2. Total Textile Demand in Iran

No adequate data are available at present for studying the current status of the Iranian synthetic fiber market, i.e., such factors as the total textile consumption, material-wise consumption, etc. These data are absolutely necessary as the basis for formulating forecasts on the future synthetic fiber demand in Iran.

The current level of textile consumption in Iran has been estimated for the year 1976 on a material-wise basis by fully utilizing all the available data which have been classified into the categories of natural fibers, regenerated fibers, and synthetic fibers. The data and information obtained during the recent field survey were also fully incorporated into the estimation.

2-1 Current status

2-1-1 Study of the data pertaining to the total textile consumption

The basic data employed here for the study of Iranian total textile consumption are the fiber consumption statistics by FAO, Iranian import statistics, and the export statistics on major 15 countries compiled by CIRFS. Regarding the production and consumption of cotton, the data collected by the International Cotton Advisory Committee (ICAC) were employed. As far as the production of nylon FY, the Annual Report of the Industrial and Mining Development Bank of Iran (IMDBI) and the data presented by the Textile Organon were used as reference.

(1) FAO's fiber consumption statistics

Table III-2-1 shows the material-wise textile consumption in Iran in accordance with FAO's fiber consumption statistics. The total textile consumption shows a wholesome growth from 1970 to 1974.

(2) Iranian import statistics

Table III -2-2 shows the summary of the total import amounts on the material-wise and form-wise bases on the basis of the import statistics issued by the Iran Customs Administration pertaining to the textile materials (SF, FY, spun yarns, fabrics). Table III-2-3 gives the production, consumption, and exportation of cotton in accordance with the statistics of ICAC, as well as the production of nylon FY in accordance with the Annual Report of IMDBI (on the basis of Textile Organon for years prior to 1973).

Table III-2-4 is compiled by combining Tables III -2-2 and 3 in order to summarize the Iranian textile

Table III-2-1 Material-wise Textile Consumption in Iran (FAO)

(Unit: 1,000 ton)

	1970	1971	1972	1973	1974
Cotton	64.3	63.6	70.4	86.0	103.3
Wool	8.0	7.4	8.8	11.6	11.8
Regenerated	52.1	66.1	59.2	43.7	54.3
Synthetic	27.3	23.1	35.2	45.3	52.3
Total	151.7	160.2	173.6	186.6	221.7

Source: FAO

Table III-2-2 Textile Import into Iran

(Unit: ton)

		1973	1974	1975	1976
Cotton	Spun Yarn	448	477	635	981
	Fabric	3,946	6,418	3,662	13,647
	Sub-Total	4,394	6,895	4,297	14,628
Wool	Raw Fiber	14,851	17,875	27,951	25,582
	Spun Yarn	2,347	2,467	2,156	2,940
	Fabric	289	468	3,159	5,196
	Sub-Total	17,487	20,810	33,266	33,718
Regenerated	SF/FY	40,890	52,287	41,514	39,061
	Spun Yarn	1,662	897	1,727	927
	Fabric	3,935	5,803	6,147	16,255
	Sub-Total	46,487	58,987	49,388	56,243
Synthetic	SF/FY	39,098	46,400	53,543	38,266
	Spun Yarn	6,513	10,092	14,608	19,949
	Fabric	1,830	2,967	1,975	15,825
	Sub-Total	47,441	59,459	70,126	74,040
Total		115,809	146,151	157,077	178,629

Source: Iran Imports Statistics

Table III-2-3 Production and Domestic Consumption of Iranian Cotton and Nylon Production in Iran

(Unit: ton)

	1970	1971	1972	1973	1974	1975	1976
Cotton							
Production	154,000	147,000	209,000	199,000	237,000	139,000	152,000
Consumption	61,000	60,000	69,000	73,000	76,000	79,000	80,000*
Exports	107,300	95,400	131,200	96,500	109,500	139,800	n.a.
Nylon Filament							
Production	3,000	3,000	5,000	5,800	6,000	7,000	7,500

Sources: ICAC Statistics
Textile Organon
IMDBI Annual Reports

Note: * The survey team

Table III-2-4 Total Textile Consumption in Iran

(Unit: ton)

	1973	1974	1975	1976
Cotton	77.4	82.9	83.3	94.6
Wool	17.5	20.8	33.3	33.7
Regenerated	46.5	59.0	49.4	56.2
Synthetic	53.2	65.5	77.1	81.5
Total	194.6	228.2	243.1	266.0

Sources: IRAN Imports Statistics
ICAC Cotton Statistics
IMDBI Annual Reports

consumption data. The total textile consumption has also shown a sound growth from 1974 to 1976.

(3) CIRFS export statistics

Table III-2-5 summarizes the Iran-destined exportation made by major 15 countries of the world in accordance with the export statistics data compiled by CIRFS. The 15 countries are as follows:

Belgium, the Netherlands, France, West Germany, Italy, Austria, Denmark, Finland, Norway, Portugal, Sweden, Switzerland, the U.K., Japan, the U.S.A.

Although no statistical data on the synthetic woven fabrics are available from this statistics, the above list of countries include nearly all the nations which are exporting regenerated and synthetic fibers to Iran. Table III-2-6 shows the consumption of regenerated and synthetic fibers in Iran calculated by adding the nylon FY production amount to the data shown in Table III-2-5. As far as the regenerated and synthetic fibers are concerned, a wholesome growth was made from 61.5 thousand tons in 1970 to 123 thousand tons in 1975. The growth of synthetic fibers is particularly notable.

Figs. III-2-1 and 2 give a summary of total textile consumption, cotton consumption, regenerated fiber consumption, and synthetic fiber consumption on the basis of the three sets of statistic data explained above. Concerning the total textile consumption, the FAO data and the data obtained on the basis of the Iranian import statistics are roughly inter-related; however, the Iranian import data are still on a slightly higher side. In view of the cotton consumption, the FAO data covering years prior to 1972 are roughly the same as the ICAC data. However, FAO data shows a considerably higher figure for the years 1973 and 1974. According to the results of interview made through the field survey, it seems that ICAC data are more reasonable. Concerning the regenerated fiber consumption, all the data by FAO, the Iranian import statistics, and the CIRFS export statistics show a considerable extent of fluctuation, and almost no overall growth is indicated. Concerning the data on synthetic fibers, there is a good coincidence between the FAO data and CIRFS export data, while the Iranian import statistics show a higher level. As will be discussed in more detail, the Iranian import statistics sometimes involve quantity figures of material-wise synthetic fiber classification which are hard to understand. In accordance with the results of the field survey, it seems obvious that the CIRFS export statistics data are more reliable than the Iranian statistics.

On the basis of the foregoing studies, Table III-2-7 has been compiled to show the annual textile consumption amount on a material-wise basis. The data in this table have been compiled by taking the ICAC data for the domestic cotton

Table III-2-5 Regenerated and Synthetic Fiber Exportation to Iran (from Principal 15 Countries)

(Unit: ton)

	1970	1971	1972	1973	1974	1975
Regenerated						
SF/FY	44,845	37,678	48,358	43,092	48,824	52,764
Spun Yarn	238	355	868	326	502	316
Fabric	176	349	332	827	540	464
Sub-Total	45,259	38,382	49,558	44,245	49,866	53,544
Synthetic						
SF/FY	10,717	18,125	25,264	31,344	38,257	53,744
Spun Yarn	2,437	2,335	5,585	6,346	6,631	8,684
Sub-Total	13,154	20,460	30,849	37,690	44,888	62,428

Source: CIRFS Exports Statistics

Note: * Belgium, Netherlands, France, West Germany, Italy, Denmark, U.K., Austria, Finland, Norway, Portugal, Sweden, Switzerland, Japan, U.S.A.

Table III-2-6 Regenerated and Synthetic Fiber Consumption in Iran

(Unit: 1,000 ton)

	1970	1971	1972	1973	1974	1975
Regenerated	45.3	38.4	49.6	44.2	49.9	53.5
Synthetic	16.2	23.5	35.9	43.5	50.9	69.4
Total	61.5	61.9	85.5	87.7	100.8	122.9

