

ECONOMIC COMMISSION FOR LATIN AMERICA

TECHNICAL SYMPOSIUM ON LATIN AMERICA AND THE CURRENT
ENERGY PROBLEMS

Santiago, Chile, 23-27 September 1974

Information document No 14

THE IMPACT OF THE OIL CRISIS ON THE COMPETITIVE
POSITION OF JUTE AND HARD FIBERS

Commodities and Export Projections Division
Economic Analysis and Projections Department
Development Policy Staff

FOR INTERNAL USE ONLY

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

COMMODITY PAPER NO. 11 (9/74)

THE IMPACT OF THE OIL CRISIS ON THE COMPETITIVE
POSITION OF JUTE AND HARD FIBERS

Commodities and Export Projections Division
Economic Analysis and Projections Department
Development Policy Staff

TABLE OF CONTENTS

	<u>Page No.</u>
<u>SUMMARY AND CONCLUSIONS</u>	iii-v
- The Impact of Polypropylene on Jute and Hard Fibers: Overview	1
- The Economics of Polypropylene	2
- The Uses of Polypropylene	4
- The Utilization of Polypropylene in Traditional Jute and Hard Fibers End-Markets	6
- The Competitive Relationship Between Polypropylene and the Natural Fibers	9
- The Oil Crisis and its Short-Term Impact on the Production Costs of Polypropylene Resin and Products	13
- The Oil Crisis and the Short-Term Changes in the Prices of Jute and Sisal Fibers and Products in Relation to Polypropylene Resin and Products	18
- The Future Prices of Polypropylene Resin and Products	21
- The Present and Future Ceiling Prices on Jute, Sisal and Their Manufactures	25
- Some of the Implications for Hard Fibers and Jute Producers	26
<u>TEXT TABLES</u>	
1. World Consumption of Polypropylene Resin by Major Consuming Areas, 1965-1973	3
2. Estimated Utilization of Polypropylene Resin in Traditional Jute and Hard Fibers End-Uses in Major Developed Consuming Areas, 1967, 1970 and 1973	7
3. United Kingdom and United States: Price Trends of Raw Jute, Sisal and Competing Products, 1968-1974	10
4. United States and Western Europe: Market Prices of Crude Oil, Chemical Feedstocks and Polypropylene Resin, 1970, Mid-1973 (Actual), 1974 (Estimated) and Projections to 1980	15

Page No.

5. United States and Western Europe: Estimated Direct and Indirect Impact of Change in Crude Oil Prices on the Production Costs of Polypropylene Resin and Products Competing With Jute and Hard Fibers, End-1972 to Mid-1974 and Mid-1974 to 1980	17
6. United Kingdom and United States: Recent Trends in the Prices of Raw Jute, Sisal and Manufactures Relative to Those of Polypropylene Resin and Manufactures	19
7. Polypropylene Resin Capacity and Utilization in Major Developed Producing Areas, 1970 and Projections for 1974 and 1976	22

CHARTS

1. Price Trends of Polyolefin Resins by Major Consuming Areas, 1962-1972	5
--	---

SUMMARY AND CONCLUSIONS

1. During the past ten years both jute and hard fibers have become subject to increasing competition from various types of synthetic substitutes. The major threat to jute and hard fibers came from polypropylene - a low cost thermoplastic commercially developed in the mid-1960's. Several factors accounted for the successful market development of polypropylene in direct competition with jute hard fibers. The basic appeals, however, were its low price and its ready availability. The relative price position of raw jute and jute products deteriorated steadily between 1968 and 1973. In 1972 and 1973 the relative price position of sisal fiber also worsened. Despite the oil crisis, the overall competitive position of both jute and hard fibers has further deteriorated in 1974. The current heavy imbalance between the prices of jute and hard fiber products and those of competing synthetic substitutes clearly indicates that the burden of adjustment still is on jute and hard fiber exporters.

2. This paper focuses on the impact of the oil crisis on the economics of polypropylene, and examines in detail the changes in the production costs and relative prices of polypropylene products which occurred during 1974. It also attempts to forecast 1980 costs and prices of polypropylene resin and textile products and to assess the new ceilings imposed on jute and hard fibers prices.

3. The total short-term impact of the increase in oil prices on the production costs of polypropylene resin is estimated to have been in the neighborhood of 27 percent in the United States and 61 percent in Western Europe. From mid-1973 to mid-1974 polypropylene resin prices increased by 31 percent in the United States and 75 percent in Western Europe. The production costs of polypropylene fabrics are estimated to have gone up by a minimum of 18 percent to a maximum of 32 percent, while the increase in polypropylene harvest twine costs probably ranged between 25 and 52 percent. Manufacturers, however, have absorbed for the time being, part of the cost increases and polypropylene product prices - with the exception of harvest twine - have gone up by less than the estimated rise in production costs. During 1974 the price of polypropylene cloth for bags increased by about 13 percent in the United Kingdom and 8 percent in the United States. Polypropylene carpet backing prices went up by about 24 percent in the United Kingdom, while in the United States they remained at the same level as in 1973.

