,000	330,000	Expansion
	3) FCI	Ramagundam (Andra Pradesh)	1978/6	228,000	495,000	
	4) FCI	Sindri (Bihar)	1978/10	129,000	280,000	Expansion
	5) FCI	Talcher (Orissa)	1978/4	228,000	495,000	
	6) FCI	Trombay V (Maharashtra)	1980/7	243,000	152,000	
	7) Gujarat Narmada Valley Fertilizer Co.	Chavaj (Gujarat)	1980/4	273,000	594,000	
	8) Indian Farmers Fertilizer Coop	Phulpur (Uttar Pradesh)	1979/6	228,000	495,000	
	9) National Fertilizers	Bhatina (Punjab)	1978/3	235,000	511,500	
	10) National Fertilizers	Panipat (Haryana)	1978/7	235,000	511,500	
	Sub-total		2,103,000	4,031,400		
Approved in Principle	1) FCI	Korba (Madhya Pradesh)	1983-84	228,000	495,000	
	2) FCI	Paradeep (Orissa)	1984-85	345,000	-	
	*3) FCI	Namrup (Assam)	1982-83	152,000	-	
	*4) West Coast Fertilizer Coop.	Rewas (Maharashtra)	1982-83	345,000	500,000	
	5) West Coast Fertilizer Coop.	Rewas (Maharashtra)	1982-83	345,000	500,000	
	*6) Indian Farmers Fertilizer Coop.	Ahmedabad (Gujarat)	1983-84	345,000	500,000	
	*7) Maharashtra Coop. Fertilizers and Chemicals	Tarapur (Maharashtra)	1984-85	51,000	-	
	8) Nagarjuna Fertilizers	Kakinada (Andhra Pradesh)	1982-83	228,000	437,000	
	9) Shriram Chemical Industries	Kota (Rajasthan)	1983-84	152,000	330,000	
	Sub-total		2,191,000	2,762,000		
Under Consideration	1) N.A.	North of Bombay (Maharashtra)	1983-84	345,000	-	
Grand Total			4,639,000	6,793,400		

CAPACITY UTILIZATION RATIO OF NITROGEN FERTILIZER PLANTS IN INDIA

ANNEX II
Tab. 2-2-9

	1975/76		1976/77		(B)/(A)	Production Capacity (A) (N 000 t)	Actual Production (B) (N 000 t)	(B)/(A) (%)
	Production Capacity (A) (N 000 t)	Actual Production (B) (N 000 t)	Production Capacity (A) (N 000 t)	Actual Production (B) (N 000 t)				
Plants in 1st year of operation	733	159	102	24	22	102	24	24
Plants in 2nd year of operation	215	111	733	393	52	733	393	54
Plants in 3rd year and after of operation	2,076	1,238	2,234	1,440	60	2,234	1,440	64
Total	3,024	1,508	3,069	1,857	50	3,069	1,857	62

Source: Calculated from "Fertilizer Statistics" (FAI)

FERTILIZER CONSUMPTION BY PRODUCT, 1964/65 TO 1976/77, BANGLADESH

ANNEX II
Tab. 2-2-10

		Unit: 000 Tons product													
		1964/65	65/66	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74	74/75	75/76	76/77	
Urea		72	85	123	154	162	200	216	172	281	272	177	317	359	
AS		-	-	-	-	-	-	-	-	-	-	-	-	-	
TSP		19	20	34	49	54	67	76	61	90	95	76	112	128	
SSP		-	-	-	-	-	-	-	-	-	-	-	2	1	
HP		-	-	-	-	-	-	-	-	-	-	12	4	4	
MP		3	3	7	11	13	15	17	14	19	19	18	22	23	
NPK		-	-	-	-	-	-	-	-	-	-	1	8	6	
Total		95	108	165	214	229	282	309	248	390	386	284	465	521	
Annual increase rate (%)															
Urea		18	45	25	25	5	24	8	-20	63	-3	-35	79	13	
TSP		5	70	44	44	10	24	13	-20	48	6	-20	47	14	
MP		0	133	57	57	18	15	13	-18	36	0	-5	22	5	

Source: BADC

Notes: Average annual increase rate of urea = 14.3 %
Average annual increase rate of TSP = 17.2 %
Average annual increase rate of MP = 16.5 %

COMPARISON OF DIFFERENT PROJECTION OF NITROGEN REQUIREMENT, BANGLADESH
ANNEX II
Tab. 2-2-11

Unit: 10³ Ntons

	1976	1978	1980	1983	1985	1990	1992	1995
UNICO Optimistic (1978)	217	289	395	463	618	671	736	
UNICO Moderate (1978)	207	258	334	380	477	509	552	
EIU High (1977)	205	258	333	429	711	871		
EIU Medium (1977)	185	219	296	361	520	655		
BADC Original Target	166	244	337	488	600			
Planning Commission (1975)	238	289	326	395				
IBRD/IDA (1974)	268	339	398	507				
TVA (1974) Medium	262	388						
IFDC (1974)	150	298	414					
ESCAP Expert Group (1975)	138	203	298	438				
FAO (1975)								1,087

PROJECTED AREA & HYV RATIO, BANGLADESH

ANNEX II

Tab. 2-2-12

Unit: 000 HA

	1976/77	1980/81 O	1980/81 M	1985/86 O	1985/86 M	1990/91 O	1990/91 M
Aus local	2,855	2,770	2,770	2,394	2,578	2,115	2,460
Aus HYV	365	650	650	1,026	842	1,305	960
Aus total	3,220	3,420	3,420	3,420	3,420	3,420	3,420
HYV ratio %	11.3	19.0	19.0	30.0	24.6	38.2	28.1
Aman local	5,390	4,935	5,041	4,360	4,849	4,070	4,534
Aman HYV	424	879	773	1,454	965	1,744	1,280
Aman total	5,814	5,814	5,814	5,814	5,814	5,814	5,814
HYV ratio %	7.3	15.1	13.3	25.0	16.6	30.0	22.0
Boro local	363	290	363	265	363	249	363
Boro HYV	492	648	671	1,058	1,099	1,410	1,479
Boro total	855	938	1,034	1,323	1,462	1,659	1,842
HYV ratio %	57.3	69.1	64.9	80.0	75.2	85.0	80.3
Rice local	8,608	7,995	8,174	7,019	7,790	6,434	7,357
Rice HYV	1,281	2,177	2,094	3,538	2,906	4,459	3,719
Rice total	9,889	10,172	10,268	10,557	10,696	10,893	11,076
HYV ratio %	13.0	21.4	20.4	33.5	27.2	40.9	33.6
Wheat local	44	22	44	11	44	10	44
Wheat HYV	117	240	122	300	128	350	133
Wheat total	161	262	166	311	172	360	177
HYV ratio %	73.1	91.6	73.5	96.5	74.4	97.2	75.1
Foodgrain total	10,050	10,434	10,434	10,868	10,868	11,253	11,253
Others	1,802	1,802	1,802	1,802	1,802	1,802	1,802
Grand total	11,852	12,236	12,236	12,670	12,670	13,055	13,055

PROJECTED AVERAGE UREA USE INTENSITY, BANGLADESH

ANNEX II
Tab. 2-2-13

Unit: Kg/HA urea

	1976/77	1980/81 O	1980/81 M	1985/86 O	1985/86 M	1990/91 O	1990/91 M	Recommen- dation
Aus local	16	30	25	50	47	70	57	146
Aus HYV	94	110	110	130	120	150	130	243
Aman local	17	30	25	50	40	70	47	122
Aman HYV	114	120	120	130	125	150	130	243
Boro local	20	35	35	50	50	70	60	146
Boro HYV	133	150	140	170	150	180	160	243
Wheat local	8	25	25	40	40	60	50	97
Wheat HYV	37	120	80	180	120	200	160	243
Jute	36	46	46	56	50	60	60	97
Sugarcane	55	70	70	80	75	85	85	365
Tabacco	53	70	70	80	73	85	80	
Potato	163	180	180	200	193	225	200	365
Gram & Pulse	1	2	2	3	3	4	4	73
Oilseed	20	30	30	40	31	45	45	73
Vegetable	65	67	66	78	70	95	95	
Others	33	40	40	40	40	55	55	

ACTUAL PRODUCTION BY PRODUCTS, BANGLADESH

ANNEX II
Tab. 2-2-14

Unit: 000 Tons product

	Fenchuganj		Ghorasal	Total	Chittagong
	urea	AS	urea	urea	TSP
1962/63	72.6			72.6	
63/64	101.1			101.1	
64/65	77.4			77.4	
65/66	92.9			92.9	
66/67	95.1			95.1	
67/68	111.0			111.0	
68/69	88.0			88.0	
69/70	95.9	4.7		95.9	
70/71	56.1	6.2	45.0	101.1	
71/72	47.0	3.1	-	47.0	
72/73	39.2	6.0	175.2	214.4	
73/74	60.6	10.2	221.0	281.6	
74/75	58.4	4.9	10.7	69.1	30.0
75/76	53.2	6.2	228.9	282.1	48.7
76/77	72.3		194.2	266.5	44.8
77/78 Jul.-Jan.	34.7		100.2	134.9	
Capacity	106	12	363	468	152
Average Operation rate (%)	70.5	49.2	34.4	-	27.1

Source: BCIC, (Up to 1975/76
reproduced from EIU)

FUTURE UREA PRODUCTION ASSUMPTIONS, BANGLADESH ANNEX II
Tab. 2-2-15

(Unit: 000 tons product)

Year	Fenchuganj	Ghorasal	Ashuganj	Chinese plant	Chittagong	Total
1977/78	62	167	-	-	-	229
78/79	30	230	-	-	-	260
79/80	81	254	-	-	-	335
80/81	81	254	-	-	-	335
81/82	81	254	391	-	-	726
82/83	81	254	419	90	-	844
83/84	81	254	419	100	433	1,287
84/85	81	254	419	100	510	1,364
85/86	81	254	419	100	510	1,364
86/87	81	254	419	100	510	1,364
87/88	81	254	419	100	510	1,364
88/89	81	254	419	100	510	1,364
89/90	81	254	419	100	510	1,364
90/91	81	254	419	100	510	1,364

Note: Data for Fenchuganj, Ghorasal, Ashuganj, and Chinese Plant are prepared by BCIC.

Operating rate for Chittagong are 255 d/y at initial start up year and 300 d/y at usual years.

SUPPLY/DEMAND BALANCE SHEET, UREA, BANGLADESH

ANNEX II

Tab. 2-2-16

(Unit: 000 M tons product)

Year	Supply	Demand & Balance			
		Moderate		Optimistic	
1977/78	229	400	-171	400	-171
78/79	260	450	-190	472	-212
79/80	335	506	-171	550	-215
80/81	335	562	-227	630	-295
81/82	726	618	+108	708	+18
82/83	844	673	+171	785	+59
83/84	1,287	728	+559	860	+427
84/85	1,364	780	+584	934	+430
85/86	1,364	828	+536	1,007	+357
86/87	1,364	874	+490	1,079	+285
87/88	1,364	918	+446	1,150	+214
88/89	1,364	960	+404	1,217	+147
89/90	1,364	1,000	+364	1,282	+82
90/91	1,364	1,037	+327	1,345	+19
91/92	1,364	1,073	+291	1,404	-40
92/93	1,364	1,107	+257	1,459	-95
93/94	1,364	1,140	+224	1,510	-146
94/95	1,364	1,170	+194	1,558	-194
95/96	1,364	1,200	+164	1,600	-236

SUPPLY/DEMAND PROJECTION OF NITROGEN FERTILIZER, VIETNAM

ANNEX II
Tab. 2-2-17

		(N 000 tons)													
		1975/6*	76/7*	77/8	78/9	79/80	80/1	81/2	82/3	83/4	84/5	85/6	86/7	87/8	
Capacity/Production															
Ha Bac Plant	NH ₃	0	22	54	54	54	54	54	54	54	54	54	54	54	
	Cap. (A)														
	Prod. (B)	0	13	38	41	41	41	41	41	41	41	41	41	41	
	(B)/(A)	-	60	70	75	75	75	75	75	75	75	75	75	75	
New Plant	NH ₃														
	Cap. (A)														
	Prod. (B)														
	(B)/(A)														
Total		0	22	54	54	54	54	54	54	54	54	54	54	54	
	Cap.														
	Prod.	0	13	38	41	41	41	41	41	41	41	41	41	41	
Demand		204	221	235	248	261	271	282	290	298	305	312	317	323	
Balance		-204	-221	-197	-207	-220	-230	-241	-249	-257	-264	-222	-163	-160	