Sources: CIRFS Exports Statistics
IMDBI Annual Reports
Textile Organon

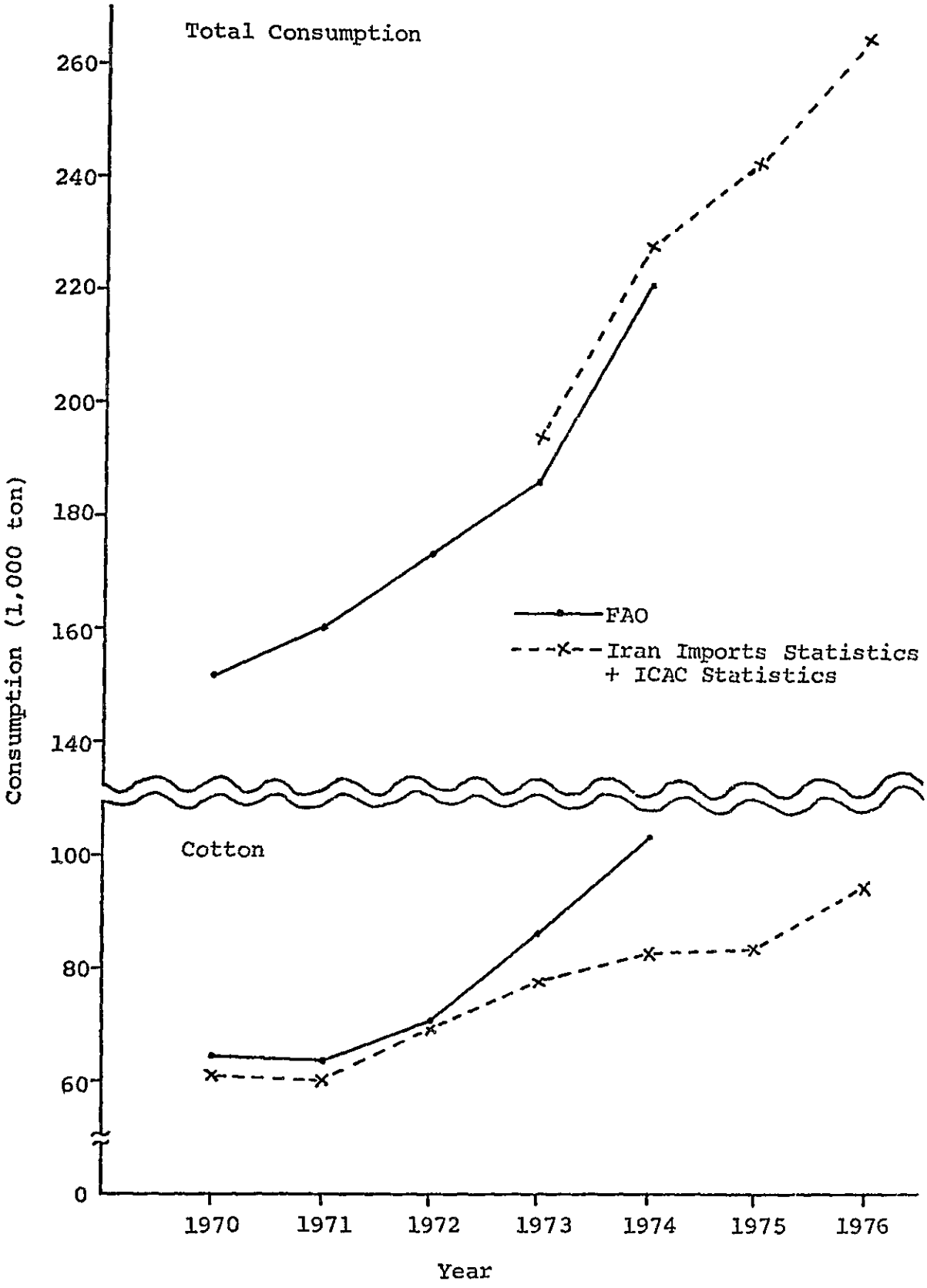

Fig. III-2-1 Textile Consumption and Cotton Consumption in Iran

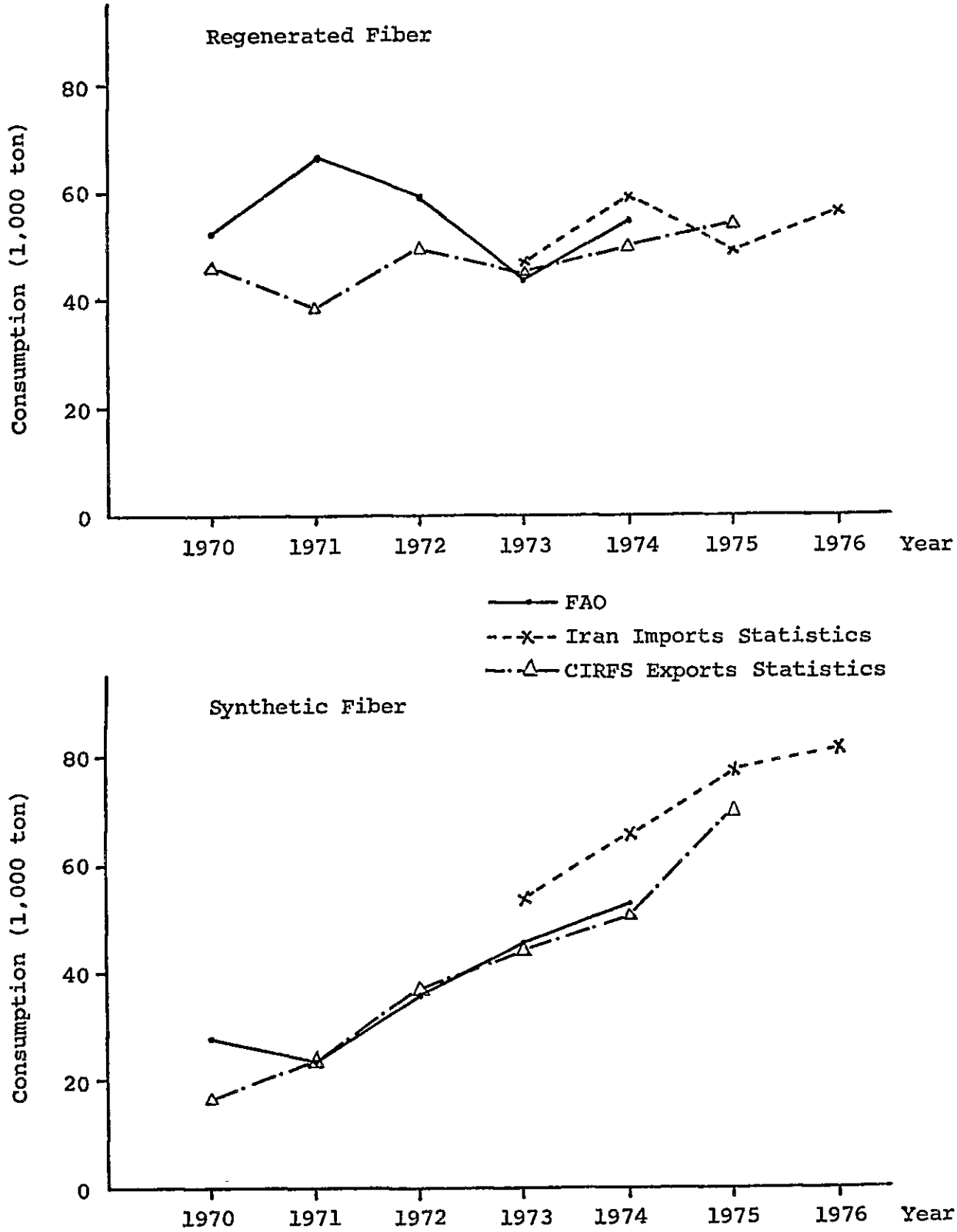

Fig. Ⅲ-2-2 Regenerated, Synthetic Fiber Consumption in Iran

Table Ⅲ-2-7 Trend of Material-wise Textile Fiber Consumption in Iran

(Units: 1,000 ton, %)

	1972	1973	1974	1975	1976*
Cotton	69.0 (42.2)	77.4 (43.8)	82.9 (42.4)	83.3 (37.1)	94.0 (39.2)
Wool, Other Natural Fiber	8.8 (5.4)	11.6 (6.6)	11.8 (6.0)	18.0 (8.0)	20.0 (8.3)
Regenerated	49.6 (30.4)	44.2 (25.0)	49.9 (25.5)	53.5 (23.9)	50.0 (20.8)
Synthetic	35.9 (22.0)	43.5 (24.6)	50.9 (26.1)	69.4 (31.0)	76.0 (31.7)
Total	163.3	176.7	195.5	224.2	240.0

Notes: * The survey team
( ) % on total textile consumption

consumption and the CIRFS export statistics data for the regenerated/synthetic fiber consumption. Concerning wool, all the garment-use wool is imported into Iran, in spite of the fact that carpet-use wool is domestically produced.

In view of the results of the above studies, it is likely that the total fiber consumption in 1976 in Iran must have attained a level of 240 thousand tons. On a material-wise basis, cotton amounted to 94 thousand tons (39%), wool 20 thousand tons (8%), regenerated fiber 50 thousand tons (21%), and synthetic fiber 76 thousand tons (32%), thereby showing that the Iranian synthetic fiber rate as of 1976 was 32%.

In 1976, Iran had a population of 33.9 million. Therefore, the total textile consumption of 240 thousand tons can be calculated to represent per capita consumption of 7.1 kg/year. If the average weight of fabric is assumed to be 340 g/m, 240 thousand tons of textile corresponds to 706 million meters. In view of the total 750 million meters as stated by the Annual Report of the IMDBI concerning the production and importation of textiles, this figure seems to represent a reasonable estimation.

2-2 Demand forecast

Table III-2-8 shows the estimated figures of population and per capita GDP both of which will be used as the basic data for this demand forecast. The population growth rate employed here (1985/1972-74) is average 2.9% per year, and the annual average increase rate of per capita GDP is 7.6%. Generally speaking, there is a strong correlation between the per capita textile consumption and per capita GDP in a given country. Fig. III-2-3 is a plotting of the correlation between the per capita textile consumption and per capita GDP covering major 55 countries of the world on the basis of FAO's fiber consumption statistics and the per capita GDP data of the World Product Cast. The relative regression formula is as follows:

$$\log y = -1.111095 + 0.630446 \log x \quad (r = 0.94)$$

where;

y: Per capita textile consumption (kg/year)

x: Per capita GDP (US$/year)

Fig. III-2-4 shows a regression line obtained concerning the relationship between per capita textile consumption and per capita GDP of the above 55 countries in 1972 and 1973. The regression curve remains almost the same even after the turn of the year. The relationship between per capita textile consumption and per capita GDP shown in Fig. III-2-3 should be maintained also in the future.

In Fig. III-2-3, the Iranian data from 1972 up to 1976 are plotted. Although the plotting is on a slightly lower level, the Iranian data seems to be fairly in compliance with the regression line in comparison to some other countries.

The reasons for the fact that the Iranian data plotting is lower than the regression line are as follows:

- The supply of textile product in Iran could not quite follow up the rapid increase in GDP.
- People of same lower class did not consume so much textile, as their income increased.

Along with the expansion of the distribution of the income among wider range of the people, the supply of textile products will also be more evenly distributed among the people. Once the fair distribution of the products should happen, the consumption level will grow further.

The per capita textile consumption in 1985 can be calculated as 11.1 kg/year by means of this regression formula on an assumption that the per capita GDP of 1985 will be US$2,621/year on the basis of Table III-2-8. Since per capita textile consumption in 1976 is 7.1 kg/year, the consumption will grow by 60% in nine years. A rapid industrialization is expected to take place in Iran on the basis of abundant oil and natural gas production, thereby boosting the growth of national economy. Also, the government is planning to increase the production of cotton, and at the same time boosting the construction of synthetic fiber manufacturing plants. In view of these factors, it is more than likely that the per capita textile consumption in 1985 will attain a level of approximately 11 kg/year which corresponds to the 1974 level of Italy, Portugal, Greece, etc. The Iranian total textile demand as of 1980 and 1985 has been forecast as shown in Table III-2-9.