4. Despite this increase in the market prices of polypropylene resin and some of its products caused directly or indirectly by the oil crisis, the overall competitive position of jute and hard fibers has worsened during 1974. Only raw jute has become more price competitive with polypropylene resin. Sisal fiber prices reached a post-World War II peak in 1974. Droughts in Africa have constrained output in key producing countries for three consecutive years. Sisal prices are now completely out of line in relation to polypropylene resin prices. The relative price position of

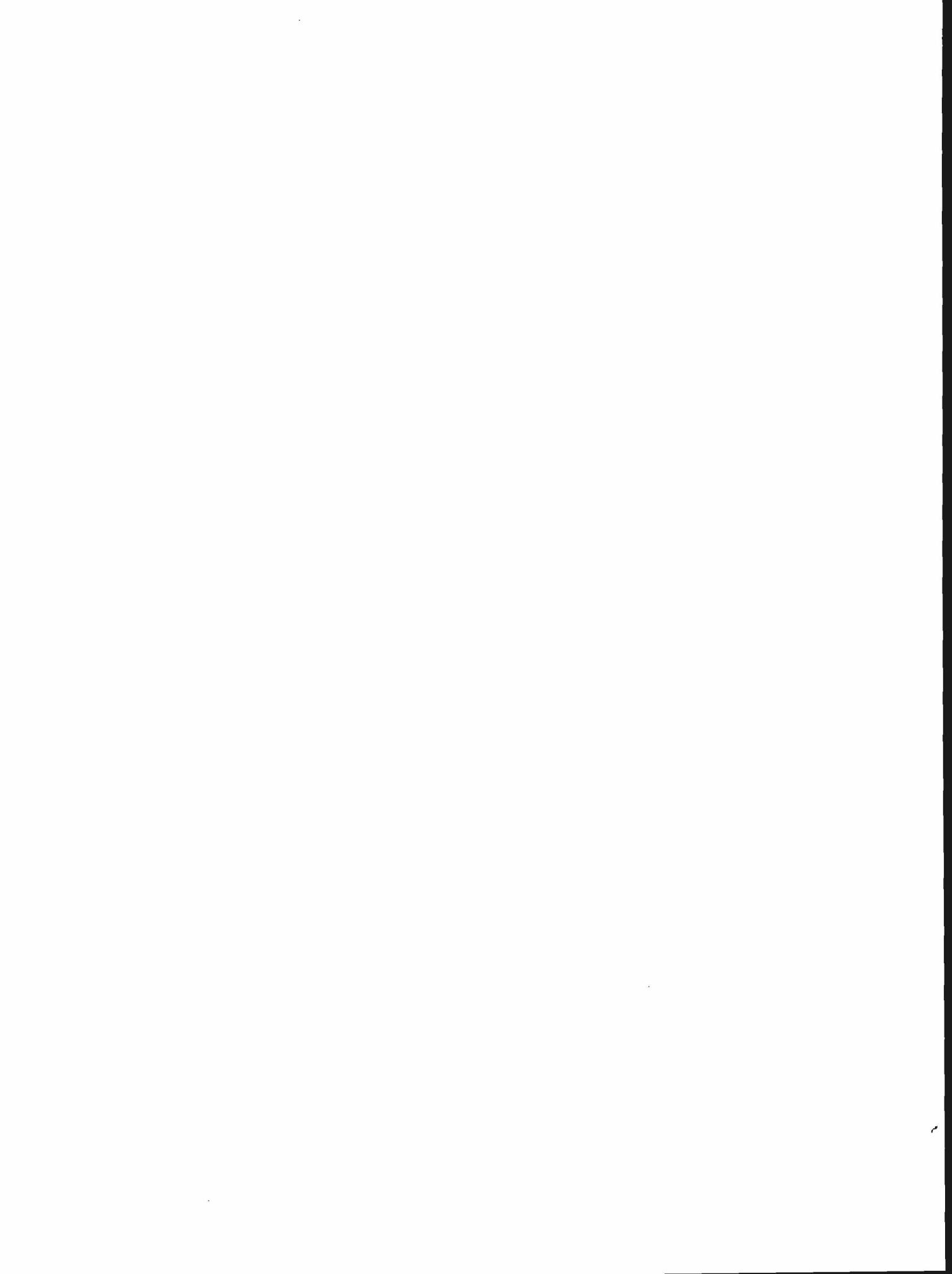
jute fabrics and sisal twine also worsened considerably during 1974. On the whole, the market prices of jute fabrics rose by about 30 percent in 1974. Strikes and electric power failures severely curtailed the output of the Indian industry during the first four months of the current year. Labor problems, scarcities of ancillary raw materials and electric power failures also constrained production of jute goods in Bangladesh. Speculative operations, fueled by the erroneous expectation of massive polypropylene resin shortages in consuming countries, added impetus to the upswing in jute fabric prices. The deterioration in the overall competitive position of jute and hard fibers in relation to polypropylene clearly points to the urgent need for corrective measures, particularly with regard to product prices, to prevent the continuation of market losses to synthetic substitutes.