Notes: 1. *: Actual or estimated.
2. Production each years are projected by the following formula:
(Production) = (Capacity) x (B)/(A)

SUPPLY/DEMAND PROJECTION OF UREA, VIETNAM

ANNEX II
Tab. 2-2-18

		(Urea 000 ton)											
		1977/8	78/9	79/80	80/1	81/2	82/3	83/4	84/5	85/6	86/7	87/8	
Capacity/Production													
Ha Bac Plant	Urea	109	109	109	109	109	109	109	109	109	109	109	109
	Cap. (A)	109	109	109	109	109	109	109	109	109	109	109	109
	Prod. (B)	76	82	82	82	82	82	82	82	82	82	82	82
	(B)/(A)	70	75	75	75	75	75	75	75	75	75	75	75
New Plant													
	Urea												
	Cap. (A)												165
	Prod. (B)												99
	(B)/(A)												60
Total													
	Cap.	109	109	109	109	109	109	109	109	109	109	109	274
	Prod.	76	82	82	82	82	82	82	82	82	82	82	181
		460	485	511	530	552	567	583	597	610	620	632	632
	Demand												
	Balance	-384	-403	-429	-448	-470	-485	-501	-515	-515	-429	-307	-302

Notes: 1. *: Estimated

2. Productions in each year are projected by the following formula:

$$(\text{Production}) = (\text{Capacity}) \times (\text{B}) / (\text{A})$$

PRODUCT-WISE BALANCE, 1965 - 1976, PAKISTAN

ANNEX II
Tab. 2-2-19
(N 000 ton)

	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976*
Urea												
Production	19.1	21.9	20.0	52.8	95.7	105.8	181.5	245.4	264.2	275.6	277.6	273.0
Import	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	70.5	82.3	166.1	93.1	33.4	38.9
Consumption	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	335.6	300.4	307.8	352.8	N.A.
Ammonium Sulphate												
Production	8.2	9.0	9.8	8.9	12.0	12.4	13.9	12.1	19.2	19.8	20.4	20.9
Import	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.0	0.0	2.1	0.0	0.0	0.0
Consumption	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	11.9	10.7	13.2	21.8	N.A.
Ammonium Nitrate												
Production	19.9	21.1	20.4	17.2	21.8	22.1	19.8	17.0	16.5	15.4	18.4	21.9
Import	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.0	0.0	9.5	6.2	0.0	0.0
Consumption	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	19.2	7.4	20.4	21.7	N.A.
Other Products												
Import	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	0.0	33.3	27.7	7.6	42.7	32.2
Consumption	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	19.6	14.6	17.4	45.6	N.A.
Total												
Production	47.1	52.0	50.2	78.9	129.5	140.3	215.2	274.4	299.9	310.8	316.5	(309.3)
Import	50.1	66.0	113.4	108.9	287.9	102.4	70.5	115.6	205.5	106.9	76.2	(118.9)
Consumption	69.2	107.8	177.4	203.5	272.6	251.5	344.0	386.2	333.0	359.0	441.9	(500.4)
Export	0.0	0.0	3.8	16.0	9.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0

Sources: 1) FAO, "Annual Fertilizer Review"

2) *Production/Import: "Monthly Statistical Bulletin"
Consumption: "Fertilizer Situation in Pakistan"

(Paper prepared for FAO/FIAC SEMINAR ON FERTILIZER
PRICING POLICIES AND SUBSIDIES, 1978)

3) Figures in parentheses: "Monthly Bulletin of
Statistics" (FAO)

NITROGEN FERTILIZER DEMAND PROJECTION, PAKISTAN

ANNEX II
Tab. 2-2-20

(N 000 ton)

	Pakistan*1 Government	UNICO	4th 5 year*2 plan	OECD*2	FDAS*2
1977	609	510			
1978	682	552	536		1,021
1979	764	594	635	585	1,100
1980	825	636			
1981	875	682			
1982	950	728			
1983		774			
1984		820			
1985		866			
1986		911			
1987		956			

Sources: *1: "Fertilizer Situation in Pakistan"
(Paper prepared for FAO/FIAC Seminar on
Fertilizer Pricing Policies and Subsidies,
1978)

*2: "Country Paper - Pakistan (Fertilizers)"
(Paper prepared for Symposium on Farm
and Agriculture, 1974)

SUPPLY/DEMAND PROJECTION OF UREA, PAKISTAN

ANNEX II

Tab. 2-2-21

(Urea 000 ton)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Capacity/Production											
Existing Plants Cap. (A)	618	618	618	618	618	618	618	618	618	618	618
Prod. (B)	593	593	593	593	593	593	593	593	593	593	593
(B)/(A) (%)	96	96	96	96	96	96	96	96	96	96	96
New Plants											
Cap. (A)	-	-	574	574	574	1,234	1,234	1,580	1,580	1,580	1,580
Prod. (B)	-	-	431	459	517	1,012	1,045	1,371	1,388	1,422	1,422
(B)/(A) (%)			75	80	90	82	85	87	88	90	90
Total											
Cap.	618	618	1,192	1,192	1,192	1,852	1,852	2,198	2,198	2,198	2,198
Prod.	593	593	1,024	1,052	1,110	1,605	1,638	1,964	1,981	2,015	2,015
Demand											
	942	884	1,024	1,052	1,110	1,157	1,273	1,394	1,520	1,633	1,767
Balance											
	-349	-291	0	0	0	448	365	570	461	382	248

ANNEX II
Tab. 2-2-22

NITROGEN FERTILIZER PLANTS IN PAKISTAN

Status	Company	Location	Start-up year	Capacity		Remarks
				NH ₃ (N.T/Y)	Urea (T/Y)	
Existing	NFC (National Fertilizer Co.)	Daudkhel	1958/69	25,000	-	
	NFC	Multan	1962	54,000	66,000	The NH ₃ Plants will be closed after Pak-Arab Plant's start up.
	ESSO Pakistan Fertilizer Co.	Dharki	1968	87,000	189,000	
	Dawood Hercules Chem. Co.	Chichokimalian	1971	170,000	363,000	
	Sub-total			357,000	618,000	
Under Construction	Pak-Arab Fertilizer Ltd.	Multan	1978	247,000	-	
	Pak-Saudi Fertilizer Co.	Mirpur-Mathelo	1979	270,000	574,200	
	Sub-total			517,000	574,200	
Under Planning	Dawood Hercules Chem. Co.	Chichokimalian	N.D. (1984)	170,000	346,500	
	Fauji Fertilizer Co.		1982	270,000	561,000	
	NFC	Hazara	N.D. (1982)	46,000	99,000	
	Pak-Ajman Fertilizer Co.		N.D.	541,200	1,148,400	
	Sub-total			1,027,200	2,154,900	
Grand Total				1,901,200	3,347,100	

Note: N.D.: Not decided yet.

UREA PRODUCTION CAPACITY AND ACTUAL PRODUCTION, ANNEX II
PAKISTAN Tab. 2-2-23

	(ton)		
	Capacity (A)	Production (B)	B/A
1960	-	-	
1961	11,000	729	7
1962	66,000	28,090	43
1963	66,000	39,689	60
1964	66,000	43,955	67
1965	66,000	41,080	62
1966	66,000	46,831	71
1967	66,000	42,996	65
1968	255,000	104,811	41
1969	255,000	203,071	80
1970	255,000	201,545	79
1971	618,000	388,500	63
1972	618,000	533,139	86
1973	618,000	575,463	93
1974	618,000	599,493	97
1975	618,000	605,336	98
1976	618,000	593,568	96

Sources: Capacity: Compiled by the Team

Production: "25 Years of Pakistan
in Statistics, 1947-
1972"
"Monthly Statistical
Bulletin"

SUPPLY/DEMAND PROJECTION OF NITROGEN FERTILIZER, PAKISTAN

ANNEX II
Tab. 2-2-24

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
(N 000 ton)											
Capacity/Production											
Existing Plants Cap. (A)	357	282	282	282	282	282	282	282	282	282	282
Prod. (B)	311	245	245	245	245	245	245	245	245	245	245
(B)/(A) (%)	87	87	87	87	87	87	87	87	87	87	87
New Plants											
Cap. (A)	-	247	517	517	517	833	833	1,003	1,003	1,003	1,003
Prod. (B)	-	173	387	438	465	686	718	869	886	903	903
(B)/(A) (%)		70	75	85	90	82	86	87	88	90	90
Total											
Cap.	357	529	799	799	799	1,115	1,115	1,285	1,285	1,285	1,285
Prod.	311	418	632	683	710	931	963	1,114	1,131	1,148	1,148
Demand											
	510	552	594	636	682	724	774	820	866	911	956
Balance											
	-199	-134	38	47	28	207	189	294	265	237	192

FORECAST ON INTERNATIONAL MARKET PRICE OF UREA

ANNEX II
Tab. 2-3-1

	1979	1980	1981	1982	1983	1984	1985
Case I (With high energy prices)							
							(US\$/urea ton)
Production costs plus charges of urea produced by the marginal producers in the market (CIF India)	174	156	168	145	145	151	158
Production costs plus charges of urea produced by the producers following the marginal producers (CIF India) (A)	192	162	168	187	209	237	264
Variable costs plus charges of urea produced by the producers following the marginal producers (CIF India) (B)				175	185	208	231
Mean of (A) and (B)				181	198	223	243
Forecast price (CIF India, Bagged)	174	156	168	181	198	223	243
Forecast price (FOB Indonesia, Bulk)	147	128	138	150	164	188	206
Case II (With low energy prices)							
Production costs plus charges of urea produced by the marginal producers in the market (CIF India)	172	154	161	136	141	146	151
Production costs plus charges of urea produced by the producers following the marginal producers (CIF India) (A)	189	158	161	177	194	215	236
Variable costs plus charges of urea produced by the producers following the marginal producers (CIF India) (B)				154	170	188	205
Mean of (A) and (B)				166	182	202	221
Forecast price (CIF India, Bagged)	172	154	161	166	182	202	221
Forecast price (FOB Indonesia, Bulk)	145	126	131	135	148	167	184

Continued on the next page.

FORECAST ON INTERNATIONAL MARKET PRICE OF UREA
(CONT'D.)