Table III-2-8 Forecast on Population and Per Capita GDP in Iran

	1974	1975	1976	1980	1985
Population (10^6 person)	32.1	33.0	33.9	38.1	44.0
Per Capita GDP* (US$/year)	1,369	1,597	1,634	2,076	2,621

Source: World Product Cast

Note: * 1975 Constant price

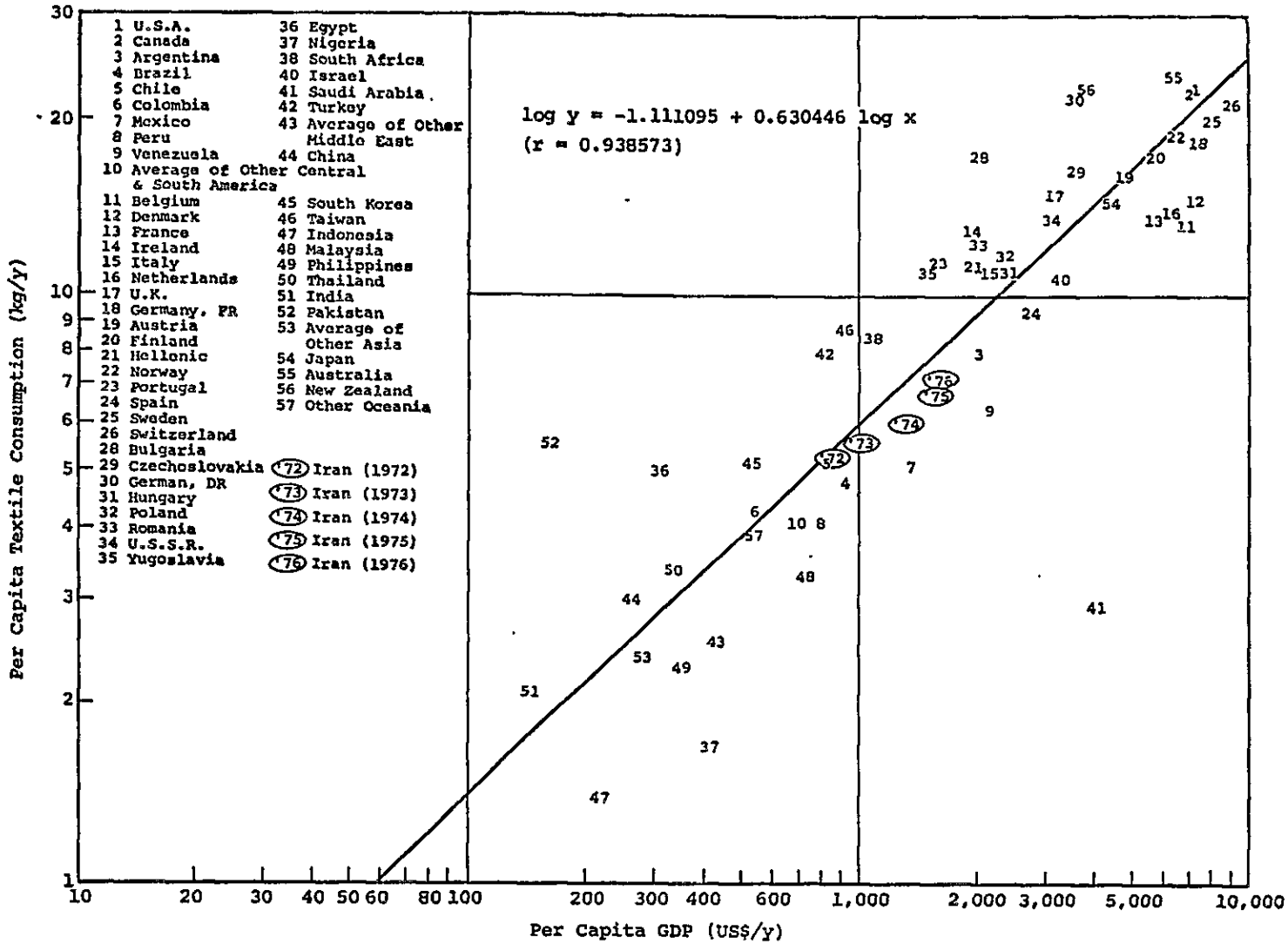

Fig III-2-3 Relationship between Per Capita Textile Consumption and Per Capita GDP in various Countries in the World (1974)

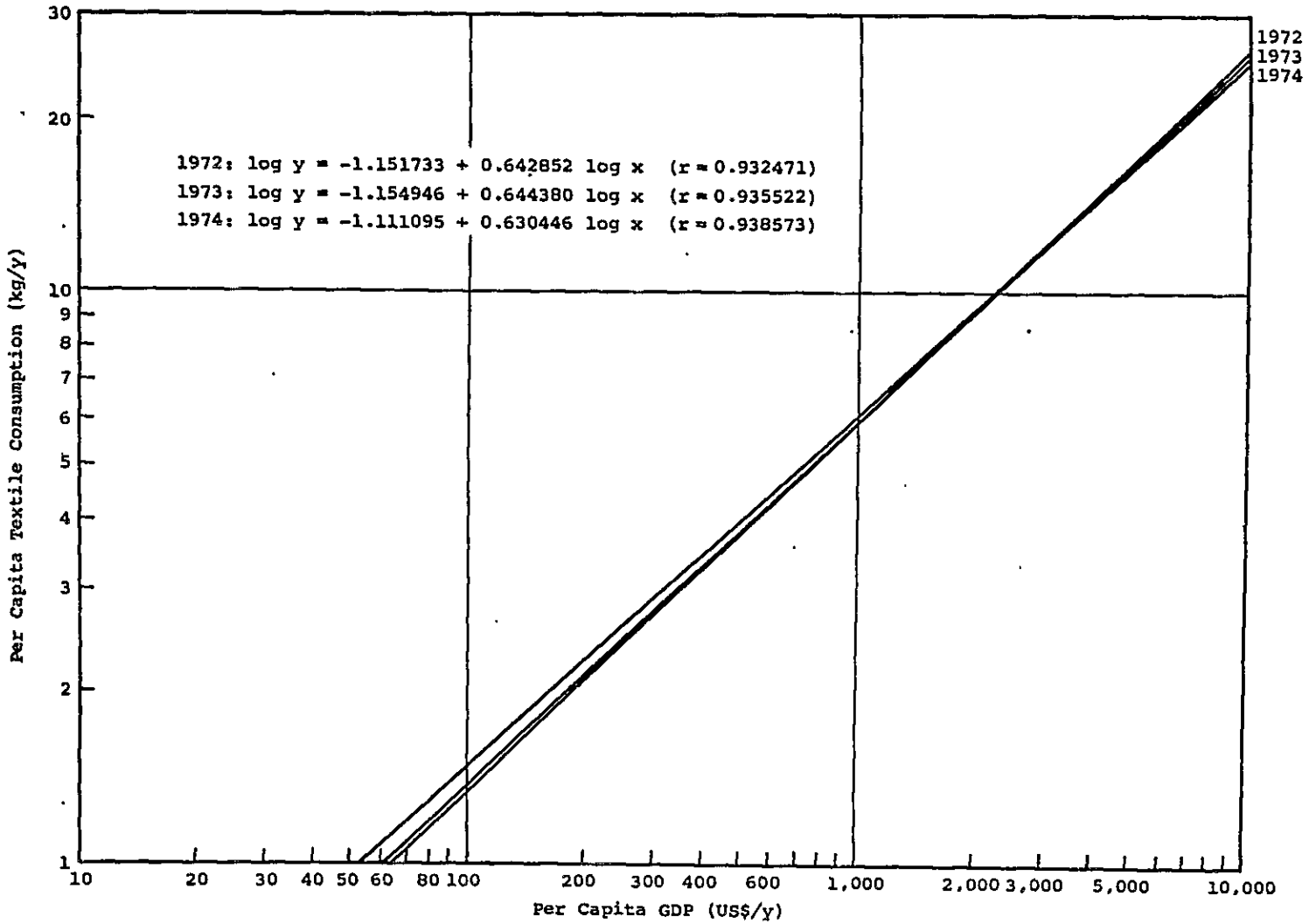

Fig III-2-4 Relationship between Per Capita Textile Consumption and Per Capita GDP in Various Countries in the World (1972 - 1974)

Table III-2-9 Forecast on Textile Consumption in Iran in 1980 and 1985

		Per Capita Textile Consumption (kg/year)	Total Textile Consumption (ton/year)	Average Annual Growth Rate (%) 1980/1976 1985/1976
1976		7.1	240,000	
1980	Minimum	8.6	328,000	8.1
	Medium	9.1	347,000	9.7
	Maximum	9.6	364,000	11.0
1985	Minimum	10.1	444,000	7.1
	Medium	11.1	487,000	8.2
	Maximum	12.1	532,000	9.3

Source: The Survey Team

3. Synthetic Fiber Demand in Iran

3-1 Current status

3-1-1 Material-wise textile consumption

Table III-2-7 shown in Chapter 2 gives the material-wise textile consumption in Iran. Iran is a cotton producing country. The output is about 200 thousand tons, and about half of this output is consumed domestically, the remaining being allocated to exportation. Concerning the cotton export, a large portion of the shipments are for barter transactions with the U.S.S.R. and East European countries. The domestic consumption has been steadily increasing. It is estimated that about 80 thousand tons of Iranian cotton was consumed in 1976. Being a cotton producing country, Iranian Government prohibits the importation of raw cotton. However, the importation of gray cotton fabrics is not placed under regulation because of the garment supply shortage in Iran. Gray cotton fabrics imported from India, Pakistan, etc. are being processed into products within Iran.

The Iranian indigenous wool is used as a raw material for producing carpet which is a product of traditional manufacturing industry of the country. However, wool for producing garments is being imported in the form of both raw wool and worsted yarn. The production of traditional carpets seems to be stagnating at present; however, the consumption of garment-use wool seems to be presenting a slight uptrend along with the increase in the national income. The importation of regenerated fiber started during the decade of 1950s, and the consumption at present registers about 50 thousand tons per year. However, the consumption of regenerated fiber in recent years has been showing almost no growth. Synthetic fibers on the other hand grew by more than two-fold from 36 thousand tons in 1970 to 76 thousand tons in 1976. The increase in the textile consumption over recent years is mostly made by the growth of synthetic fiber consumption and cotton consumption. Therefore, the synthetic fiber rate (rate of synthetic fiber occupied in the total textile consumption) grew from 22% in 1972 to 32% in 1976.

3-1-2 Synthetic fiber consumption

As has been discussed so far, the synthetic fiber consumption in Iran has been rapidly growing. However, there is only one company manufacturing nylon FY which commenced its production in 1969. This company is the only synthetic fiber manufacturing enterprise in Iran. The shortage portion of nylon FY and all the other synthetic fibers are entirely imported.

Table III-3-1 shows a summary of material-wise and form-wise importation amounts of synthetic fibers on the basis of the Iranian import statistics. In view of the results of the

Table III-3-1 Trend of Form-wise and Material-wise Synthetic Fiber Import into Iran

(Unit: ton)

		1973	1974	1975	1976
FY	Nylon	14,962	16,000	14,411	11,022
	Polyester	1,540	1,513	2,024	3,819
	Acrylic	1,431	879	1,062	513
	Not Mentioned Above	6,003	6,103	3,374	3,709
	Others	444	132	854	11
	Woven Fabrics	1,162	2,073	1,344	12,601
	Sub-Total	25,542	26,700	23,069	31,675
SF	Nylon				
	Fiber	3,047	4,936	4,606	619
	Spun Yarn	905	539	436	689
	Polyester				
	Fiber	3,481	5,652	1,656	3,547
	Spun Yarn	1,021	1,716	2,323	3,112
	Acrylic				
	Fiber	3,066	8,050	24,099	13,259
	Spun Yarn	3,518	6,650	9,662	14,691
	Not Mentioned Above				
	Fiber	5,124	3,135	1,547	1,767
	Spun Yarn	1,069	1,187	2,187	1,457
	Woven Fabrics	668	894	631	3,224
	Sub-Total	21,899	32,759	47,147	42,365
	Total	47,441	59,459	70,216	74,040

Source: Iran Imports Statistics

field survey and in the light of common sense, there are several points in the Iranian import statistics which need further clarification. The points are as follows:

(1) The import amount of nylon SF (including both fibers and spun yarns) is stated as 1,500 ton/year to 5,000 ton/year. This figure seems to be too high. The actual importation must have been extremely small.