5. In the longer term, the impact of the energy crisis on the production costs and prices of polypropylene resin and fabrics is likely to be quite strong. Petrochemical producers will be caught in a severe cost squeeze; energy costs will continue to increase and so will capital costs. Chemical feedstocks prices will have in the future to reflect closely their hydrocarbon values. Polypropylene resin producers will have to pay continuously higher prices for their basic raw material - propylene. The impact of scale economies and technical innovations on the production costs of polypropylene resin, although still significant, will not be sufficient to offset fully the expected increase in the costs of chemical feedstocks, energy used in the transformation process and capital.

6. By 1980, the production costs of polypropylene resin in the United States can be expected to be about 64 percent higher than in mid-1974. In Western Europe the cost increase is likely to be smaller - about 33 percent with respect to mid-1974 levels. Similarly between 1974 and 1980, the costs of polypropylene fabrics competing with jute can be forecast to increase by 35-36 percent in the United States and by 27-29 percent in Western Europe. These cost increases will have to be reflected in the market prices of the finished products. The future production costs of polypropylene harvest twine competing with sisal twine are more difficult to forecast, given the larger scope for technical improvements and scale economies in polypropylene twine manufacturing. Tentative estimates indicate a possible cost increase of 45 percent in the United States and 35 percent in Western Europe with respect to 1974.

7. Given the expectation of substantial future cost and price increases for both polypropylene resin and products, the prospects for jute and hard fibers would appear to be better than in the recent past which was dismal. The fact remains, however, that the current relative price position of jute, sisal and their products is so unfavorable that, short of a maximum effort to make the natural products more price competitive with synthetic substitutes, the present imbalance is likely to continue to exist in the foreseeable future with ominous consequences on the demand for these products in developed countries.

8. In the short-term a strategy of containment is the only feasible one for jute and hard fibers exporters. Minimization of market losses is largely a function of the efforts that exporters will be able to make to redress the present heavy imbalance between the prices of their products and those of competing synthetic substitutes. In the longer term, the survival of jute and hard fibers as an important source of employment, income and foreign exchange for producing countries will depend on their ability to better manage supply, increase productivity in fiber production and processing and develop, through research, new end-uses for these fibers.



The Impact of Polypropylene on Jute and Hard Fibers: Overview

1. During the past 10 years both jute and hard fibers have become subject to increasing competition from synthetic substitutes: nylon, polyesters, and polyolefins. 1/ While competition by nylon and polyester fibers remained confined to only some of abaca and sisal cordage end-uses (ropes and cables), polyolefin fibers and tapes found applications in both the cordage and cloth sectors traditionally serviced by hard fibers and jute (ropes, twines, cloth for bags, carpet backing and carpet yarn).

2. Polyolefin plastics 1/not only had highly desirable mechanical and physical properties - high tensility, stiffness, impact resistance and low weight 2/ - but were also characterized by low production costs. The potential of these low-cost thermoplastics as substitutes for lower priced natural fibers, was quickly understood by the petrochemical industry, which spared no research and development efforts to perfect these products and to market them as substitute primary materials for hard fibers and jute.

3. In the early 1960's when polyolefin plastics began to be commercially produced in the United States, Western Europe and Japan, the prevailing high prices of sisal and abaca gave a strong impulse to the development of production techniques by which these three thermoplastics could be utilized in the manufacture of cordage products. The production of polypropylene and high-density polyethylene woven cloths and film sheets in direct competition with jute carpet backing and hessian cloth for bags was also strongly encouraged by the various crises which besieged the world jute economy in the mid and late 1960's.

4. Superior to polyethylene in product performance, particularly in cordage and woven cloth, and much less expensive than nylon and polyesters, polypropylene became by the end of the 1960's the single most important substitute for both jute and hard fibers. Its penetration of jute and hard fibers traditional markets continued at an even faster pace in the early 1970's. In various forms - as filament, spun yarn and ribbons - polypropylene now competes with sisal in ropes, packing and harvest twine and with jute in backing yarn for woven carpet, narrow cloths for bags and sacks as well as in wide cloths for carpet backing.

1/ Polypropylene and Polyethylene.

2/ Polypropylene is the lightest of all thermoplastics, having a specific gravity of 0.90. This is an important factor in making it a low-cost, rigid material suitable in a large number of applications.

A. The Economics of Polypropylene

5. Propylene, the basic raw material for polypropylene is manufactured by steam cracking and refinery processes. The steam cracking of naphtha ^{1/} provides the bulk (about 90 percent) of the propylene in both Western Europe and Japan, where propylene is a co-product of ethylene production. In the United States, on the contrary, much of the propylene (about 85 percent) is supplied by refineries and it is derived from natural gas liquids (NGL) and from liquified petroleum gasses (LPG). Relatively smaller amounts come from naphtha and gas oil. The polymerization of propylene yields the polypropylene resin.