ANNEX II
Tab. 2-3-1

Notes of Tab. 2-3-1

International prices are projected based on the following assumptions:

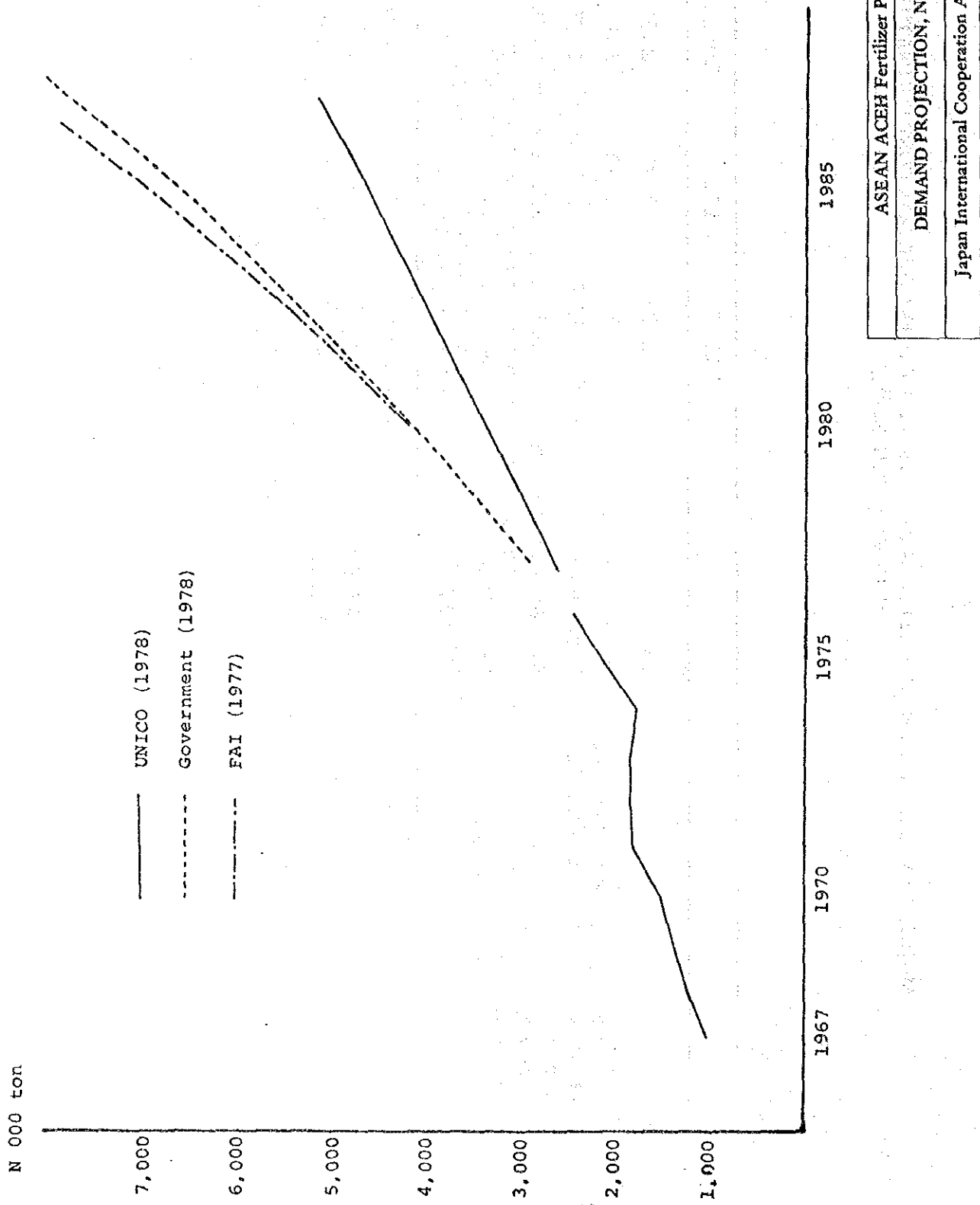
1. In case the gap between the cost plus charges of urea (CIF India, Bagged) by the marginal producers and that by the producers following the marginal producers is very narrow, then the international price will be formulated based on the former cost plus charges. This case has been observed in the past oversupply markets.
2. If not the case and the gap is large enough for the producers following the marginal producers not to be able to follow the international market price which is calculated on the above assumption, then the price will be formulated based on the mean of costs plus charges and variable costs plus charges of the producers following the marginal producers. This level on which the price is formulated is considered to be the level at which the producers following the marginal producers will give up to come into the international market.

As for the major material prices used as the bases of the above production cost estimation, see Tab. 2-17.

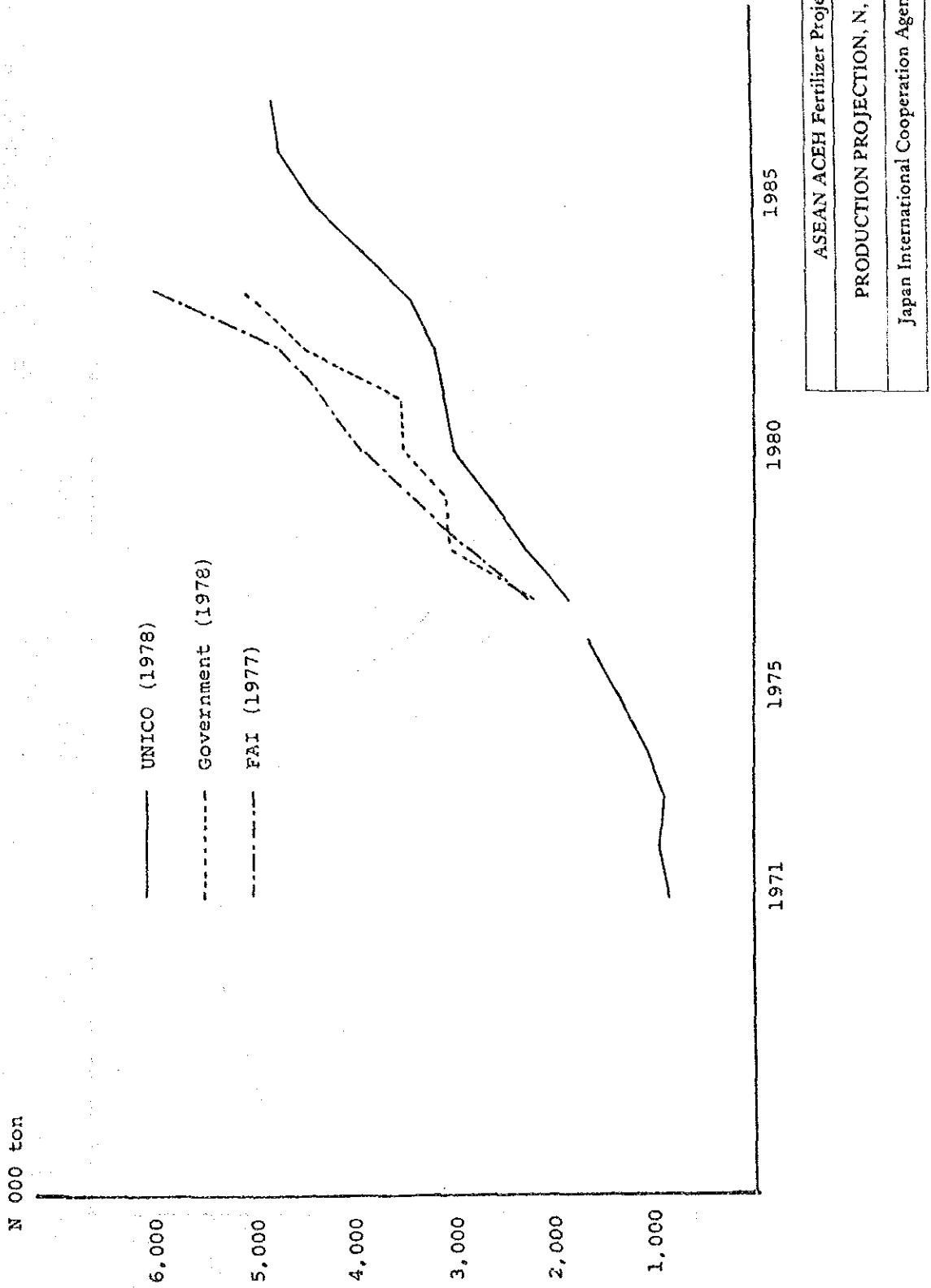
MAJOR RAW MATERIAL PRICES USED AS THE BASES OF THE PRODUCTION COST ESTIMATION ANNEX II
 OF UREA IN THE WORLD Tab. 2-3-2

	1979	1980	1981	1982	
Case I (High Energy Prices)	USA	1.91	2.27	2.69	3.19
	W. Europe	2.12	2.52	3.00	3.55
	Natural Gas (US\$/MMBTU)	0.67	0.73	0.79	0.85
	Indonesia	0.39	0.42	0.46	0.50
	Mideast countries				
	W. Europe	130	140	151	163
	Naphtha (US\$/T)	166	179	194	209
	USA	1.84	2.10	2.40	2.74
	W. Europe	2.04	2.34	2.67	3.05
	Natural Gas (US\$/MMBTU)	0.65	0.68	0.70	0.73
Case II (Low Energy Prices)	Mideast countries	0.38	0.39	0.41	0.43
	W. Europe	125	130	135	140
	Naphtha (US\$/T)	160	166	173	180
	Japan				

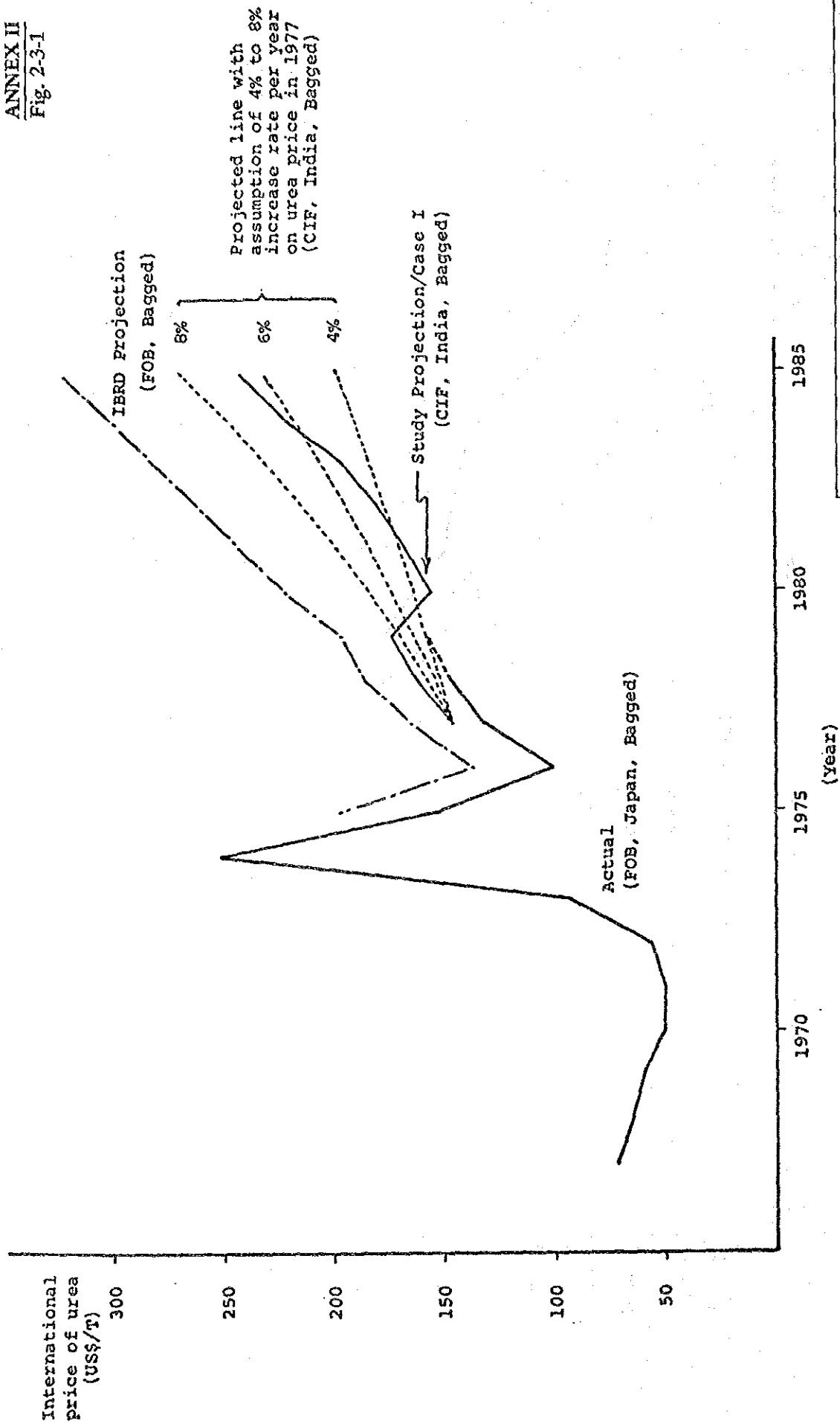
ANNEX II
Fig. 2-2-1



ANNEX II
Fig. 2-2-2



ANNEX II
Fig. 2-3-1



Projected line with assumption of 4% to 8% increase rate per year on urea price in 1977 (CIF, India, Bagged)

IBRD Projection (FOB, Bagged)

Study Projection/Case I (CIF, India, Bagged)

Actual (FOB, Japan, Bagged)

1970 1975 1980 1985
(Year)

International price of urea (US\$/T)