(2) The acrylic FY importation amount is stated to have been 500 tons to 1,500 tons. This stipulation does not seem to represent the actual status. (At present, acrylic FY is produced and consumed in a small amount only in some of the developed countries.)

(3) The items "not mentioned above" involves several thousands of tons of importation. It is most likely that the items included under this categorization should be classified into the three major synthetic fiber categories. Also, no material-wise classification is clearly made concerning fabrics.

In view of the findings made through the field survey, it seems necessary to take the following points into consideration when employing the Iranian import statistics as a reference material:

(1) The figure of acrylic FY importation contains the importation of polyester FY.

(2) The "not mentioned above" item of FY contains nylon-66 FY.

(3) The FY woven fabrics consist of nylon woven fabrics and polyester woven fabrics.

(4) Nylon SF and nylon spun yarn include polyester SF and polyester spun yarns.

(5) The "not mentioned above" item of SF contains polyester SF.

(6) The SF woven fabrics consist mainly of polyester-blended woven fabrics.

Although it is impossible to modify the Iranian import statistics quantitatively to incorporate the above points, these must be borne in mind when estimating the material-wise synthetic fiber consumption. The estimation therefore was made after taking the above points into consideration and by adding the nylon FY production amounts shown in Table III-2-3. Nylon FY is the first synthetic fiber used in Iran. The Iranian domestic production of nylon FY started in 1969. The domestic production includes nylon-6, while both nylon-6 and nylon-66 are imported into Iran and processed into tricot and textured yarn. Further, FY woven

fabrics and tire cord woven fabrics are also imported. These production and importation together, it is likely that the consumption in 1976 amounted approximately to 28 thousand tons.

Acrylic SF has been showing a rapid growth in recent years due to the increase in the consumption of sweaters made of bulky yarns, and also a conspicuous growth in the consumption of acrylic carpets. It is likely that the consumption level of 1976 was about 28 thousand tons.

It is highly difficult to confirm the consumption level of polyester SF and FY. At present, the consumption of polyester SF is mainly made in the form of rayon-blended or wool-blended products. Importation of polyester-55/wool-45 worsted yarn is currently carried out. No production of polyester/cotton blended yarn is produced in Iran, because the Iranian domestic cotton is of medium fiber length, thereby showing some difficulties in being applied for cotton blending. The importation and consumption of cotton blended spun yarns and woven fabrics have not been large amount. Polyester FY is first processed into textured yarn and then further processed into knitted fabrics for the most part. The production of textured yarn woven fabrics is still on a test stage in Iran. In 1976 when the import restriction was relaxed, a considerably large amount of textured yarn woven fabrics were imported. It seems that the imported fabrics are still stocked. The polyester import amounts shown in the Iranian import statistics do not represent the actual status. It is safer to assume that there are imported polyester which has been included in some other classification items. It is also likely that a considerably high amount of polyester FY and SF woven fabrics are included in the synthetic fiber woven fabric categorization. The polyester consumption in both SF and FY as of 1976 seems to have grown to about 10 thousand tons.

Table III-3-2 shows the form-wise synthetic fiber consumption amounts compiled on the basis of the Iranian import statistics. As has been mentioned earlier, individual figures of this statistics involve some problems; however, it is possible to ascertain the overall trend. In 1973, the consumption in the form of SF and FY occupied 85% of the total; however, the rate dropped to 56% in 1976. In the same year, the consumption of SF, FY, and spun yarn together amounted to about 80%. This drop seems to be due to the increase in the importation of acrylic spun yarns and synthetic FY woven fabrics. The form of textile items imported into Iran at present has been mostly SF or FY because of the import control imposed upon textile processed products for the purpose of protecting the domestic textile industry. However, the Iranian domestic textile processing capacity failed to follow up both in quality and quantity the rapidly increasing textile consumption, thereby forcing the import control to partly relax. The cycle of import restriction intensification and relaxation will be maintained also in the future.

On the basis of the above studies, it is estimated that the material-wise textile consumption as of 1976 was as shown in Table III-3-3. It is further estimated here that the ratio of the materials are; natural fiber 47%, regenerated fiber 21%, and synthetic fiber 32%. The material-wise rates of the synthetic fiber are; nylon FY 37%, polyester FY 13%, polyester SF 13%, and acrylic SF 37%.

Table III-3-2 Form-wise Synthetic Fiber Consumption in Iran

(Unit: ton)

	1973	1974	1975	1976
Fiber + Filament	39,098	46,400	53,633	38,239
Filament Production	5,800	6,000	7,000	7,500
Sub-Total	44,898	52,400	60,633	45,739
	(84.4)	(80.1)	(78.5)	(56.0)
Spun Yarn	6,513	10,092	14,608	19,949
	(12.2)	(15.4)	(18.9)	(24.0)
Fabric	1,830	2,967	1,975	15,825
	(3.4)	(4.5)	(2.6)	(19.0)
Total	53,241	65,459	77,216	81,513

Sources: Iran Imports Statistics
IMDBI Annual Reports

Note: ( ) % on total amount

Table III-3-3 Material-wise Textile Consumption in Iran (1976)

	Qantity (ton/year)	Ratio (%)	
Cotton	94,000	39	47
Wool, Other Natural Fibers	20,000	8	
Nylon FY	28,000	12	32
Polyester FY	10,000	4	
Polyester SF	10,000	4	
Acrylic SF	28,000	12	
Regenerated FY	10,000	4	21
Regenerated SF	40,000	17	
Total	240,000	100	

Source: The Survey Team

3-2 Demand forecast

3-2-1 Synthetic fiber rate

The future trend of the synthetic fiber rate in Iran has been forecast from the following two angles:

- On the basis of the trend of synthetic fiber rate in other countries
- On the basis of supply/demand balance trend of natural fibers and regenerated fibers in Iran in the future

(1) Forecast of synthetic fiber rate based on that of other countries

When forecasting the future trend of synthetic fiber rate of a given country, the following factors must be taken into consideration:

- Weather and climatic conditions of the country
- Conditions of production, demand, and supply of natural fibers in the country
- Extent of the development of the synthetic fiber industry of the country
- Tradition of the culture and the foreign cultural influence

Iran is a cotton producing country, and the climatic condition is generally dry. Although the temperature rises high during summer, the winter in Iran is considerably cold. From the cultural viewpoint, Iran has been under strong influence of West European culture. Because of these factors, the Iranian structure of textile demand is highly complicated. Various types of textiles are consumed in variety of forms and applications.

Fig. III-3-1 shows the trend of synthetic fiber rate in the developed countries and in Iran. The synthetic fiber rate in West European countries grew from 20% in 1966 to 40% or 45% by 1974. This West European trend has not as yet shown a trend of saturation. The progress of synthetic fiber rate in Iran has been strikingly similar to that of the West European countries with a delay of about six years. On the other hand, Iran is one of the cotton producing countries, and the demand propensity towards cotton-type products is still conspicuous in view also of the climatic conditions. With these factors taken into account, the Iranian synthetic fiber rate in 1980 and 1985 has been estimated to be 40% and 45% respectively.

U: U.S.A.
F: France
G: Germany,Fed.Rep.
K: United Kingdom
J: Japan
I: Iran

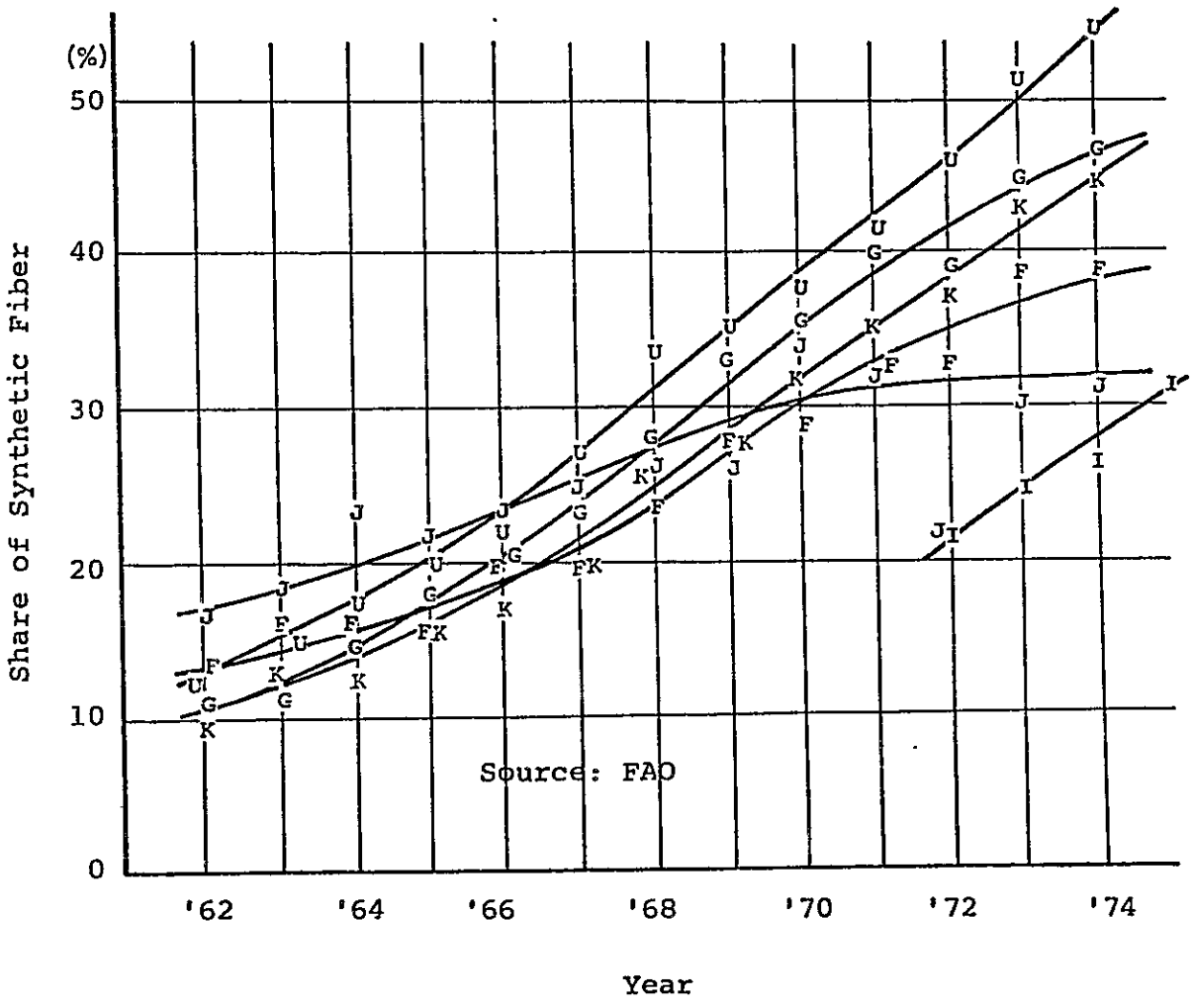

Fig. III-3-1 Trend of Synthetic Fiber Ratio in Developing Countries

(2) Forecast in view of the supply/demand balance trend of natural fibers and regenerated fibers

In forecasting the future synthetic fiber demand, the effects of the supply/demand balance of natural and regenerated fibers must not be overlooked. As has been discussed so far, Iran is one of the cotton producing countries of the world with annual output of 160 thousand ton/year to 200 thousand ton/year. About 50% of the domestic output is consumed inside Iran, and the remaining is being exported. In view of the utilization of domestic resources, the government is encouraging to increase the cotton production in the future. On the other hand, the self-sufficiency in the supply of food is one of the most important policies. Therefore, it is not possible to increase the cultivation area of cotton without considering the availability of the land for food cultivation. As a future plan, the cotton production level of 300 thousand ton/year is set as a target. It is estimated that cotton domestic consumption of 200 thousand ton/year to 250 thousand ton/year will be amply possible.