6. The production of polypropylene resin is highly capital intensive. Variable costs are relatively low, in spite of the substantial energy component, because propylene is a low-cost feedstock. In 1972 total manufacturing costs of polypropylene resin in the United States (excluding marketing, transportation and profit) were estimated at \$275 per ton, of which \$154 per ton were fixed costs (56 percent of the total) and \$121 per ton were variable costs (44 percent of the total). Among the fixed costs, capital was by far the largest single component, accounting for 62 percent of total fixed costs and 35 percent of total manufacturing costs. Propylene, the basic feedstock, made up for 59 percent of total variable costs, but only 26 percent of total manufacturing costs. Utilities were the second largest component of variable costs accounting for 27 percent of their total. ^{2/}

7. Polypropylene resin, first produced in the mid-1950's, began to be commercially exploited in the early 1960's. World demand for polypropylene resin increased at a phenomenal rate throughout the 1960's and continued to grow at an average rate of 25 percent a year in the early 1970's (see Table 1). Economies of scale, ^{3/} technological improvements and competition among producers - stiffened by expiration of patents - brought polypropylene prices down by about one half between 1962 and 1972 (from 33 to 16 ¢/lb. in the United States and 32 to 17 d/lb. in the United Kingdom). Although actual market prices for polypropylene

^{1/} Naphtha is derived from the primary distillation of crude oil. Naphtha, however, is not a chemically defined material, but a mixture of various hydrocarbons. The characteristics of naphtha depend on both the boiling range and the crude oil source.

^{2/} See IBRD, The Future for Hard Fibers and Competition from Synthetics, Working Paper 156, June 1973.

^{3/} The impact of scale economies on production costs of polypropylene resin is well-documented. See G. C. Hufbauer, Synthetic Materials and the Theory of International Trade, London, 1966, pp.56 and 151; FAO Impact of Synthetics on Jute and Allied Fibers, Commodity Bulletin Series No. 46, Rome, 1969, pp. 14-21; the Economist Intelligence Unit, Sisal and Polypropylene in the Agricultural Twine Market, London, 1964, pp. 18-26.

Table 1 : WORLD CONSUMPTION OF POLYPROPYLENE RESIN BY MAJOR CONSUMING AREAS, 1965-1973

('000 metric tons)

	1965	1966	1967	1968	1969	1970	1971	1972	1973 /1	Growth Rates		
										1965-1973	1970-1973	
											% per annum	
Western Europe	70	105	143	193	242	280	345	445	598	30.8	28.8	
United States	150	226	265	363	400	407	517	668	850	24.2	27.9	
Japan	55	99	160	235	340	400	465	550	600	34.7	14.5	
Others	<u>19</u>	<u>32</u>	<u>57</u>	<u>85</u>	<u>120</u>	<u>135</u>	<u>179</u>	<u>229</u>	<u>328</u>	<u>42.7</u>	<u>34.4</u>	
Total	294	462	625	876	1,102	1,222	1,506	1,829	2,376	29.8	24.7	

/1 Preliminary.

Sources: European Chemical News (weekly), London, various issues; McGraw-Hill, Modern Plastics (monthly), New York, various issues; Chemical Age (weekly), London, various issues; The Industrial Bank of Japan, Quarterly Survey of the Japanese Finance and Industry, various issues; Chemical Data Services, London; and trade and industry data.

resin are available for only a few of the main producing countries, 1/ comparative analysis of list prices during the 1960's and early 1970's clearly shows that the sharp price decline was general to all developed consuming countries (see Chart 1).

8. Mostly because of the different route to propylene, the United States polypropylene industry long enjoyed the advantage of a low cost basic feedstock (gas) whose domestic prices were kept low and isolated by government control from the international market price trends of other energy sources (oil, coals, etc.). The Western European and Japanese industries remained, on the contrary, dependent on higher cost crude oil (from which naphtha is derived) as the main source of their propylene. Polypropylene resin, therefore, was consistently more expensive in Western Europe than in the United States. Prices in Japan fell drastically from 1970 to 1972 and reached lower levels than in the United States. Excess supply created by a too rapid expansion of productive capacity in the mid-1960's forced Japanese resin producers to sell polypropylene at prices which barely covered variable costs.

B. The Uses of Polypropylene

9. Polypropylene resin finds applications in many sectors, the most important of which are solid plastics, textiles and film-sheeting. Moulded plastic products are the largest single outlet for polypropylene - about 40 percent of total world consumption of resin. 2/ Textile applications represent the second most important outlet for polypropylene accounting for about 30 percent of total world demand. 3/ Film-sheeting make up for another 15 percent of world consumption of polypropylene resin.