300

250

200

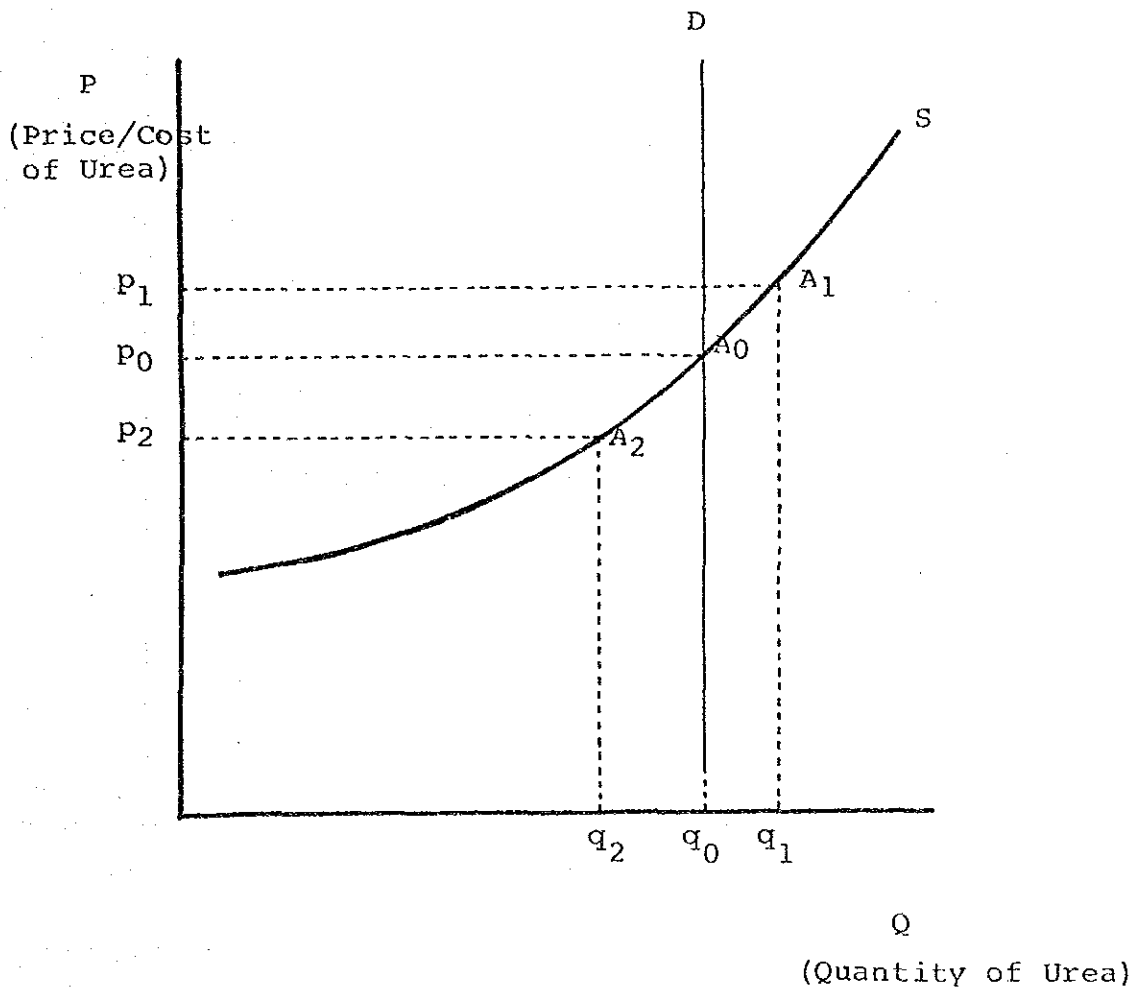
150

100

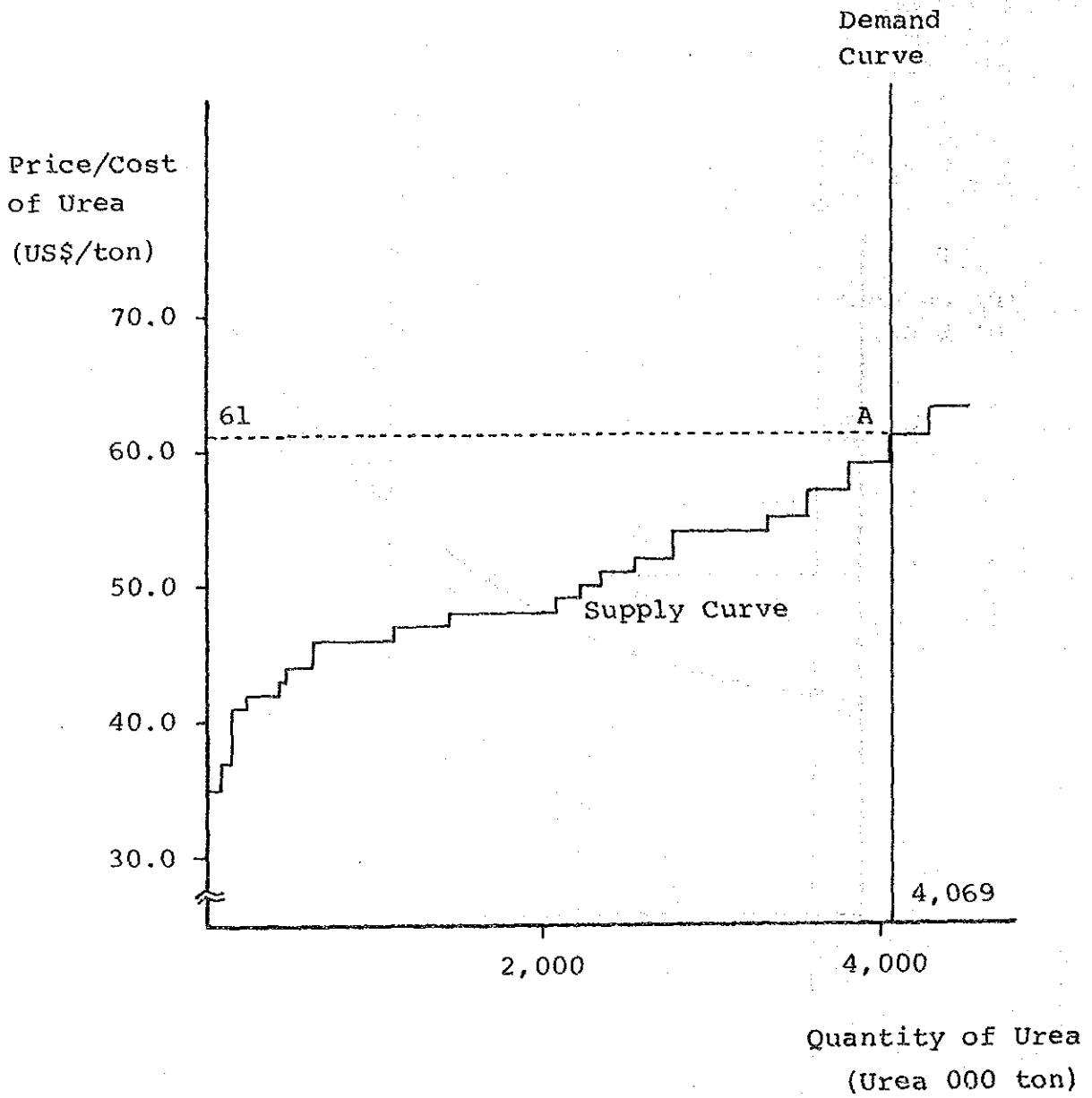
50

ASEAN ACEH Fertilizer Project
PAST TREND AND PROJECTION OF THE INTERNATIONAL MARKET PRICE OF UREA
Japan International Cooperation Agency (JICA)