Concerning wool, the production is stagnating all over the world at present. Iran will also be compelled in the future to keep importing wool for conversion into garments. Therefore, it is difficult to expect that the wool consumption in Iran will significantly grow.

A considerably high extent of regenerated fiber is being consumed in Iran. The regenerated fiber rate in the total textile consumption in 1972 was 30%; however, the rate dropped to about 20% by 1976. The recent figure of the regenerated fiber consumption in Iran is about 50 thousand tons. It seems a construction project of a rayon plant has been contemplated since some time ago in Iran; however, no prospect of implementation seems to exist.

The production of regenerated fibers at present in the world is declining. Especially in the case of industrially developed countries, the regenerated fiber production cost has been increasing because of the hike in the raw material wood cost and bulging of the pollution control countermeasure investment. On the other hand, new construction and expansion of regenerated fiber producing facilities are actually undertaken in some developing countries; however, it seems highly difficult to achieve any significantly large increase in the production.

Traditionally, West Europe and Japan had a great extent of export surplus of regenerated fibers. However, the production drop in these countries have been especially conspicuous because of the above reasons. The U.S.S.R. and East European countries still show a considerably

high rate of regenerated fibers in their total textile production, thereby filling in the gap of export surplus in West Europe and Japan. However, there is no factor indicating a continued production increase of regenerated fibers. Therefore, the production of rayon in Iran seems to be unfeasible for some time to come. As it is estimated that the price of rayon will show a comparative uptrend, it is forecast that no significant increase in regenerated fiber production will be made in Iran.

Table III-3-4 shows the consumption trend of per capita consumption trend of cotton, wool, regenerated fibers, synthetic fibers, and total fibers of the countries in the world categorized in the industrially developed countries, centrally-planned socialist countries, developing countries, and Mideast countries.

Table III-3-4 Trend of Per Capita Textile Consumption in the World

(Unit: kg/year)

		1970	1971	1972	1973	1974
Developed Countries	Cotton	6.1	6.2	6.5	6.6	6.0
	Wool	1.3	1.2	1.3	1.2	0.9
	Regenerated	2.6	2.7	2.7	2.7	2.4
	Synthetic	5.2	5.8	6.5	8.0	7.3
	Total Fibers	15.4	16.1	17.2	18.5	16.6
Centrally Planned Countries	Cotton	3.1	3.8	3.8	3.9	4.0
	Wool	0.4	0.4	0.4	0.4	0.4
	Regenerated	0.8	0.9	0.9	1.0	1.0
	Synthetic	0.4	0.5	0.6	0.7	0.8
	Total Fibers	5.1	6.1	6.2	6.0	6.2
Developing Countries	Cotton	2.0	1.9	1.9	2.0	2.1
	Wool	0.1	0.1	0.1	0.1	0.1
	Regenerated	0.3	0.3	0.4	0.3	0.3
	Synthetic	0.4	0.4	0.4	0.5	0.6
	Total Fibers	2.8	2.7	2.8	2.9	3.1
Near East * in Asia	Cotton	2.9	2.6	2.7	3.0	3.3
	Wool	0.6	0.6	0.6	0.5	0.5
	Regenerated	1.0	0.9	1.0	0.8	0.9
	Synthetic	0.7	0.7	0.8	1.0	1.2
	Total Fibers	5.2	4.8	5.1	5.3	5.9

Source: FAO

Note: * Afganistan, Cyprus, Iran, Iraq, Jordan, Lebanon, Saudi Arabia, Syria, Turkey

In comparison to the developing countries, the Mideast countries show a generally higher level of consumption concerning all types of fibers. The Mideastern level is nearly the same as that of the socialist region. Regarding the per capita cotton consumption, both developed group and developing group show a steady unchanged trend, while a slight uptrend is shown by the socialist group. A similar uptrend is also noted in the Mideast countries. Wool shows an overall status quo or a gradual downtrend. As far as the regenerated fibers are concerned, the socialist countries demonstrate a small extent of increase, while the developing countries showing a status quo and the developed countries a slight decline. The Mideast countries are also showing a slight fall.

On the other hand, the consumption trend of synthetic fibers in countries other than the developed countries uniformly shows an uptrend which is higher than the increase of cotton consumption, although the absolute amount represented by the synthetic fiber increase is still smaller.

In the developed countries, the per capita textile consumption has already attained a considerably high level. In these countries, the progress in the synthetic fiber rate is expected to be made further in the future, thereby gradually decreasing the per capita consumption of both cotton and regenerated fibers. However, there may be some countries among the socialist group and the developing group which may show an increase in the per capita regenerated fiber consumption.

There are a number of oil producing countries in Mideast with a tremendous potential for economic growth. At the same time, Iran, Syria, and Turkey are cotton producing countries. Therefore, along with the increase in the synthetic fiber consumption, the per capita consumption of cotton will also grow.

The per capita consumption of cotton, wool, and regenerated fibers in 1976 in Iran was 2.8 kg/year, 0.6 kg/year, and 1.5 kg/year respectively. On the other hand, those of Mideast countries in 1974 were 3.3 kg/year, 0.5 kg/year, and 0.9 kg/year respectively. When the Iranian per capita consumption figures are compared with those of the average figures of the Mideast countries, the Iranian figure is lower by 0.5 kg/year in the case of cotton consumption, while regenerated fiber consumption of Iran shows a level higher by 0.6 kg/year. The cotton per capita consumption will show a growth in accordance with the increase in the per capita textile consumption in the future; however, the per capita consumption of regenerated fibers will not show any progress.

3-2-2 Forecast for material-wise synthetic fibers

The material-wise synthetic fiber rate in Iran at present is as shown in Table III-3-3. However, it is rather dangerous to assume that this rate will persist unchanged in the future.

The material-wise synthetic fiber production rate during 1970-1976 in West Europe, the U.S.A., and Japan was obtained, and the Iranian material-wise synthetic fiber demand rate was forecast on the basis of the rate of the above countries. This procedure was taken because of the fact that the Iranian textile demand structure is highly complicated, so that it does not necessarily follow the general trend of the world. The reason for employing the material-wise synthetic fiber production rate is that these regions represent the most important powers of synthetic fiber production (although no specific data showing the material-wise consumption amount in these regions are readily available), so that the production pattern in these most developed countries most likely represents the standard demand pattern.

The material-wise synthetic fiber production rate figures are shown in Table III-3-5 covering West Europe, the U.S.A., and Japan. As an overall trend, nylon FY shows a downtrend, while polyester FY and SF uptrend. The acrylic SF shows a steady level.

However, individual countries in these regions show their specific features. The acrylic SF shows the highest rate in West Europe, and at the same time the rate has been showing an uptrend. The present level of acrylic SF in West Europe is about 30%. In the U.S.A., the acrylic SF rate is low and still declining, thereby showing a rate only about 10% at present. Japan shows a rate around 25%. Regarding nylon FY, the rate is declining in all these countries; however, West Europe still holds 27% rate which is higher than 23%-24% shown by the U.S.A. and Japan. Nylon SF shows a particularly high and growing rate in the U.S.A. The U.S.A. showed the highest extent of polyester FY rate growth, followed by Japan. Polyester FY was the material which showed the highest production rate during 1971-1976. Japan's growth rate in polyester SF is conspicuous. American polyester FY and SF together occupies more than 50% of the total synthetic fibers. The polyester SF plus FY rate is 45% in Japan and 35% in West Europe, so that polyester FY/SF occupies the highest rate among the three major synthetic fibers in all these countries.

The Iranian textile consumption pattern in relation to that of these developed countries is closest to the West European pattern. Although there is a difference between West Europe and Iran in the climatic conditions and also in that Iran is a cotton producing country, the West European influence upon

Table III-3-5 Material-wise Synthetic Fiber Production Rate in the World

(Unit: %)

		1970	1972	1974	1976
West Europe	Acrylic SF	27.0	27.2	27.4	31.3
	Nylon FY	35.4	31.8	29.5	27.4
	Nylon SF	5.1	5.6	5.5	5.3
	Polyester FY	16.0	16.9	18.1	17.1
	Polyester SF	15.0	17.1	18.5	17.7
	Others	1.5	1.4	1.0	1.2
U.S.A.	Acrylic SF	14.8	12.7	11.1	10.3
	Nylon FY	34.2	29.6	27.4	22.7
	Nylon SF	6.5	10.3	9.9	11.6
	Polyester FY	13.4	19.3	24.7	23.2
	Polyester SF	30.7	27.8	26.6	32.0
	Others	0.4	0.3	0.3	0.2
Japan	Acrylic SF	27.1	26.3	24.6	25.8
	Nylon FY	29.6	26.8	24.7	23.7
	Nylon SF	1.6	1.6	1.4	1.3
	Polyester FY	13.1	17.0	18.1	20.8
	Polyester SF	18.8	19.9	23.4	23.6
	Others	9.8	8.4	7.8	4.8

Source: Textile Organon

Iranian culture is quite strong. The inclination towards wool consumption in Iran seems to be present also in the fact of acrylic fiber consumption increase. Although polyester fibers are showing uptrend, a sudden increase such as shown by the U.S.A. is not existent. It is obvious that nylon consumption rate in Iran will show an overall decline.