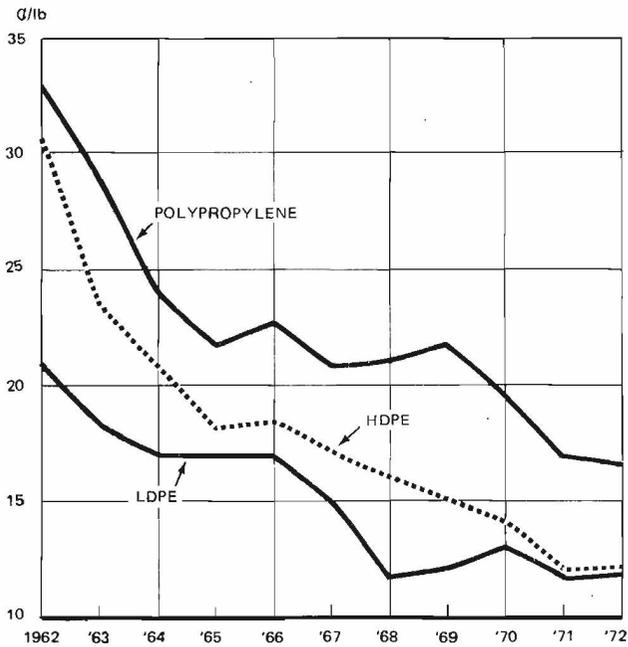
10. Polypropylene is available to textile producers in a variety of forms: mono and multifilament fibers, tapes (slit film, extruded ribbon and fibrillated slit film) and non-wovens. Mono and multifilament fibers are used in cordage - particularly ropes and twines. Tapes are utilized in woven cloths and twine. Non-wovens are used as primary and secondary backings for carpets.

1/ The behavior of market prices of polypropylene resin in the United States and the United Kingdom from 1968 to 1974 is illustrated in Table 3.

2/ Excluding the centrally planned countries, for which the applicational breakdown of polypropylene resin consumption is not available.

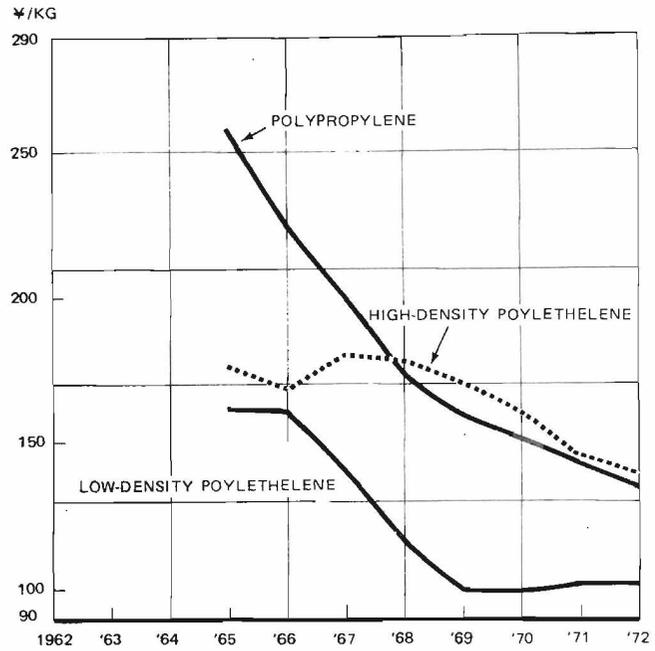
3/ In developed countries, where the displacement of jute and hard fibers has proceeded at a faster rate than for the world as a whole, textile uses account for an even greater percentage of total domestic consumption of polypropylene resin. In 1973, fibers and tapes uses made up for 39 percent of total polypropylene utilization in the United Kingdom, 35 percent in Italy, 32 percent in the United States and 30 percent in the Federal Republic of Germany.

Chart I: PRICE TRENDS OF POLYOLEFIN RESINS IN MAJOR CONSUMING AREAS, 1962-1972
U.S.: LIST PRICES OF PRINCIPAL PLASTIC RESINS, 1962-72



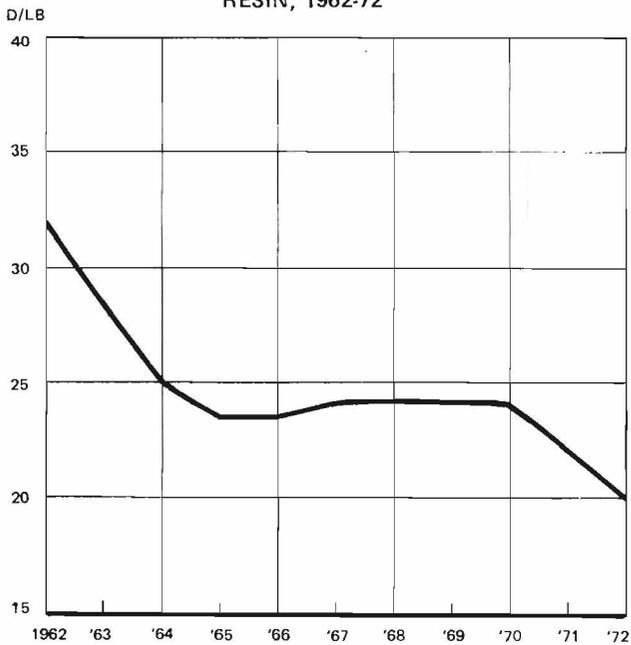
Source: Modern Plastics (monthly)