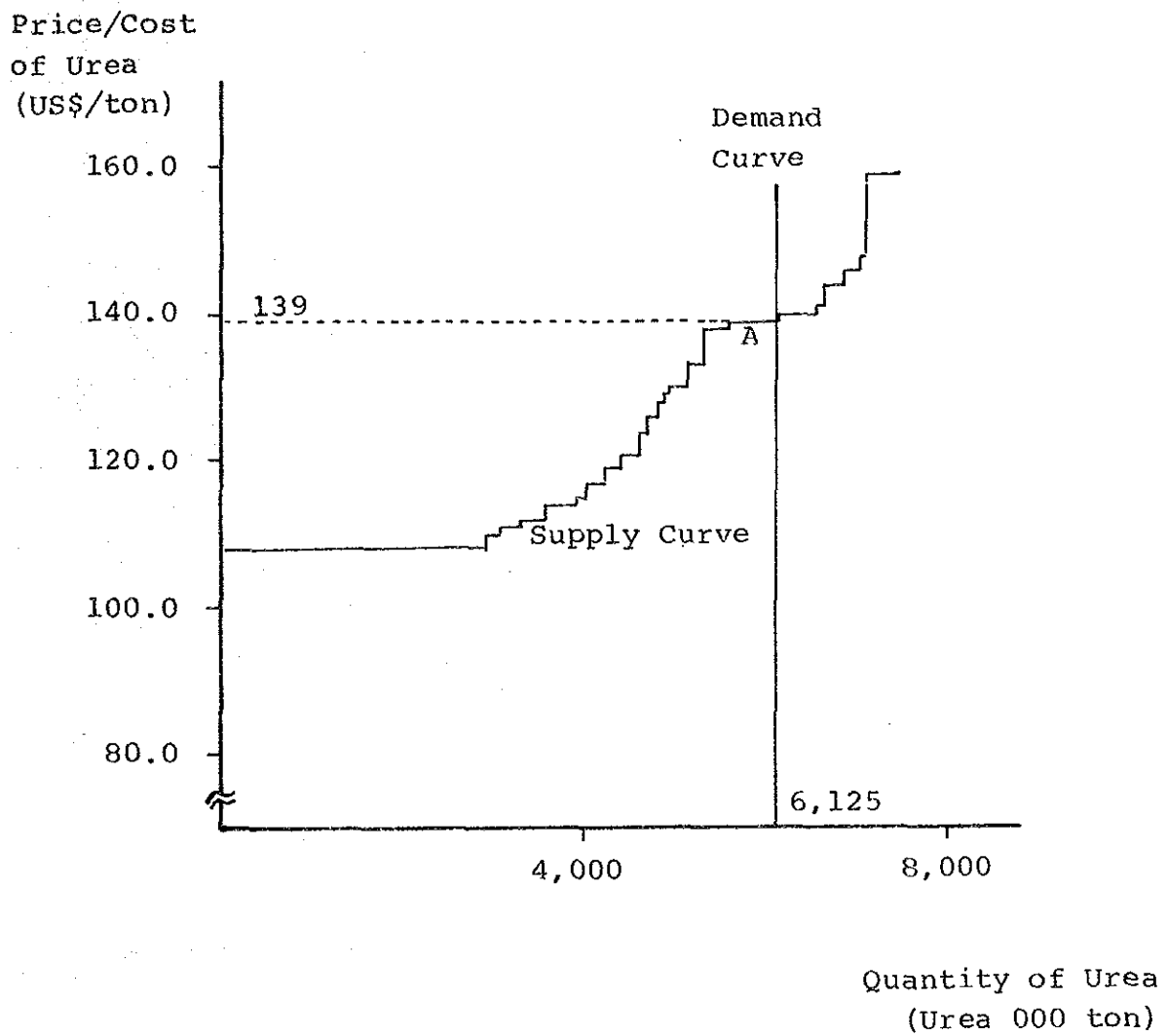
Source: Tab. 2-16



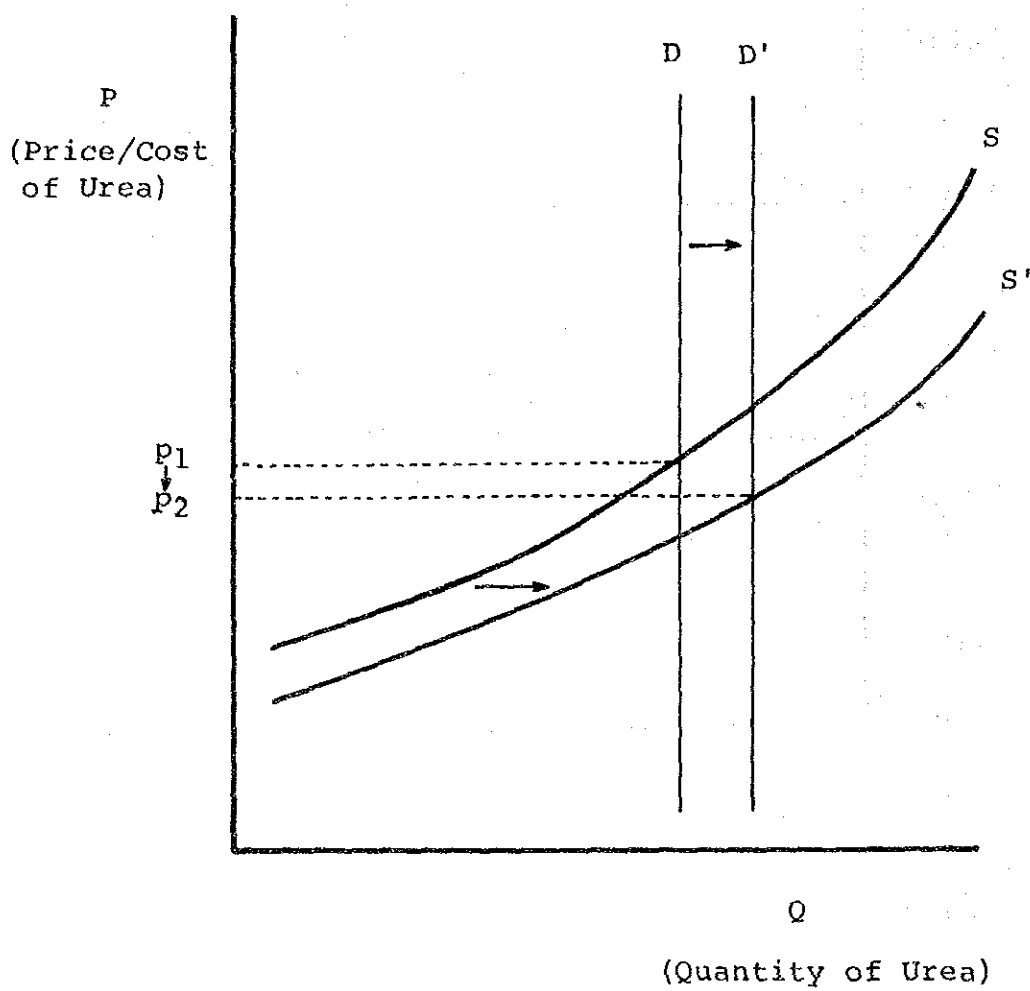
ASEAN ACEH Fertilizer Project
SUPPLY/DEMAND CURVE OF UREA IN THE INTERNATIONAL MARKET
Japan International Cooperation Agency (JICA)



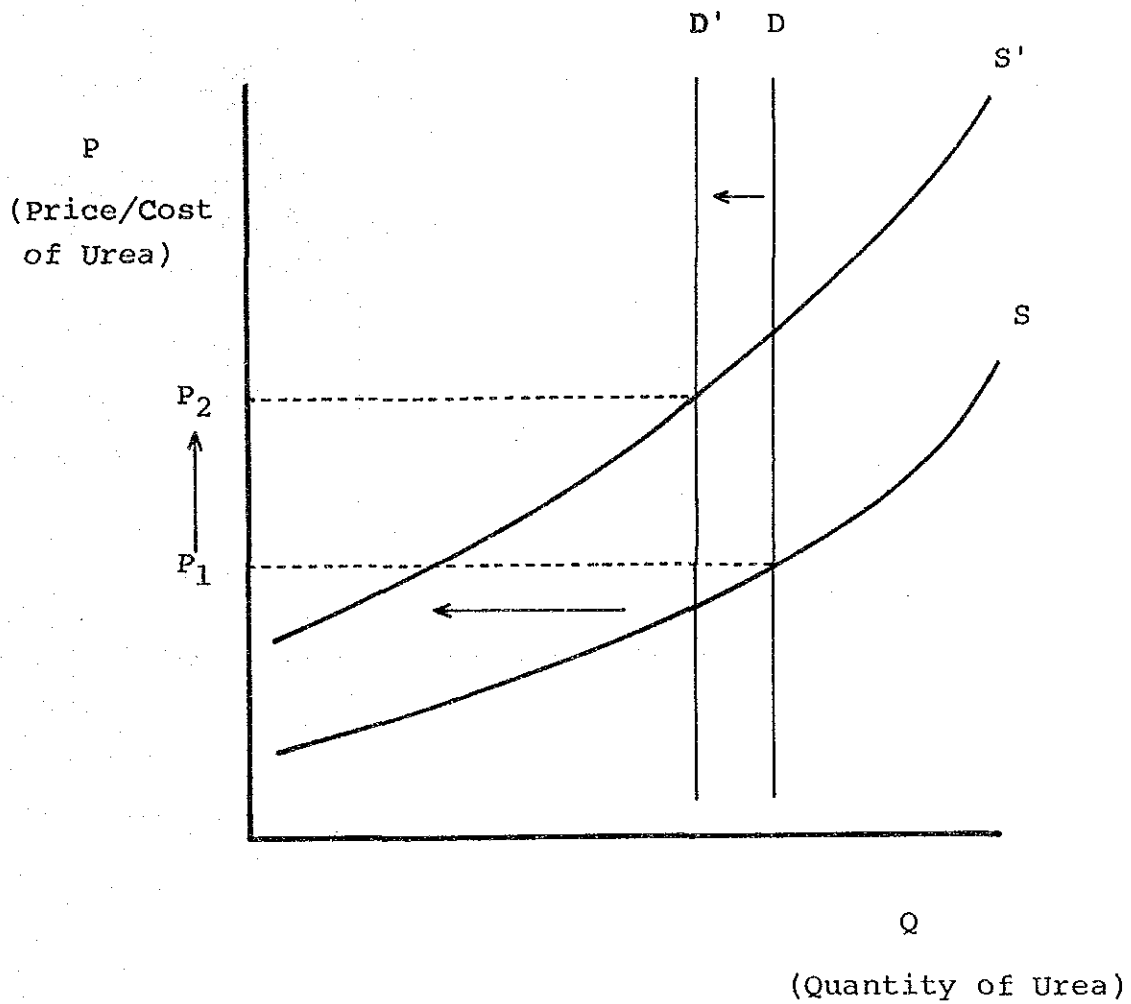
ASEAN ACEH Fertilizer Project
ESTIMATED SUPPLY/DEMAND CURVE OF UREA IN THE INTERNATIONAL MARKET, IN 1972
Japan International Cooperation Agency (JICA)



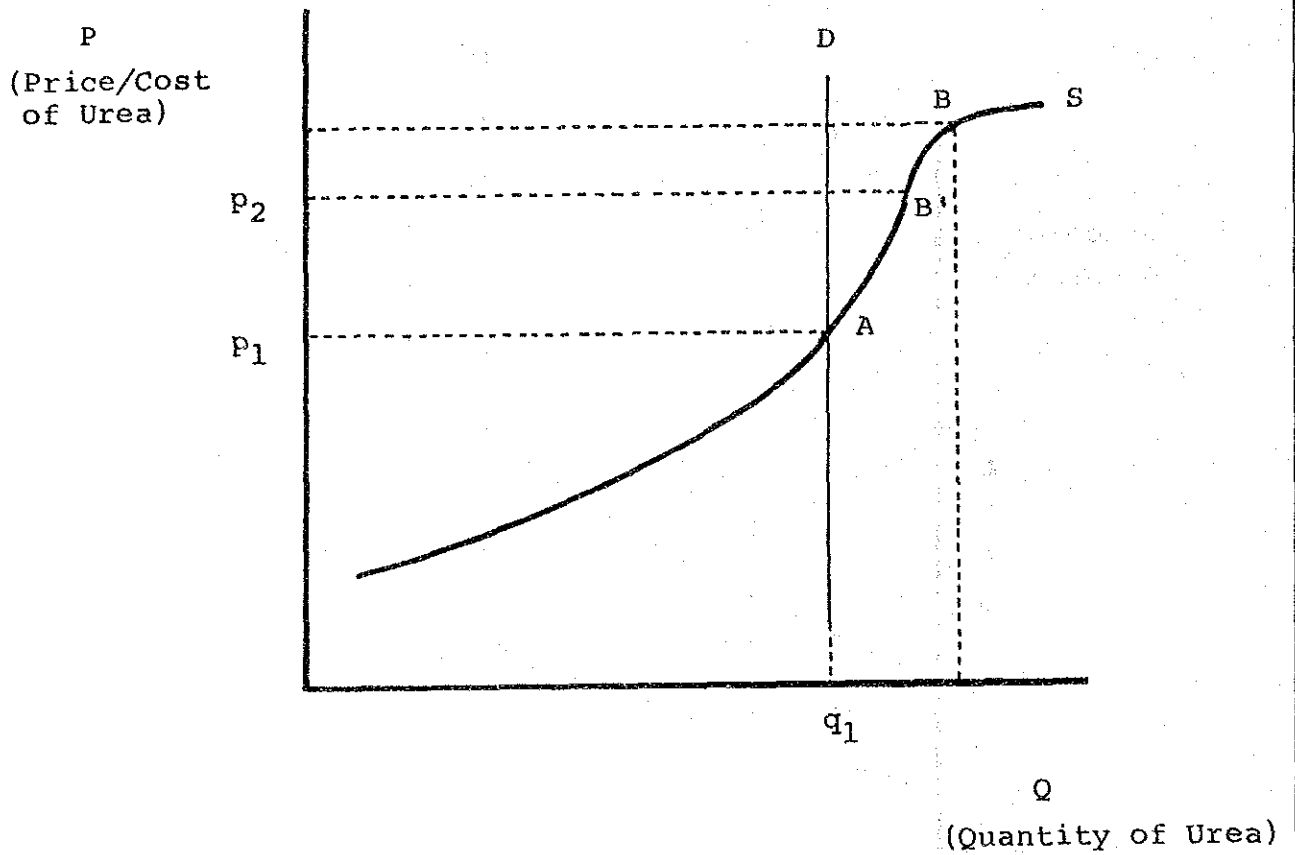
ASEAN ACEH Fertilizer Project
ESTIMATED SUPPLY/DEMAND CURVE OF UREA IN THE INTERNATIONAL MARKET, IN 1977
Japan International Cooperation Agency (JICA)



ASEAN ACEH Fertilizer Project
SHIFTS IN THE SUPPLY CURVE AND THE DEMAND CURVE IN THE INTERNATIONAL MARKET IN THE PERIOD BEFORE THE 'OIL CRISIS'
Japan International Cooperation Agency (JICA)



ASEAN ACEH Fertilizer Project
SHIFTS IN THE SUPPLY CURVE AND THE DEMAND CURVE IN THE INTERNATIONAL MARKET DUE TO THE 'OIL CRISIS'
Japan International Cooperation Agency (JICA)



ASEAN ACEH Fertilizer Project
SUPPLY/DEMAND CURVE OF UREA IN THE INTERNATIONAL MARKET IN 1980S
Japan International Cooperation Agency (JICA)

PART III ANNEX

Annex III-1 Summary of Minutes of the Meeting and Record of Activities

Several meetings were held between the Sub Gas Team of the Japanese Evaluation Team and the Indonesian Counterpart Team during the period between February 7 and March 1, 1978.

The following summarizes the minutes of the aforesaid meetings and records the activities made by the Sub Gas Team in Indonesia:

February 7, 1978 (11:00 a.m. to 11:30 a.m.)

Place: MIGAS office
Attendants: Indonesian Party

1. Mr. Wijarso (MIGAS)
2. Mr. Soembarjono (MIGAS)
3. Mr. Effendi Daud (PUSRI)

Evaluation Team

1. Mr. S. Maeno
2. Mr. D. Kasahara
3. Mr. Y. Nishida

Discussions were held following a courtesy call to Mr. Wijarso, Director General of MIGAS.