A full-fledged progress towards substantial self-supply system is being made in the synthetic fiber industry of Iran marked by the commencement of polyester and acrylic fiber production, the substantialization of synthetic fiber processing facilities, and the expansion projects in nylon production. Therefore,

it is likely that the choice of synthetic fiber products will be considerably broadened for the Iranian textile consumers in the future. The following paragraphs will discuss the Iranian future demand trend of each of the synthetic fiber materials.

Nylon FY has the longest history in Iran among all the synthetic fibers, and domestic production has long been conducted. However, in the developed countries, polyester FY is more extensively used than nylon FY for garment application. Therefore, the garment-destined demand for nylon FY in the future will not be very high. It is forecast, however, the demand generated from the industrial-use application centering on tire cord will grow, together with a certain extent of growth of BCF bulked continuous filament) which is carpet-use nylon FY. The share taken up by nylon FY as a whole in the total synthetic fiber consumption will decline.

The polyester FY processing facilities were quite recently installed in Iran, and the production of knitted fabrics has already started. Regarding the textured yarn woven fabrics, a great importation was conducted during 1975-1976. At present, producing facility installation projects are positively progressed, so that the system for domestic production of textured yarn woven fabrics will be established gradually. Although no sudden knit boom such as once taken in place in the United States is not expected to happen in Iran, the demand for polyester FY will steadily grow, thereby showing a gradual uptrend of the share rate in Iran.

Polyester SF in Iran is mainly used for blending with rayon and wool, mainly applied to produce suitings. However, as long as the polyester SF consumption is limited to the blending with rayon and wool, the demand growth rate will also be limited accordingly. The production of polyester/cotton blended products, which normally is the largest application field for polyester SF, is almost non-existent in Iran. The reason here is the fiber length of Iranian cotton which runs from 1" - 1 1/16" which makes it difficult to produce spun yarn of 45-count which is the standard polyester/cotton blended yarn. However, the domestic production of polyester SF is envisaged to be started in 1979. Studies are also made as to the possibility of developing spinning technology for blending of Iranian domestic cotton. This being the circumstance, it is expected that the consumption of polyester SF in Iran will grow in the future. The level of consumption of cotton, rayon SF, and polyester SF will be decided in accordance with the comparison of the relative prices. It is likely here that polyester SF will be equipped with high advantage than rayon SF in Iran in the future. In view of the fact that Iran is a cotton producing country, the polyester SF consumption will increase rather gradually.

The consumption of acrylic SF has been showing an acute

growth over the past few years. Acrylic SF is now widely used for producing high-bulky sweaters, blankets, carpets, etc. in line with the Iranian climatic conditions and traditional customs. This trend is expected to continue in the future. The current rate of acrylic SF in the total synthetic fiber consumption is as high as 37%. This share by acrylic SF will be maintained or improved in the future.

On the basis of the results of the above discussions, the material-wise synthetic fiber demand rate in Iran as of 1980 and 1985 has been forecast as shown in Table III-3-6.

And also Table III-3-7 has been compiled to show the forecast figures of the Iranian material-wise domestic synthetic fiber demand on the basis of the following assumptions:

- The growth rate of the total textile demand will be 8.2% per year (9.7% per year up till 1980).

- The synthetic fiber rate as of 1980 and 1985 is assumed to be 40% and 45% respectively. The synthetic fiber demand as of 1980 and 1985 will be 137,000 ton/year and 219,000 ton/year respectively.

On the basis of material-wise classification, nylon FY will take up 59,000 ton/year, polyester FY 37,000 ton/year, polyester SF 42,000 ton/year, and acrylic SF 81,000 ton/year. The average annual growth rate from 1976 to 1985 will be, 12.5%/year for domestic synthetic fiber demand, 8.6%/year for nylon FY, 15.6%/year for polyester FY, 17.3%/year for polyester SF, and 12.5%/year for acrylic SF.

Table III-3-6 Forecast on Material-wise Synthetic Fiber Demand Rate in Iran

(Unit: %)

	1976	1980	1985
Nylon FY	37	32	27
Polyester FY	13	15.5	17
Polyester SF	13	15.5	19
Acrylic SF	37	37	37

Source: The Survey Team

Table III-3-7 Forecast on Material-wise Synthetic Fiber Demand in Iran

	Amount (1,000 ton)			Average Annual Growth Rate (%)
	1976	1980	1985	1976 - 1985
Nylon FY	28	44	59	8.6
Polyester FY	10	21	37	15.6
Polyester SF	10	21	42	17.3
Acrylic SF	28	51	81	12.5
Total	76	137	219	12.5

Source: The Survey Team

4. Production Amount of Synthetic Fiber SF and FY in Iran

The maximum synthetic fiber SF/FY produceable amount of a certain country depends on the facility capacity for processing SF/FY and the export ability of synthetic fiber SF/FY. The relationship here will be as follows:

SF/FY produceable amount = SF/FY processable amount + SF/FY exportable amount

4-1 Processable amount of synthetic fiber SF/FY

4-1-1 Present status of textile processing facilities

In previous Chapter 3, the future Iranian synthetic fiber demand amount was forecast; however, this forecast amount does not necessarily correspond with the synthetic fiber SF/FY processable amount in Iran. It goes without saying that the synthetic fiber processing operation requires the plant and equipment investment, engineers, skilled workers, and unskilled workers to carry out the synthetic fiber processing operations.

The textile industry has a long history in Iran. Within the framework of First Five Year Plan after World War II, the textile industry was appointed as one of the important industrial sectors to receive specially emphasized investment. Because of such a history, the basic foundation of the textile industry was fairly well prepared, thereby presently forming an industrial sector in which the self-supply system is well established. Therefore, the textile industry is the largest industry in Iran in terms of number of employees and enterprises. However, the growth rate has been stagnating as the industry itself attained its maturity. The Government of Iran is highly willing to expand the textile industry along with the progress of heavy chemical industries. A vast extent of production increase projects are being formulated by the government; however, the major drive for the progress is expected to be given by the private sector investment.

Table III-4-1 shows a summary of the information obtained through the field survey concerning the present status of the textile processing facilities. It is not clear as to the extent of utilization of these facilities for processing synthetic fibers. Fig. III-4-1 shows a graphic illustration of the form-wise consumption of synthetic fibers in terms of FY and SF on the basis of Tables III 3-1 and 2 which are based on the Iranian import statistics. Both FY and SF, the consumption in the form of fabrics is small, whereas consumption in the form of FY and SF is high. Although the effects of the import control was great, most of the demand of the FY type were imported in the form of filament yarns and SF type in the form of staple fiber and spun yarns for further processing inside Iran. However, importation increased in spun yarn in 1975 and in spun yarn and fabrics in 1976, so that the

Table III-4-1 Present Textile Processing Facilities in Iran

Spinning	Cotton & Synthetic	approx. 1,100,000	spindles
	Wool & Acrylic	approx. 200,000	spindles
Weaving		approx. 28,000	looms
Texturizing	(False Twisting)	approx. 120	machines
Knitting	Warp Knit	1,200	machines
	Flat Knit	12,000	machines
	Circular Knit	1,400	machines

Sources: Iranian Textile Industries Syndicate
Others

importation of filament yarns and staple fibers comparatively fell. This was mainly due to an acute increase in the filament woven fabrics, particularly polyester filament woven fabrics, and acrylic spun yarns. Because of this great increase in the importation, the Iranian domestic synthetic fiber processing capacity increase could not follow up the domestic demand growth. Instead, the operational rate of the processing facilities fell because of a number of reasons which eventually led to the relaxation of the import control. This was the major reason for the acute increase in the filament woven fabrics.

At present, the Iranian synthetic fiber processing industry mainly consists of worsted spinning systems and knit processing facilities centering on the cotton spinning system as shown in Table III-4-1. The facilities for manufacturing filament woven fabrics are almost non-existent. The most active investment is now undertaken to the acrylic spinning facilities. A large-scaled expansion has been accomplished over the past two to three years. There are eleven bulky yarn spinning mills altogether having 50 ton/day capacity.

In the case of the spun yarn and weaving, a full-line mill encompassing spinning, weaving, and dyeing facilities are in operation in many cases. There are several specialized spinning mills. In the case of large companies, spinning and weaving of not only cotton but also spinning and weaving of rayon, polyester/rayon, and acrylic fibers are undertaken in many cases. Some companies are carrying out blend weaving