JAPAN: LIST PRICES OF PRINCIPAL PLASTIC RESINS, 1965-71



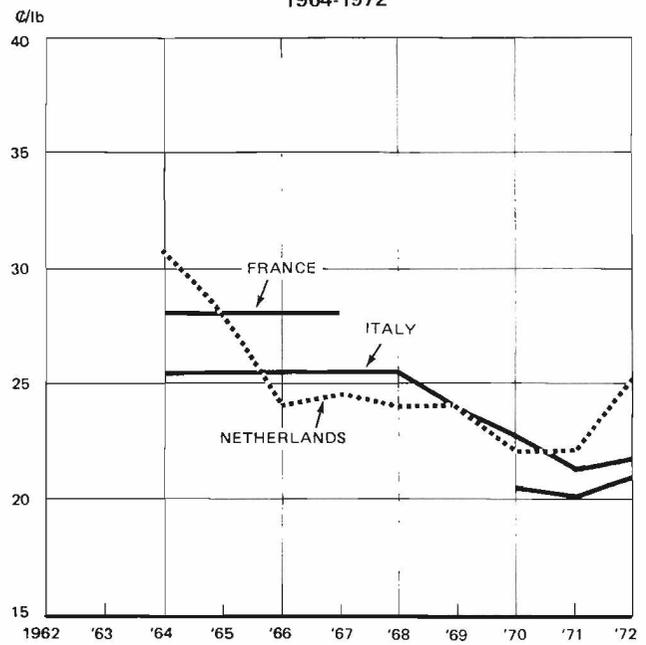
Source: The Industrial Bank of Japan, Quarterly Survey of the Japanese Finance and Industry

U.K.: LIST PRICES OF POLYPROPYLENE RESIN, 1962-72



Source: British Plastics (monthly) and Imperial Chemical Industries (ICI)

EEC: LIST PRICES OF POLYPROPYLENE POLYMER IN SELECTED COUNTRIES 1964-1972



Source: European Chemical News (weekly)

11. It was with tapes that polypropylene made its most extensive market impact in textile applications. Jute suffered most from the development and marketing of polypropylene tapes: slit film and extruded ribbons became extensively utilized in the manufacture of bags and primary carpet backing. Extruded ribbons found another sizeable market in the manufacture of packing twine, mostly at the expenses of sisal. Polypropylene tape harvest twine is also being marketed in increasing amounts, even though this particular market is still mostly serviced by sisal. Non-wovens (spunbonded) polypropylene fabrics were more difficult to develop and to market than tapes. However, after a period of massive research and development, the United States industry is now manufacturing and selling increasing quantities of non-wovens, both as primary and secondary carpet backing. 1/ Non-wovens are also becoming more extensively utilized in Western Europe.

C. The Utilization of Polypropylene in Traditional Jute and Hard Fibers End-Markets

12. In both the United States and Western Europe - which are two of the major export markets for jute and hard fibers - utilization of polypropylene products has increased dramatically since 1967 (see Table 2). Carpet backing is the area where polypropylene experienced the fastest growth, directly at the expense of jute. Between 1967 and 1973 consumption of polypropylene resin in carpet backing - both in woven and non-woven products - increased from 3.5 to 116.5 thousand metric tons in the United States and from 1.5 to 47.8 thousand tons in Western Europe. 2/ Bags and industrial cloth was the second fastest growth area for polypropylene, again mainly at the expense of jute. Between 1967 and 1973 polypropylene resin utilized in this sector increased from 6.3 to 20.5 thousand tons in the United States and from 2.2 to 42.0 thousand tons in Western Europe. 3/

13. On the whole, the development of textile polyolefins - and particularly polypropylene - had a devastating effect on jute consumption in Western Europe 4/ and also dealt a severe blow to jute demand

1/ In 1973 an estimated 45,000 metric tons of polypropylene resin was used in non-woven carpet backings.

2/ In Western Europe, polypropylene woven cloth for carpet backing is still dominant over non-woven.

3/ An additional estimated 13,000 tons of high-density polyethylene was used in the manufacture of cloth for bags in 1973.

4/ Total consumption of jute in Western Europe declined from 620 thousand tons in 1968 to 392 thousand tons in 1972 and to an estimated 360 thousand tons in 1973.