Mr. Soembarjono presented the Data of Arun Gas to the Japanese Evaluation Team. The Data of Arun Gas include the following items:

- A. Gas Reserves
- B. Hydrocarbon Gas Demand, 20 Years
- C. Arun Gas Composition (Average)
- D. Completion Schedule

Both parties had first discussed the scope of study to be performed by the Japanese

Evaluation Team and had mutually understood that the Gas Team will, with assistance from the Indonesian Counterpart Team, collect and review the data relating to the background of gas supply assured by a feasibility study executed by the Indonesian Government.

February 7, 1978 (13:00 p.m. to 14:00 p.m.)

Place: Office of Directorate General of Chemical Industry

Attendants: Counterpart Team
Mr. Soembarjono (MIGAS)
Japanese Evaluation Team
Mr. D. Kasahara

- Reviewing the Data of Arun Gas, Mr. D. Kasahara requested Mr. Soembarjono to present more detailed information relating to gas reserves.
- Mr. Soembarjono promised to hold a meeting for presentation of the requested information on February 10, 1978.

February 10, 1978 (09:00 a.m. to 11:00 a.m.)

Place: MIGAS office

Attendants: Counterpart Team and other Indonesian Party

1. Mr. Soembarjono (MIGAS)
2. Mr. M. Pandjaitan (MIGAS)
3. Mr. Hidayat (MIGAS)
4. Mr. B. Sumantri (PERTAMINA)
5. Mr. L.D. Janzen (Mobil Oil, Indonesia)
6. Mr. S.M. Hasan (Mobil Oil, Indonesia)

Evaluation Team

1. Dr. S. Ueki, Team Leader
2. Mr. D. Kasahara, Team Member
3. Mr. Y. Nishida, Team Member
4. Mr. Kanda (Japanese Embassy)

- Mr. Soembarjono briefed the attending members on the purpose of the meeting and then requested Mobil Oil Indonesia to present the background of the reserve estimation of the Arun gas field.

- Mr. L.D. Janzen described a general view of the Arun gas field.
- Mr. S.M. Hasan distributed data sheets to all attendants and explained in detail about the following items pertaining to the Arun gas field:
 - A. Calculation of OGIP
 - B. Location of Facilities
 - C. Summary of Petrophysical Parameters
 - D. Reservoir Gas Analysis
 - E. Original Gas in Place
 - F. Summary of Well Tests
 - G. Top Structure
 - H. Net Pay Isopach
- Mr. D. Kasahara further requested the Counterpart Team to present the following items:
 - 1) Well Data including completion date, well classification and current status of Arun field
 - 2) PVT Analysis
 - 3) Follow diagram of LNG plant describing the following at inlet and outlet of processing unit:
 - a. Pressure and Temperature
 - b. Compositions
 - c. Condensate Ratio
 - d. Heating Value
- Mr. Soembarjono accepted supplying these data during the Evaluation Team's stay in Indonesia.
- Regarding the Indonesian LNG supply schedule, Mr. D. Kasahara confirmed the fact that there is a 4.48 TSCF commitment FOB (free on board) for the shipment of LNG to Japan under the contract signed in 1977 between PERTAMINA and Japanese LNG buyers. There is also an additional 4.3 TSCF commitment FOB (free on board) for the Federal Power Commission by another contract signed in 1977 between PERTAMINA and Pacific Lighting International SA.
- Mr. D. Kasahara requested an explanation about the cycling projection schedule.

- Mr. S.M. Hasan explained the outline of the cycling schedule as follows:
 - Four clusters installed at Arun gas field can treat produced gas up to 2.4 BSCF against a total LNG plant capacity of 1.8 BSCFD, so that excess gas of 0.6 BSCFD can be cycled to the reservoir by three injection compressors.
 - Cycling will be continued for the recovery of more condensate up to 1992, when reservoir pressure is estimated to decline to 3,000 psig, which is 1,426 psig below a dew point of 4,426 psig.
 - Mr. D. Kasahara asked Mr. S.M. Hasan about cut off limits which have been applied to the calculation of original gas in place and also about a recovery factor applied to the estimation of recoverable value.
 - Mr. L.D. Janzen answered that 5% of porosity and 50% of water saturation were applied for cut off limits and 90 - 95% of the recovery factor was arrived at by their calculation.
 - Mr. D. Kasahara asked Mr. L.D. Janzen about background information pertaining to the study of original gas in place.
- Mr. L.D. Janzen answered that the initial study was performed by Degolyer and MacNaughton in 1974 and the result had thereafter been updated properly.

February 11, 1978 (11:00 a.m. to 11:30 a.m.)

Place: PUSRI office in Palembang

Attendants: Indonesian Party

1. Mr. Wardiyada (PUSRI)
2. Mr. Eddi Madnawidjaja (PUSRI)

Evaluation Team

1. Mr. D. Kasahara
2. Mr. Y. Nishida

- After a plenary meeting, Mr. Wardiyada explained to the Japanese Team about the schematic flow diagram of a receiving system for supply gas to the PUSRI plant.

February 18, 1978 (08:00 a.m. to 10:30 a.m.)

Place: Guest House of LNG Complex

Attendants: Indonesian Party

1. Mr. M. Pandjaitan (MIGAS)
2. Mr. Z. Abidin (PERTAMINA)
3. Mr. B. Sumantri (PERTAMINA)
4. Mr. R.E. Loshbaugh (Mobil Oil)

Evaluation Team

1. Mr. D. Kasahara
2. Mr. Y. Nishida

- After the introduction of each member, Mr. R.E. Loshbaugh was requested to explain a schematic diagram of the LNG plant by Mr. S. Abidin.
- Mr. Y. Nishida requested to be informed of possible gas intake points for the proposed Aceh urea plant including a design concept of the LNG plant.
- Mr. R.E. Loshbaugh presented an outline of the LNG plant, answering the above questions. Replying to Mr. Y. Nishida's inquiry about a selection of the gas intake point, he commented as follows:
 - There are three possible gas intake points, namely:
 - A. 42-inch inlet line to the 1st stage condensate separator
 - B. 36-inch outlet line of the 1st stage condensate separator
 - C. Outlet of the acid gas removal unit.
- For Case A: Condensate removal will be needed for gas processing at the fertilizer plant. At the same time, a large fluctuation of composition will be anticipated as well head pressure decreases.
- For Case B: This is a recommendable gas intake point because of the steady conditions of composition expected over the next 20 years.
- For Case C: Since the acid gas removal unit has been designed as one of a series for natural gas liquefaction train having equilibrium capacity, gas intake from

this point will interfere with the economics of LNG plant operation while the Urea plant operation will also be disturbed by interruption in the supply of natural gas which could occur due to intermittent up-set conditions.

- Mr. Y. Nishida asked Mr. R.E. Loshbaugh about an amount of fuel gas for liquefaction and of shrinkage by boil-off at LNG storage tank.
- Mr. R.E. Loshbaugh answered that ten percent of the total gas for fuel, including boil-off gas with a rate of 0.05 percent per day, of LNG storage tank was arrived at by them based on the design.

February 18, 1978 (13:30 p.m. to 14:00 p.m.)

Place: Mobil Oil office in Arun gas field

Attendants: Indonesian Party

1. Mr. M. Pandjaitan (MIGAS)
2. Mr. B. Sumantri (PERTAMINA)
3. Mr. Irzal Chan (PERTAMINA)
4. Mr. C.R. Farrar (Mobil Oil)
5. Mr. B. Siagian (Mobil Oil)
6. Mr. V. Zulkfekar (Mobil Oil)

Evaluation Team

1. Mr. D. Kasahara
2. Mr. Y. Nishida
3. Mr. S. Inakazu
4. Mr. T. Kamita

The following items of data were presented by Mr. C.R. Farrar:

- A. Facility Location Map of Arun Gas Field
- B. Plot Plan Point 'A'
- C. Typical Cluster Plot Plan

February 19, 1978

Place: MIGAS office

Mr. K. Irie of the Evaluation Team received from Mr. Soembarjono (MIGAS) the following data requested by Mr. D. Kasahara at the meeting held on February 10, 1978.

- A. Well Data including completion date, well classification and current status in Arun gas field.
- B. PVT Analysis

February 21, 1978 (09:00 a.m. to 11:30 a.m.)

Place: Headquarters of PERTAMINA Unit I, Medan

Attendants: Indonesian Party

1. Mr. Mumaji Irawan (PERTAMINA)
2. Mr. M. Pandjaitan (MIGAS)
3. Mr. Effendi Daud (PUSRI)
4. Mr. Irzal Chan (PERTAMINA)

Evaluation Team

1. Mr. D. Kasahara
2. Mr. Y. Nishida

- Mr. Mumaji Irawan briefed members with an outline of activities of PERTAMINA Unit I, showing 'Oil and Gas Field Location Map'.
- Mr. D. Kasahara asked the Indonesian Party if he could obtain any information related to the following questionnaire:

1. Policy relating to gas supply from Arun gas field for the proposed Aceh urea plant
2. Possibilities of supply gas from other fields
3. Measuring system to be adopted to supply gas for the proposed Aceh urea plant.
4. Fuel consumption for Arun gas field operation
5. Design capacity of inlet condensate separator of the LNG plant

- Mr. Mumaji Irawan stated that although PERTAMINA Unit I is responsible for operation of the Unit I area, any answer to the above questions shall be handled by the Head Office in Jakarta or MIGAS.
- Mr. M. Pandjaitan answered that he will arrange for the Evaluation Team to be provided with this information in Jakarta.

February 27, 1978 (09:30 a.m. to 10:30 a.m.)

Place: MIGAS office

Attendants: Counterpart Team

1. Mr. M. Pandjaitan (MIGAS)
2. Mr. Effendi Daud (PUSRI)

Evaluation Team

1. Mr. D. Kasahara
2. Mr. Y. Nishida

Mr. M. Pandjaitan presented the following data to the Evaluation Team:

- A. Typical Facility Design, Arun field.
- B. Gas Supply Conditions, requested by Mr. D. Kasahara at the meeting held on February 10, 1978.
- C. Existing Pipeline, requested by Mr. D. Kasahara at the meeting held on February 21, 1978.

- Mr. D. Kasahara asked the Counterpart Team about the authorities policy relating to gas supply from the Arun gas field for the proposed Aceh urea plant.
- Mr. M. Pandjaitan explained that although the Indonesian Government's policy is to give priority to supply gas and oil for domestic use, the first priority, particularly for Arun gas, will be given to LNG exports because of an earlier date of commitment and the next priority will be given to supply gas for the proposed Aceh urea plant.
- Regarding gas sales for domestic use, Mr. D. Kasahara further asked Mr. M. Pandjaitan about the principles of the contract between PERTAMINA and Mobil Oil Indonesia.
- Mr. M. Pandjaitan explained that Mobil Oil Indonesia shall accept any amount of gas supply

for Indonesian domestic use as far as it is within the extent of Indonesian share based on their production sharing, at any price fixed by the Indonesian Government, according to the contract between PERTAMINA and Mobil Oil Indonesia.

- Mr. D. Kasahara asked the Counterpart Team about possibilities of gas supply from other fields.
- Mr. M. Pandjaitan answered that according to the information provided by Mr. Harli Saleh, since the PERTAMINA Arun gas field has a sufficient amount of excess gas to be sent to the proposed Aceh urea plant as supply gas over twenty years, there was no necessity to extend to other fields.
- Mr. Y. Nishida asked the Counterpart Team about the most feasible point for gas intake they had decided on.
- Mr. M. Pandjaitan answered that according to the information provided by Mr. Harli Saleh, PERTAMINA believes that a gas intake from an overhead inlet separator of the LNG plant will be the most feasible point of gas intake for the proposed Aceh urea plant.
- Mr. Y. Nishida asked Mr. Effendi Daud about the measuring system to be utilized for gas supply for the proposed Aceh urea plant.
- Mr. Effendi Daud explained that the measurement for gas amount and heating value will be made by PERTAMINA.
- Mr. Y. Nishida further asked Mr. Effendi Daud about the measuring system adopted for PUSRI.
- Mr. Effendi Daud explained as follows:

In case of PUSRI, gas is delivered to the plant on the basis of measurements of gas amount and heating value which are made by PERTAMINA.

On the other hand, PUSRI has its own measurement devices not only for checking but also for control of the plant operation.

In case that a difference between two measurements is over two percent, the amount is settled by negotiation between both parties concerned.