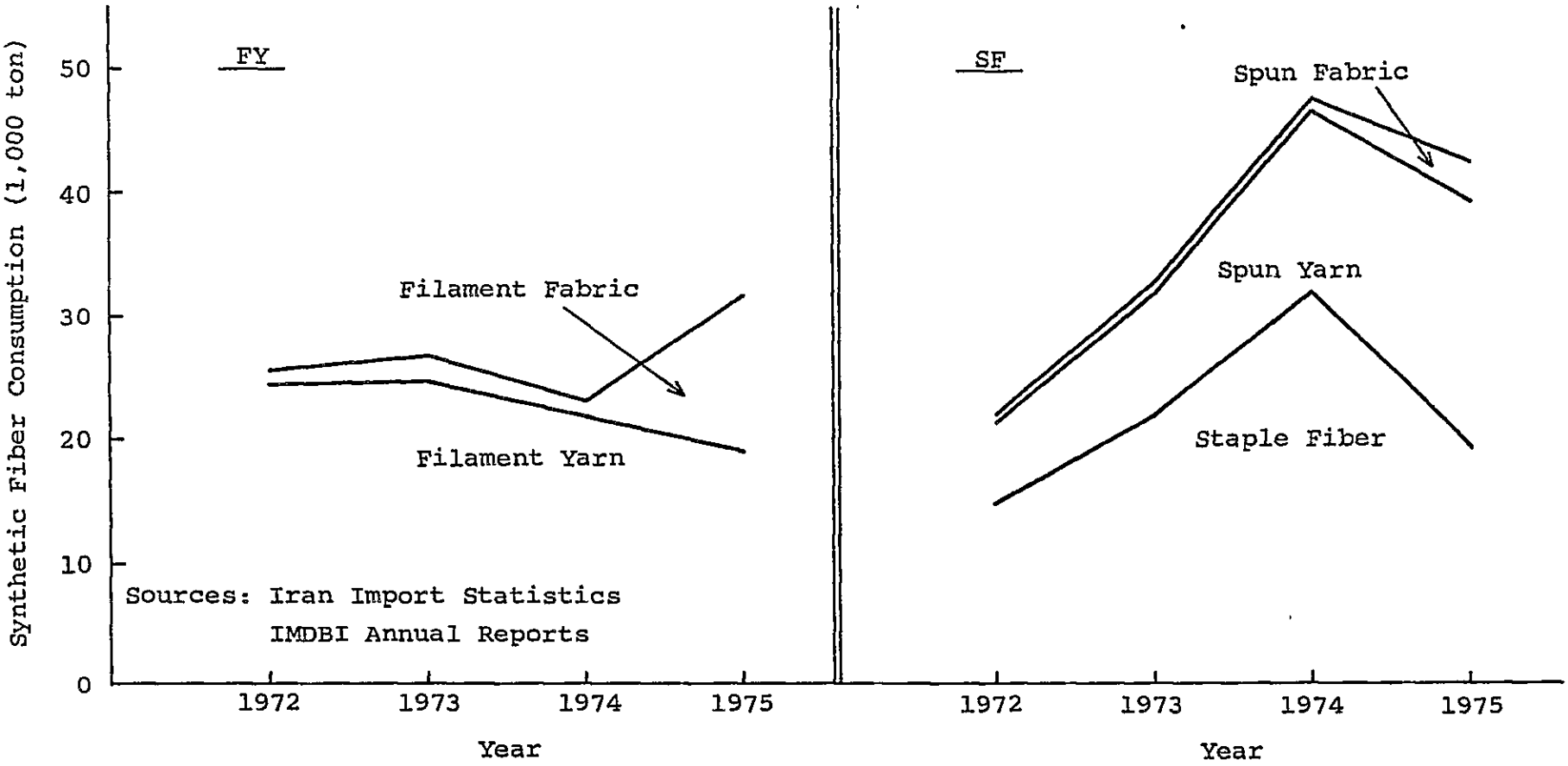

Fig. III-4-1 Trend of Form-wise Synthetic Fiber Consumption in Iran

of rayon filament with spun yarn. However, polyester/cotton blended spinning and weaving is seldom undertaken. The spinning in the worsted yarn process is often undertaken on the basis of imported polyester/wool blended spun yarns to produce woven fabrics. There are some cases in which the production was undertaken from the top by installing the spinning facilities. Although there is a variation from district to district, the operational rate of spinning/weaving facilities were generally low with some exceptions. The average of operational rate is reported to be 50% to 60%. The major reasons here are shortage of labour, managerial manpower and skilled workers. It is highly difficult for the textile industry obtain high quality labour force in the vicinity of large cities such as Tehran, Isfahan, etc. This being the circumstance, nearly all the mills were compelled to adopt two-shift instead of three-shift operation. Some companies were even forced to shut-down the spinning machines.

New construction and expansion have been carried out by leading industrial-group manufacturers concerning the facilities for false twisting and circular knitting. World's top-quality machines have already been installed. The textured yarns are knitted by the yarn producers themselves or by their subsidiary knitters, and the remaining textured yarns are sold to outsider processors. The amount of importation of textured yarns is much lower than the filament yarn importation. The types being processed are nylon and polyester. Nylon yarns are mostly made into hosiery, while polyester used for circular knitting. The flat knitting operation is for the most part carried out by small-scaled enterprises which are concentrated in Tehran and Isfahan areas. These small knitters are receiving acrylic and worsted yarns through supplying agents. The warp knitting operation is mainly carried out by employing nylon. There seems to be about 70 nylon tricot producing enterprises in Iran. However, the number of the major nylon tricot manufacturers is about ten. These companies are not willing to expand their producing facilities because of the dim outlook on the nylon tricot demand growth.

In addition to the above, now construction and expansion of processing facilities for blankets, carpets, etc. are increasing. Although the expectation in this field is rather high, the individual enterprises are either suffering from low operational rate or showing a considerably high level of operation. In view of the materials, rayon is used to be extensively for blankets, but acrylic fibers have been increased in recent years. Except for the traditional Persian carpet production, the ordinary carpet manufacturing is increasingly using acrylic fibers. Nylon BCF is imported in a small amount. There are processing facilities for needle punch carpets of polypropylene based on imported staple.

There is no weaving facilities for producing tire cords which is the major industrial-item. The dipping operation is carried out only partly by some tire manufacturers. All the other tire cords are imported in the form of dipped cords.

4-1-2 Forecast on processing capacity

Generally speaking, the processing capacity depends on the capacity of the processing facilities installed and the operational rate of the facilities:

Processing capacity = Capacity of installed processing facilities x Operational rate

As has been discussed in the foregoing chapter, a considerably high rate of growth is expected of the textile consumption in Iran. Regarding the increase in the processing capacity, a considerable degree of enhancement is formulated in development projects. In practice, however, it is difficult to expect that these facility expansion projects will be progressed as scheduled, thereby drastically increasing the operational rate of textile mills.

As shown in Table III-2-2, the importation of spun yarns and woven fabrics greatly increased during 1976 when the demand for textile products grew high. In order to increase the Iranian processing capacity, it is highly important to first improve the operational rate rather than expanding the total capacity of the processing facilities. The presently contemplated projects in this respect include the invitation of consultants from developed countries to increase the productivity, and also the establishment of a research center to carry out the necessary studies for further improvements. The Iranian industrialization activities cover a number of different sectors of industry. Therefore, it is difficult to expect that a special provision will be made in finance, labour force supply, and construction efforts only for the textile industrial sector alone to such an extent that the textile processing industry of the country becomes capable of handling all the textile demand in Iran. It is likely that the trend of increase of importation of spun yarns and woven fabrics which already took place in 1976 according to the Iranian import statistics will persist also in the future. As shown in Fig. III-4-1, the importation of synthetic fiber spun yarns and woven fabrics has been increasing. The major causes in this respect are the rapid increase in the importation of filament woven fabrics and acrylic spun yarns. The importation of spun yarns other than acrylic spun yarns as well as the importation of spun woven fabrics are also showing uptrend.

The future trend of the processing capacity in terms of product-wise categorization of synthetic fibers seems to be as follows:

Nylon:

Since the extent of growth of demand for nylon in the garment field is not expected to be very high, the future growth in the processing capacity will be able to follow up the natural growth of demand. However, the major portion of the demand

growth for nylon will be made by tire cord. Therefore, the question as to whether or not it is possible to domestically produce the tire cord greatly affect the future trend of demand for caprolactam which is the major raw material of nylon yarns. In terms of filaments, the present extent of tire cord demand is estimated to be 5,000 ton/year. Nearly all the demand has so far been met by imports in the form of dipped fabrics. It is forecast that domestic tire production in 1985 will be three times as high as the 1977 production figure. Therefore, the tire cord requirements are also estimated to grow up to 15,000 ton/year. Further the potential demand including imported tire is estimated 24,000 ~ 27,000 ton/year which is 60 ~ 80% over the production amount. The raw materials to produce tire cord are nylon (both Nylon 66 and Nylon 6), and polyester along with the popularization of radial tires. The steel cord will also be employed in the future; however, nylon cord will occupy the prominent position in the demand and at least domestic production for some time to come in view of the Iranian road conditions. In order to domestically produce tire cord, it is necessary to install, along with the tire cord production facilities, the twisters, the tire fabric machines, and the dipping machines. Several tire cord production plans have been formulated so far. It is reported that Parsylon Co. is presently planning to install the necessary facilities. However, it is likely that the implementation of such a project will run into a number of difficulties in view of the speciality of the tire cord manufacturing technology and the severeness of the approval tests to be imposed by the tire manufacturers.

In addition to tire cords, the demand for carpet-use nylon BCF will grow to a certain extent. Here again, the production facilities and technology for nylon BCF will require a high level of technology. Therefore, the Iranian domestic production of nylon BCF will not be feasible for some time to come until the demand has grown to a certain level to warrant the economy of domestic production. After all, it is estimated that the maximum produceable amount of domestic nylon filaments, i.e., the amount of domestic processing, as against the total nylon demand will be approximately 65%.

Polyester:

The polyester filament processing capacity represents the textured yarn producing capacity, circular knitting capacity, and the textured woven fabric producing capacity. Since the productivity of circular knitting machines is quite high, they will be further installed together with the textured yarn processing facilities along with the increase in demand. The textured woven fabric manufacturing facilities are just beginning to be installed in Iran, so that there are a number of unknown factors in this country concerning the level of technology, productivity, and the availability of the market. Both circular knitted products and textured woven fabrics are expected to have a growing demand, and it is highly likely

that leading manufacturers will exert efforts in expanding these operations. Therefore, a comparatively smooth progress will be made in facility expansion and production increase. It is therefore forecast that about 80% of the total domestic demand will be covered by domestic production.

Concerning polyester staple fiber, the demand forecast includes the demand for polyester/cotton blended fabrics for which no domestic production project is formulated at present. Iran has a large-scaled expansion projects in spinning; however, the actual operational rate is still low, and the progress of this project seems to be involving several problems. For the most part, the newly installed facilities will be capable of carrying out weaving of synthetic fibers, and the productivity of the existing spun weaving facilities will be made in the future. However, the expected growth in the total demand in this respect is also high. Therefore, the processing capacity is estimated to be about 70% as against the total polyester demand including such items as polyester/cotton blended, polyester/rayon blended, and polyester/wool blended products.

Acrylic fibers:

The acrylic fiber field is now carrying out the most active facility expansion investment. Both the yarn spinning facilities and the importation of acrylic SF and spun yarns are presently increasing. Since the products, i.e., bulky sweaters, blankets, carpets, etc. are suitable for the Iranian climatic conditions, the expansion of the processing facilities will continue in the future to a certain extent. However, the demand for these items is expected to considerably grow at the same time. Therefore, the estimated extent of domestic processing capacity here is about 70% of the total acrylic SF demand.

The gap between the demand and the processing capacity will have to be filled by importation in the form of either spun yarns or fabrics. Therefore, as has been exercised, balance between the domestic industry protection and fulfillment of the domestic demand will be maintained by means of controlling the importation.

On the basis of the above discussions, the processing capacity figures for 1980 and 1985 have been calculated for various synthetic fiber SF/FY as shown in Table III-4-2.

4-2 Production amount of synthetic fiber SF/FY

Production of nylon has been already conducted in Iran for some time. At the same time, the construction of polyester and acrylic fiber producing plants is being progressed. Also, a project for constructing a new nylon manufacturing plant is being implemented. Table III-4-3 shows a summary

of these projects on the basis of interviews held during the field survey.

Table III-4-4 gives a forecast on the domestic demand and the domestically produceable amounts of SF and FY in 1980 and 1985 on the basis of data given in Table III-4-3.