Table 2 : ESTIMATED UTILIZATION OF POLYPROPYLENE RESIN IN TRADITIONAL
JUTE AND HARD FIBERS END-USES IN MAJOR DEVELOPED CONSUMING AREAS

('000 MT)

	1967	1970	1973	% increase	
				1967-70	1970-73
<u>United States</u>					
Carpet Backing /1	3.5	22.7	116.5	548.6	413.2
Bags and Industrial Cloth	6.3	4.5	20.5	-28.6 /2	355.5
Cordage	15.0	20.0	27.2	33.3	36.0
of which: harvest twine	(2.5)	(3.6)	(4.5)	(44.0)	(25.0)
Total	24.8	47.2	164.2	90.3	247.8
<u>United Kingdom</u>					
Carpet Backing	1.0	8.6	23.3	760.0	170.9
Bags and Industrial Cloth	0.7	3.0	7.5	328.6	150.0
Cordage	9.0	12.0	15.5	33.3	29.2
of which: harvest twine	(1.3)	(1.8)	(3.4)	(38.5)	(88.9)
Total	10.7	23.6	46.3	120.6	96.2
<u>Other Western Europe /3</u>					
Carpet Backing	0.5	5.0	24.5	900.0	390.0
Bags and Industrial Cloth	1.5 /4	14.0	34.5	833.3	146.4
Cordage	5.0 /4	17.5	56.5	250.0	222.9
of which: harvest twine	(1.0)	(3.0)	(8.5)	(200.0)	(183.3)
Total	7.0	36.5	115.5	421.4	216.4

/1 Woven and non woven (non woven PP backing estimated at 9.000 MT in 1970 and 45.000 MT in 1973)

/2 The decline in utilization of PP resin in bags and industrial applications between 1967 and 1970 reflects the shift from PP to acrylics for sand-bags.

/3 Excluding Greece and Yugoslavia.

/4 Excluding Spain and Portugal.

Sources: IBRD, The Future for Hard Fibers and Competition from Synthetics, Working Paper No. 156, June 1973; IBRD, Jute and the Synthetics, Working Paper No. 171, January, 1974; Trade and Industry Sources, (interview data).

in the United States. 1/ Between 1968 and 1973, the market share of jute in primary backing for tufted carpets declined from 93 to 18 percent in the six original EEC countries and from 71 to 5 percent in the United Kingdom. 2/ During the same period jute market share in primary backing for tufted carpets also fell from 81 to 33 percent in the United States. It is estimated that in 1973 woven polypropylene alone held about 55 percent of the total primary backing market for tufted broadloom carpets in the United States, 84 percent of the primary backing market for tufted carpets in the UK and about 60 percent of the same market in the six original EEC countries. 3/

14. In the textile bag market, synthetic penetration is more difficult to assess because of the utilization of various kinds of other woven and non-woven materials in the manufacture of bags and heavy duty sacks. By 1972, however, woven polypropylene cloth had captured 24 percent of the commercial bag market in the United States. Woven polypropylene and high density polyethylene taken together had already gained by 1971 about 33 percent of the bag and sack market of the UK and 54 percent of this market in the Federal Republic of Germany. 4/

15. The impact of polypropylene on jute consumption was stronger in developed than in developing and centrally planned countries. Jute demand, however, was also negatively affected by the development of textile polyolefins in Eastern Europe, Africa, Central and Latin America. Small plants producing polyolefin fabrics for bags and sacks were established in almost every Central and Latin American country as well as in many African countries (Ivory Coast, Tunisia, Algeria, Morocco, Nigeria, Senegal, Malagasy Republic, Angola and Mozambique). From the late 1960's to the early 1970's, jute consumption only increased in the USSR, the Peoples' Republic of China and in the Asian producing countries. On a world basis, jute demand, which had been growing continuously from the mid-1940's to the mid-1960's, began to level off in the late 1960's and actually declined from a level of 3,550 thousand tons in 1968 to an estimated 3,300 thousand tons in 1972.

1/ Imports of jute and jute goods into the United States declined from 478 thousand tons in 1968 to 410 thousand tons in 1973.

2/ Utilization of polypropylene carpet backing was first developed in the United Kingdom. The displacement of jute in this end-use proceeded faster in the United Kingdom than in any other developed consuming country.

3/ Because of differences in specific weight and other physical properties between polypropylene and jute, one pound of polypropylene utilized in carpet backing displaces between 2.1 and 2.6 pounds of jute backing.

4/ One pound of polypropylene utilized in cloth for bags displaces between 3.6 to 3.8 pounds of jute hessian.

16. Utilization of polypropylene resin in cordage uses also increased substantially between 1967 and 1973. In Western Europe - where the growth of this sector was fastest - resin consumption increased from 14 thousand tons in 1967 to 72 thousand tons in 1973. During the same period consumption of polypropylene in cordage increased from 15 to 27 thousand tons in the United States. 1/ Despite the overall good performance of polypropylene in the cordage market, the demand growth in their sector was slower than in carpet backing. Polypropylene found increasing applications in ropes and packing twines, but its penetration of the harvest twine market - the single largest one for sisal in developed countries - was slower than it was first anticipated. 2/

17. On the whole, however, the impact of polypropylene on sisal and abaca consumption in Western Europe and North America was quite heavy. Between 1967 and 1973 polypropylene alone displaced about 160 thousand tons of hard fibers in these two major consuming areas. Demand for sisal was particularly affected by polypropylene. The growth of total exports of sisal fiber and manufactures from producing countries slowed down from an annual average of 1.4 percent between 1957 and 1967 to an annual average of 0.8 percent between 1967 and 1973. 3/

D. The Competitive Relationship Between Polypropylene and the Natural Fibers

18. Several factors accounted for the successful market development of polypropylene in direct competition with jute and hard fibers: relative prices, market structure, product performance and product development.