- Mr. D. Kasahara asked the Counterpart Team to present fuel consumption for Arun gas field operation and also the design capacity of the inlet condensate separator of the LNG plant which had previously been requested in items 4 and 5 in the questionnaire submitted to the Counterpart Team at the meeting held on February 21, 1978.
- Mr. M. Pandjaitan replied that Mobil Oil Indonesia, P.T. Arun and PERTAMINA had promised to provide MIGAS with these data and that this information will be mailed to the Evaluation Team at the earliest convenience.

March 1, 1978 (08:00 a.m.)

Dr. S. Ueki, accompanying Mr. D. Kasahara and Mr. Y. Nishida, made courtesy call to Mr. Wijarso, Director General of MIGAS in attendance with Mr. M. Pandjaitan.

Annex III-2 Gas-processing Facilities at the Field

The gas produced from the well has a pressure of 4,900 to 1,850 psig and a temperature of 342° to 325°F. The gas pressure is reduced to nearly 1,800 psig at two trains of gas processing facilities installed each cluster, while the gas is cooled by an air-cooled heat exchanger. The gas is further cooled by means of heat exchange between the input gas and the gas outgoing from a condensate separator which is achieved in a heat exchanger. After that, the pressure is reduced to nearly 1,100 psig, and then condensate contained in the gas is separated. The gas, after the separation of condensate, is fed into a 42" gas pipeline with an inlet pressure of 1,100 psig, and is transmitted to the LNG plant through the pipeline. On the other hand, the separated condensate is pressurized by pumps in order to prevent its gasification inside the pipeline, and then transmitted to the LNG plant through a 16" condensate pipeline (See Annex III, Figure 11).

In Clusters II and III, a part of the gas separated with condensate is compressed by three units of compressors consisting of one unit installed in Cluster II and the other two units in Cluster III and then cycled to the reservoirs through gas injection wells. This operation is conducted for the purpose of reducing a period needed for the recovery of condensate by increasing the recovery rate, and will be continued until the early 1990s when it is expected that the pressure of the gas reservoirs will fall to about 3,000 psig.

Annex III-3 Pipeline

The gas processed by the clusters in four stations is gathered at Point A in the Arun gas field (See Annex III, Figure 2). After it is measured, the gas is transmitted to the LNG plant through a pipeline. The specifications of the pipeline is given in Table 1. The pipeline is equipped with minimum-required automatic control and monitoring devices, and the volume of flow is determined by the volume of production at the LNG plant. Namely, for changing the volume of flow, overall adjustment is made first between the main control room of the LNG plant and the field control room at Point A in the Arun gas field. The opening and closing positions of the block valve and the pressure are displayed and monitored at the control rooms of the Arun gas field and the LNG plant.

Annex III-4 LNG Plant

4-1 LNG plant

A contract has been entered into with a group of five Japanese companies (Kansai Electric Power, Chubu Electric Power, Kyushu Electric Power, Osaka Gas and Japan Steel Corporation) for the supply of 4.48 TSCF of LNG for 20 years, and another contract with Pacific Lighting of the United States for the supply of 4.3 TSCF for 20 years. The LNG plant will consist of six trains of the unit each having a 200 MMSCFD liquefaction capacity, three for the Japanese group and the other three for the American firm. The construction schedules are given in Annex III, Table 2.

4-2 An outline of the LNG plant

The pressure of the gas and condensate delivered to the LNG plant is adjusted to 800 psig, and again the condensate is separated and collected by a condensate separator. (At present, there are three units, but in the future, a spare unit will be added and the four units will be connected in parallel.)

This gas, 85°F and 790 psig, is passed through a header pipe, and fed for liquefaction in the six trains of liquefaction units as well as fuel for the units. On the other hand, the condensate, which corresponds to about 5 per cent of the gas supply, is further separated from the gas at a condensate flush drum. The gas, together with gas flowing from the condensate separator, is further compressed and fed for liquefaction. The condensate is processed by the stabilizer and is stored in the condensate tank for exportation. The feed gas is passed through a mercury absorbing tower for acid absorption wherein two-stage absorptions, one by potassium carbonate solution and the other by diethanol amine solution, are conducted. After that, the gas is pre-treated at the molecular sieves dryer and then liquefied in the liquefaction unit consisting of propane precooling and multi-component refrigeration units. LNG is stored in a low-temperature tank and exported through the shipping facility by LNG ship. Boil-off gas from the LNG tank and the shipping facilities is used as plant fuel. About 10 per cent of gas supply is used for fuel at the LNG plant.

4-3 Gas supply branching

Gas which has passed through the carbon dioxide removal unit of the LNG plant

is transmitted from the gas branching point to the fertilizer plant. The gas branching point is designed as a part of the liquefaction plant. Typical gas compositions and supply conditions at alternative branching points are given in Table 3 of Annex III. The gas branching points are illustrated in Figure 3 of Annex III.

Annex III-5 Measuring and Delivery at the Gas-receiving End in PUSRI's Fertilizer Complex

Natural gas is supplied through a pipeline from the gas fields of Pendopo, Rambutan, Prambumlish and Mura Regency to the PUSRI's fertilizer plant. The gas is received at the metering station owned by PERTAMINA and installed at the plant entrance (in the fertilizer plant premises). Figure 4 of Annex III gives the PERTAMINA metering station and the flow of gas receiving at the plant, and Table 4 of Annex III gives examples of gas compositions after the removal of carbon dioxide at the metering station. The gas received into the knockout drum is divided for the four trains of fertilizer plant. At the pressure of 550 psig, the gas is passed through the primary scrubber and filter, and then, after reducing pressure, passed through the secondary scrubber. After these scrubbers, the gas is measured and analyzed and then fed to the plant at a pressure of 400 psig. The fertilizer plant also has a flow meter in each train in order to control plant operation. The measurement is also carried out at the points after fed respectively for process use and fuel use. The gas delivery is in principle made in terms of gas quantity calculated on the basis of heat value. When there is a difference in the measured values between the two sides, the measurement will be repeated after the correction of meters. Even after such repeated measurement, if there is a difference in both values more than 2 per cent, it will be settled by the conference of both sides. The gas for process use is fed to the primary reformer of ammonia plants at the pressure of 400 psig after pre-treatment such as the removal of water, hydrogen sulfide and carbon dioxide as well as compression of the gas. The carbon dioxide removed in the above processes will be supplied to the urea plant in order to supplement 6 to 10 per cent of carbon dioxide required for urea synthesis.

ARUN FIELD - LNG PIPELINE

ANNEX III

Tab. 1

Length	Approx. 30 Km
Diameter	42 inches O. D.
Design W. P.	77.3 Kg/cm ² abs. (1100 psia)
Min. Design O. P.	56.2 Kg/cm ² abs. (800 psia)
Service Rating	ANSI 600
Material	API 5LX 60
Wall Thickness	0.562 inch
Flow Rate	1690 MMSCFD
Inlet/Outlet Pressure	1100/800 psia
Inlet/Outlet Temperature	125/85°F

LNG PLANT COMPLETION SCHEDULE

ANNEX III
Tab. 2

LNG Train-1	Mechanical Completion	April 1978
LNG Train-2	- ditto -	June 1978
LNG Train-3	- ditto -	August 1978
LNG Train-4	- ditto -	October 1982 (Projected)
LNG Train-5	- ditto -	February 1983 (Projected)
LNG Train-6	- ditto -	June 1983 (Projected)

GAS SUPPLY CONDITIONS AT LNG PLANT

ANNEX III
Tab. 3

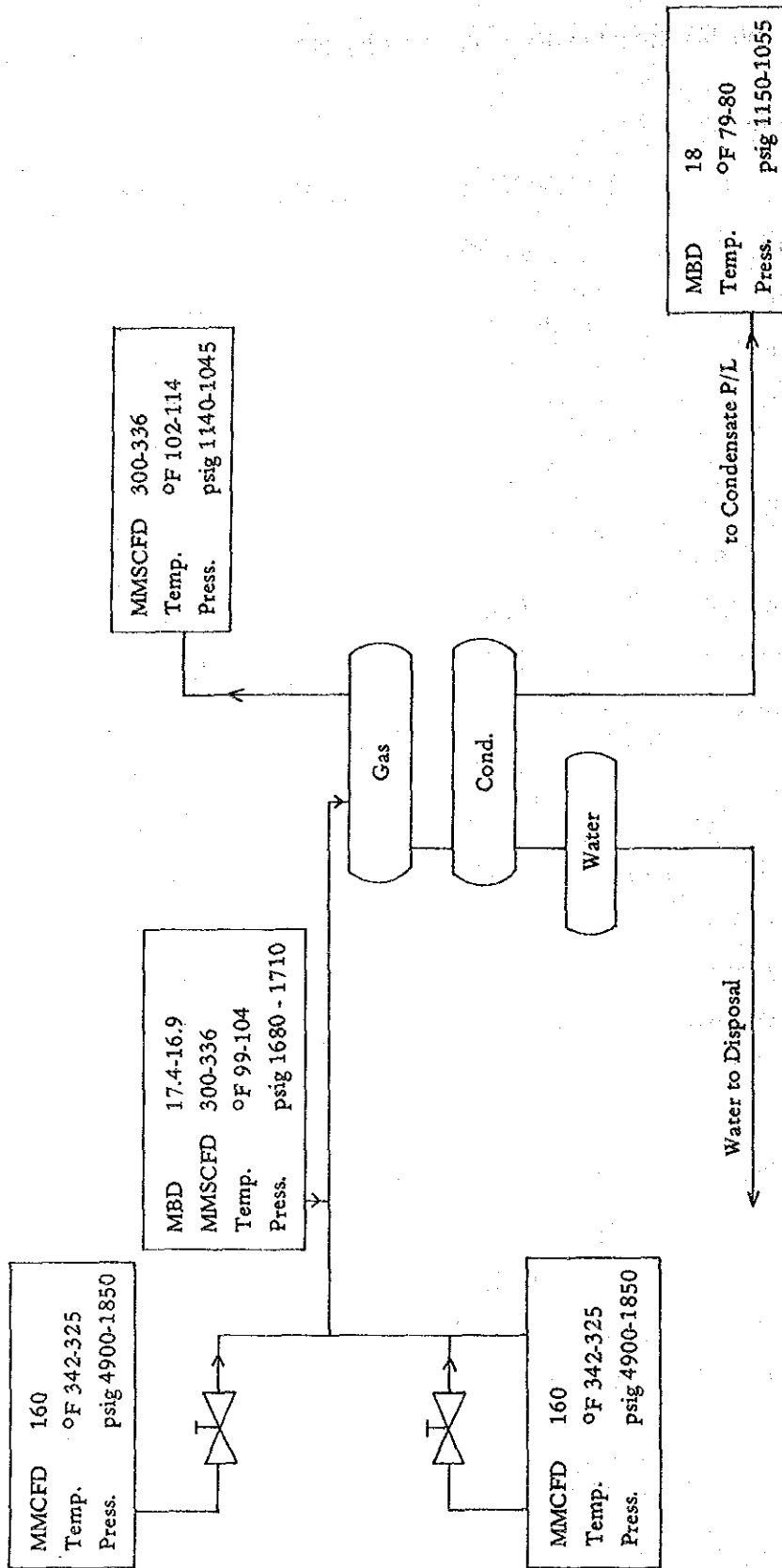
i. Composition	Mol percent	
	Case 1	Case 2
CO ₂	15.03	15.18
N ₂	0.36	0.36
C ₁	74.74	74.91
C ₂	5.55	5.63
C ₃	2.34	2.31
iC ₄	0.50	0.48
nC ₄	0.62	0.59
iC ₅	0.26	0.20
nC ₅	0.16	0.14
C ₆ ⁺	0.44	0.20
ii. Impurities		
Hydrogen sulfide	80 ppm	80 ppm
Organic sulfur	(unknown - not detected)	
Mercury	(less than 160 ppb by weight)	
iii. Water Dew Point	80°F @1100 psia	85°F @790 psia
iv. Pressure (psig)	825 to 1100	775
v. Temperature (°F)	85	60 to 85
vi. Condensate Ratio lb/MMSCF Pentanes plus	1950	1172
vii. Gross Heating Value BTU/SCF	989	973