The type-wise comparison of the produceable amount and the synthetic fiber SF/FY processable amount (domestic demand) reveals the following points:

Although acrylic SF will still show supply shortage in 1980, the production and processing capacity concerning nylon and polyester FY will roughly balance with each other. On the other hand, the produceable amount of polyester SF will be higher than the processable amount. The producing facility capacity of these synthetic fiber products in 1985 may exceed the figures shown in Table III-4-5 depending upon the trend of the supply/demand balance in the future. However, the expansion projects in this field will be affected by the following two factors:

(a) Further clarification of the outlook on the domestic demand and processing capacity increase

(b) Further clarification of the worldwide supply/demand balance of synthetic fibers

In this Study, the following assumptions were made and then Table III-4-5 was compiled:

Table III-4-2 Forecast on Material-wise Synthetic Fiber Processing Capacity in Iran

(Unit: 1,000 ton/year)

		1976	1980	1985	Estimate Ratio of Processing Capacity to Demand
Nylon	FY	18.5	28.6	38.4	65%
Polyester	FY	7.5	16.8	29.6	80%
Polyester	SF	5.0	14.7	29.4	70%
Acrylic	SF	25.0	35.7	56.7	70%

Source: The Survey Team

Table III-4-3 Synthetic Fiber Manufacturing Products (Including Existing Plants) in Iran

(Unit: ton/year)

Nylon FY	ALIAF	11,000	Present capacity, no expansion plan
	PARSYLON	16,000	Contracted for plant construction
Polyester FY	POLYACRYL	12,000	Start 1978 under construction
		6,000	Start 1981 plan
		7,000	Start 1983 plan
Polyester SF	POLYACRYL	18,000	Start 1979 under construction
			No expansion plan
Acrylic SF	POLYACRYL	20,000	Start 1978 under construction
		5,000	Start 1983 plan

Source: The Survey Team

Table III-4-4 Forecast on Domestic Demand and Possible Production Amount of Synthetic Fiber FY/SF in Iran

(Unit: 1,000 ton/year)

		1980	1985
Nylon FY	Domestic Demand	28.6	38.4
	Production	19.0	27.0 + α
Polyester FY	Domestic Demand	16.8	29.6
	Production	12.0	25.0 + α
Polyester SF	Domestic Demand	14.7	29.4
	Production	15.0	18.0 + α
Acrylic SF	Domestic Demand	35.7	56.7
	Production	20.0	25.0 + α

Source: The Survey Team

Table III-4-5 Forecast on Material-wise Synthetic Fiber Production in Iran

(Unit: 1,000 ton)

	1976	1980	1985
Nylon FY	7.5	19.0	39.0
Polyester FY	0	12.0	30.0
Polyester SF	0	15.0	30.0
Acrylic SF	0	20.0	57.0

Source: The Survey Team

- Concerning the production amount of SF and FY, the 1980 level will be equivalent to the production amount presently envisaged.

- By 1985, expansion of the processing facilities will be made for both SF and FY on further assumptions as stipulated below:

(a) The domestic demand for synthetic fibers and the domestic synthetic fiber processing capacities will grow in accordance with the forecasts made in this Study.

(b) Import controls will be exercised upon synthetic fiber SF/FY, and further price policies and investment encouragement policies will be undertaken by the government in such a manner that the synthetic fiber facility expansion will be made possible.

(c) Although plant and equipment investment for the purpose of import substitution will be made, no export-oriented expansion of the producing facilities will be carried out.

4-3 Exportation of synthetic fiber SF/FY

Except for the case of polyester SF in 1980, the produceable amount of SF and FY are uniformly below the processable amount. Usually, synthetic fiber SF/FY manufacturers first carry out marketing to fulfill the domestic market. They embark upon exportation only after clarifying all the processing problems, and after making sure that they can supply adequate products. The background for this is that the users of synthetic fibers are usually timid in purchasing and processing new synthetic fiber SF/FY because of the uncertainty of quality, optimum processing conditions, etc. The synthetic fiber production in developing countries and centrally-planned socialist countries will increase in the future, and the self-sufficiency in the supply of synthetic fibers will be further progressed. As a result, low-cost exportation from some of the developing countries will be started. On the other hand, the supply/demand balance in the developed countries seems to present a situation in which the supply capacity exceeds the level of demand until the first half of the decade of 1980s. Under such environmental conditions, temporary exportation from Iran at low-cost may be possible; however, the Iranian synthetic fiber manufacturers should first exert their best efforts in establishing the quality and product reliability while carrying out import substitution. Such efforts will greatly serve to foster the necessary competitiveness both in quality and price in the event of future exportation.

5. Demand Forecast on the Synthetic Fiber Raw Materials in Iran

5-1 Demand forecast on synthetic fiber raw materials

On the basis of the synthetic fiber production already forecast in Chapter 4, the demand for synthetic fiber raw materials in 1985 has been calculated as shown in Table III-5-1.

5-2 Plant scale

The following are outline of the scale of the world's leading synthetic fiber raw material manufacturing plants announced by 1976. It can be seen from the following that the scale of operation has become quite large in each of the raw material products:

(1) DMT/TPA (as TPA)

The largest is Amoco (U.S.A.) plant for producing p-TPA at a capacity of 450,000 ton/year. The average scale ranges from 100,000 - 200,000 ton/year. The minimum economic scale is 60,000 ton/year.

(2) Caprolactam

The largest caprolactam plant in the world now is Nipro (U.S.A.) plant of 150,000 ton/year capacity. Generally, 50,000 ton/year to 100,000 ton/year plants are often found. The minimum scale here is 50,000 ton/year.

(3) Acrylonitrile

The largest acrylonitrile plant in the world now is Monsanto (U.S.A.) plant of 190,000 ton/year capacity. The usual size is 50,000 ton/year to 100,000 ton/year. The minimum scale is 50,000 ton/year.

(4) Ethylene glycol

The world's ethylene glycol plant is owned by Oxiran (U.S.A.) with a capacity of 360,000 ton/year. The usual size runs from 100,000 ton/year to 150,000 ton/year. The minimum economic capacity is 50,000 ton/year.

A comparative study between the demand figures shown in Table III-5-1 and the production figures of the plants reveal the feasibility of constructing plants having the following capacity:

(1) DMT/TPA (as TPA)

60,000 ton/year (mainly for domestic market), or

100,000 ton/year (including the domestic demand expansion portion and some exportation)

(2) Caprolactam

50,000 ton/year (mostly for domestic market, covering the demand growth portion)

(3) Acrylonitrile

55,000 ton/year (mostly for domestic market), or 80,000 ton/year (including the domestic demand expansion portion and exportation)

(4) Ethylene glycol

Even with the 22,000 ton/year demand for polyester production together with the possible demand for anti-freeze solution manufacturing, the total demand will still be far away from the minimum economic capacity of 50,000 ton/year. Large-scaled new construction and expansion projects are being implemented in the U.S.A. and West Europe, so that the supply/demand balance outlook at the present stage is not necessarily tight. It is rather advisable to carefully watch the import possibilities without rushing into domestic production projects.

Table III-5-1 Domestic Demand of Synthetic Fiber Raw Materials in Iran (1985)

(Unit: ton/year)

Synthetic Fiber Raw Material Demand		Synthetic Fiber Production Amount	
DMT/TPA (as TPA)	56,000	Polyester FY	30,000
		SF	30,000
Caprolactam	41,000	Nylon FY	39,000
Acrylonitrile	51,000	Acryl SF	57,000
Ethylene glycol	22,000	Polyester FY	30,000
(Ethylene oxide	18,000)	SF	30,000

Source: The Survey Team

Notes: DMT/TPA (as TPA) = polyester SF/FY x 0.93
Caprolactam = nylon FY x 1.05
Acrylonitrile = acryl SF x 0.90
Ethylene glycol = polyester SF/FY x 0.36

5-3 Basic chemicals of synthetic fiber raw materials

Table III-5-2 shows the basic chemicals of synthetic fiber raw materials (i.e. benzene, xylene, propylene, ammonia-hereinafter referred to as basic chemicals) requirements to cover the plants having the capacity scale as discussed in foregoing 5-2.

In the following paragraphs, discussions will be made concerning the possibility of securing these basic chemicals inside Iran. As has been mentioned earlier, p-xylene, xylene, cyclohexane, benzene, etc. are all the aromatics petrochemical products. The production of acrylonitrile is closely connected with the operation of an olefin complex, so that discussion concerning acrylonitrile should be included within olefin complex studies.

Table III-5-3 shows the plant capacity figures of aromatics products and propylene either under construction or under planning at present in Iran. Except for the Abadan aromatic project, these plans are expected to be on stream around 1980. Concerning xylene and benzene, the production capacity of IJPC will be ample. In this sense, the Abadan aromatic projects will have to export nearly all the products. Therefore, the feasibility of the Abadan aromatic project will be secured only after sufficient estimation is made on the supply/demand balance and economic viability of the operation within the framework of the international market.

Propylene and ammonia which are the basic chemicals of acrylonitrile, are closely related to the supply/demand balance of the plastics and fertilizers. From the propylene producing capacity of IJPC, the amount necessary for producing polypropylene and DOP-use 2-ethyl hexanol should be subtracted. The remaining propylene capacity of IJPC cannot cover the production of the necessary acrylonitrile. Therefore, studies concerning other methods including the separation of the off-gas from refineries, etc. should be conducted. In Iran, ammonia is already produced in two fertilizer manufacturing plants as the raw material for urea and other nitrogenous fertilizers. The ammonia plant expansion has been carried out in accordance with the implementation of the fertilizer production increase projects. The latest expansion is scheduled to be completed around 1980. After the completion, the total ammonia production capacity will be 1,000,000 ton/year. The necessary ammonia for acrylonitrile production occupies only 3% to 4% of the total ammonia production capacity of the country. Therefore, there will be no serious problem in terms of the suppliable quantity of ammonia for acrylonitrile production.

Table III-5-2 Required Feedstock Amount for Synthetic Fiber Raw Materials Plants

(Unit: ton/year)

Synthetic Fiber Raw Material	Capacity	Feedstock	Amount		
DMT/TPA	60,000	p-Xylene	42,000	(Mixed Xylene	45,000)
	100,000	p-Xylene	70,000	(Mixed Xylene	75,000)
Caprolactam	50,000	Cyclohexane	50,000	(Benzene	47,000)
Acrylonitrile	55,000	Propylene	69,000		
		Ammonia	28,000		
	80,000	Propylene	100,000		
		Ammonia	40,000		

Source: The Survey Team

Table III-5-3 Projects for Feedstock Production for Synthetic Fiber Raw Materials in Iran

(Unit: ton/year)

Feedstock	Company	Capacity		
Xylene	IJPC	Mixed Xylene	120,000	(Under construction)
	Abadan Aromatic Project	p-Xylene	320,000	(Plan)
		o-Xylene	50,000	(Plan)
Cyclohexane /Benzene	IJPC	Benzene	360,000	(Under construction)
	Abadan Aromatic Project	Cyclohexane	210,000	(Plan)
Propylene	IJPC	105,000 - 130,000		(Under construction)
		for PP	57,000	
		for Diethyl Hexanol	28,000	
Ammonia	Iran Fertilizer Co.	42,000	for urea, etc.	(Existing)
		360,000	for urea, etc.	(Under construction)
	Shahpur Chemical Co.	330,000	for urea, etc.	(Existing)
		270,000	for urea, etc.	(Under construction)

Sources: NPC
The Survey Team