TYPICAL GAS COMPOSITION IN PUSRI

ANNEX III
Tab. 4

<u>Position</u>	<u>Met Station</u>	<u>Outlet CO₂ Removal Unit</u>
H ₂ S , ppm	1.60	-
R-SH , ppm	1.60	-
R-S-R , ppm		-
Residual Sulfur , ppm		-
Total Sulfur , ppm		-
N ₂ , % by vol.		-
O ₂ , % by vol.		-
CO ₂ , % by vol.	8.40	0.50
CH ₄ , % by vol.	79.13	88.15
C ₂ H ₆ , % by vol.	5.69	6.00
C ₃ H ₈ , % by vol.	4.29	3.91
i-C ₄ H ₁₀ , % by vol.	0.76	0.56
n-C ₄ H ₁₀ , % by vol.	0.98	0.65
i-C ₅ H ₁₂ , % by vol.	0.34	0.11
n-C ₅ H ₁₂ , % by vol.	0.22	0.09
C ₆ ⁺ , % by vol.	0.20	0.03
Gross Heating Value		
Calc. BTU/Scuft	-	-
Detn'd. BUT/Scuft	1,102	-
Specific Gravity		
Calc.	0.755	-
Detn'd.	-	-

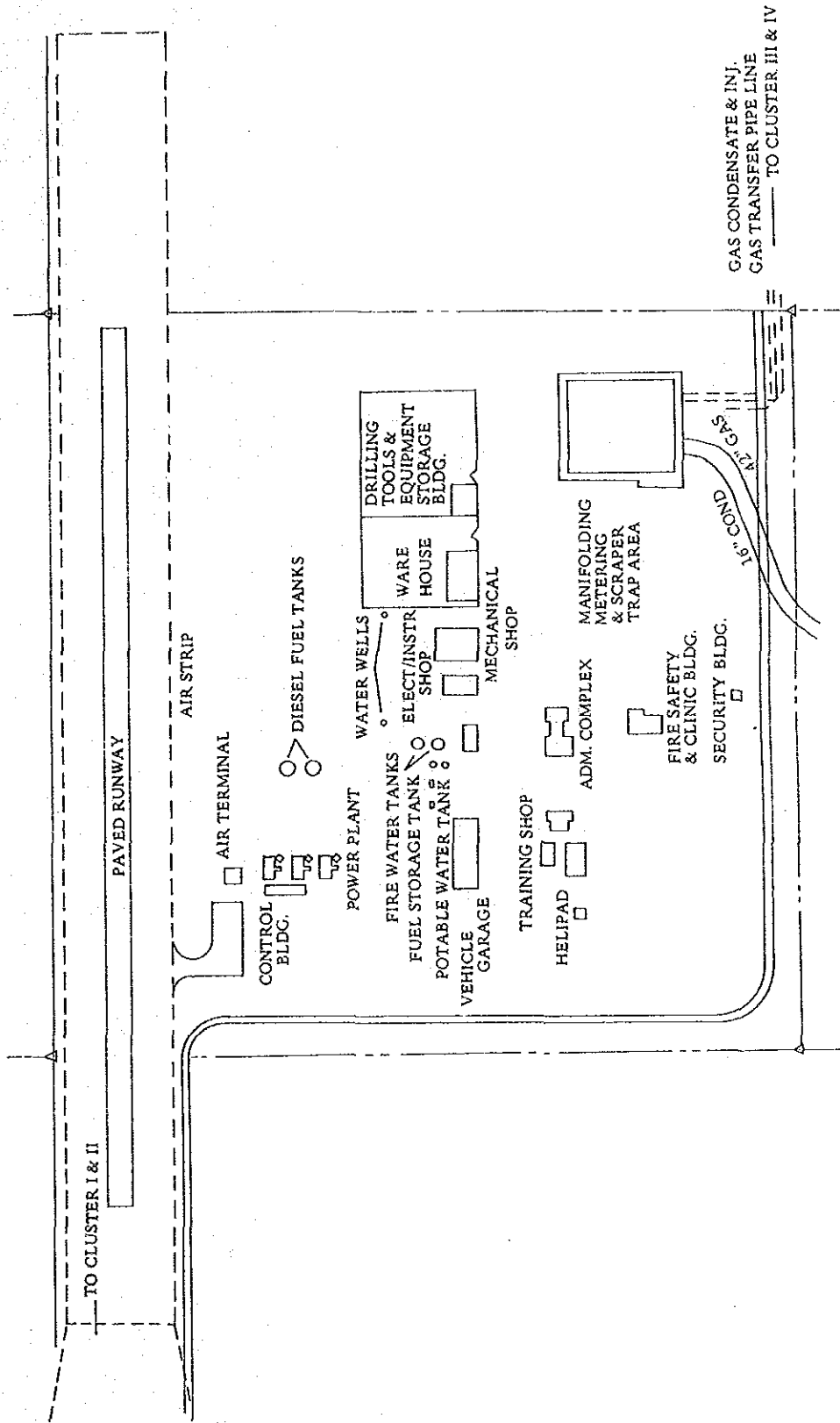
ANNEX III
Fig. 1



Note: Two Trains Per Cluster

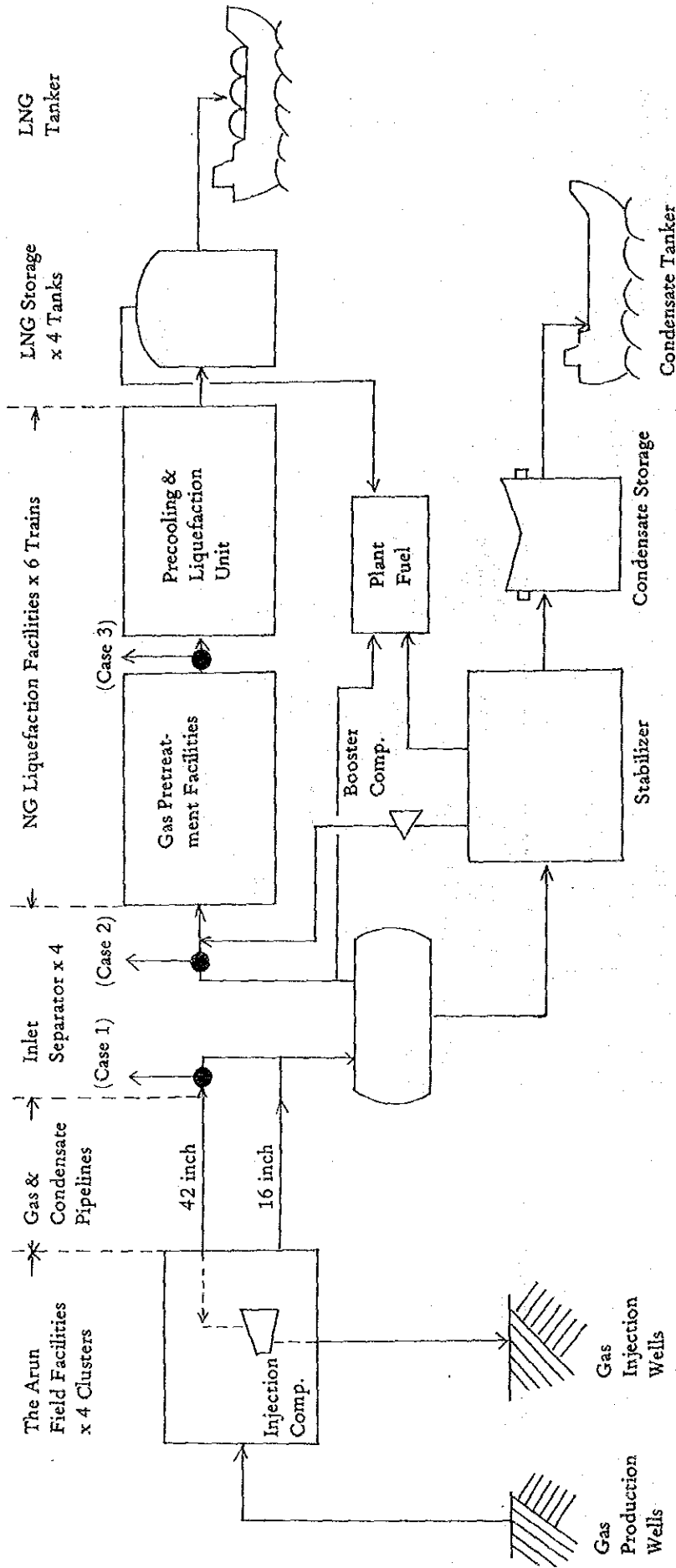
ASEAN ACEH Fertilizer Project
TYPICAL FACILITY DESIGN
Japan International Cooperation Agency (JICA)

ANNEX III
Fig. 2



ASEAN ACEH Fertilizer Project
PLOT PLAN POINT 'A'
Japan International Cooperation Agency (JICA)

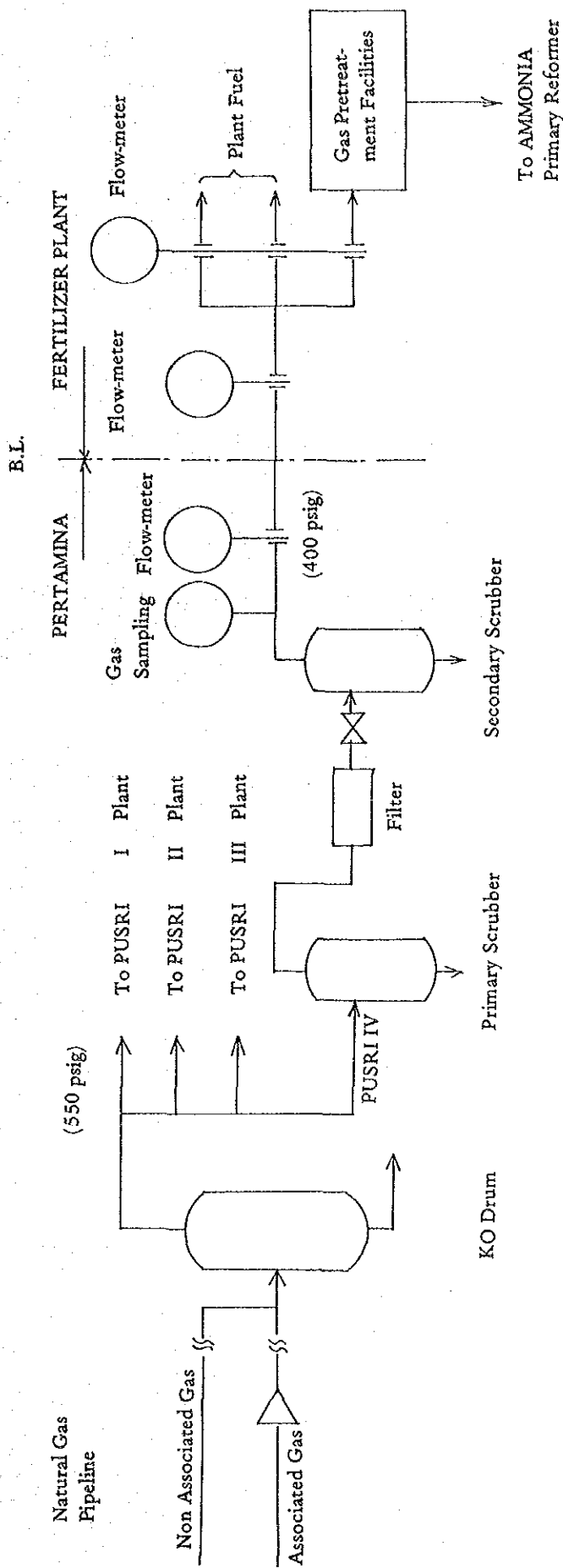
ANNEX III
Fig. 3



Condensate Recovery Facilities

ASEAN ACEH Fertilizer Project
LNG PLANT BLOCK FLOW DIAGRAM
Japan International Cooperation Agency (JICA)

ANNEX III
Fig. 4



ASEAN ACEH Fertilizer Project
PUSRI GAS SUPPLY AND RECEIVING SYSTEM
Japan International Cooperation Agency (JICA)