19. The basic appeals of polypropylene as a substitute raw material for jute and hard fibers were its low price and its ready availability. Between 1968 and 1973 while raw jute prices tended to fluctuate around a rising trend, polypropylene resin prices declined steadily in all major consuming areas (See Table 3 and Chart 1). 4/ Relative prices turned heavily in favor of polypropylene. At the finished product stage, the deterioration of the relative price position of jute hessians and carpet backing was even more evident (see Table 3). Price fluctuations also reduced the attractiveness of raw jute and jute products. In the United States, for example, where imported jute products freely compete with

1/ For the whole range of cordage products one pound of polypropylene displaces about 2.3 pounds of sisal or abaca.

2/ In 1973 polypropylene twine accounted for about 11 percent of the US harvest twine market and 18 percent of the same market in the United Kingdom. In 1972 - the last year for which statistics are available - polypropylene twine held about 7 percent of the harvest twine market in the original 6 EEC countries.

3/ 1966-68 (average) to 1971-73 (average).

4/ Table 3 is based on actual market prices of polypropylene resin, while Chart 1 is based on list prices.

Table 3: UNITED KINGDOM AND UNITED STATES: PRICE TRENDS OF RAW JUTE, SISAL AND MANUFACTURED PRODUCTS COMPETING POLYPROPYLENE RESIN AND PRODUCTS, 1968-1974

	Base Year	1968	1969	1970	1971	1972	1973	1974	
		----- (current \$/lb terms) -----							(estimated)
<u>United Kingdom</u>									
Jute Fiber <u>/1</u>	1968=100	100.0	110.3	104.8	107.3	108.3	109.2	129.4	
Sisal Fiber <u>/2</u>	1968=100	100.0	107.5	94.0	104.5	144.8	325.4	656.7	
Polypropylene Resin <u>/3</u>	1968=100	100.0	91.8	83.6	75.0	72.7	72.7	122.7	
Jute Carpet Backing <u>/4</u>	1969=100		100.0	107.6	111.4	123.8	130.0	174.3	
PP Carpet Backing <u>/5</u>	1969=100		100.0	94.3	85.2	80.7	84.5	101.1	
<u>United States</u>									
Polypropylene Resin <u>/3</u>	1968=100	100.0	95.2	90.5	81.0	76.2	78.6	107.1	
Jute Carpet Backing <u>/4</u>	1968=100	100.0	111.3	93.8	97.5	116.3	103.5	118.5	
PP Carpet Backing <u>/5</u>	1968=100	100.0	100.0	94.4	91.7	100.0	100.0	100.0	
Jute Hessian <u>/6</u>	1968=100	100.0	110.5	112.9	131.5	160.5	140.3	193.5	
PP Cloth <u>/7</u>	1968=100	100.0	87.5	68.8	68.8	75.0	78.1	82.8	
Sisal Baler Twine <u>/8</u>	1970=100			100.0	99.9	103.6	114.6	346.6	
PP Baler Twine <u>/9</u>	1970=100			100.0	94.7	94.7	100.0	231.6	

/1 B.W.C., c.i.f. UK/Europe.

/2 E.A. UG, c.i.f. UK/Europe.

/3 PP homopolymer, delivered to processors.

/4 Jute 150/9 oz. primary carpet backing delivered to tufters.

/5 PP primary carpet backing delivered to tufters.

/6 Jute hessian, 40/10 oz., spot New York.

/7 PP cloth for bags coated, standard make, delivered to bag processors.

/8 Price paid by farmers (retail price), 40 lb. bale.

/9 Price paid by farmers (retail price), 19 lb. bale.

Sources: World Fiber News, London (weekly); Fiber Market News, New York (tri-weekly); United States Department of Agriculture, Agricultural Prices, Mid-June Survey, various issues; Trade and Industry Sources (interview data).

locally produced polypropylene substitutes, 1/ jute hessians and carpet backing prices fluctuated considerably from month to month, while polypropylene cloths showed a remarkable degree of short-term price stability.

20. Until 1971 prices of polypropylene resin also declined in relation to sisal, but by less than in relation to jute. In Western Europe, where sisal is imported in raw form and processed locally, the low and stable prices of sisal fiber considerably reduced the appeal of polypropylene as a substitute material. 2/ In the US, moreover, where sisal processing is far less important than in Western Europe and imported sisal harvest twine freely competes with locally produced polypropylene twine, 3/ the price relationship between the two products changed little until 1973 and sisal remained dominant in this market.

21. The changes in the relative market structures which occurred during the past 10 years also help explain the different degrees of success encountered by polypropylene in competing with jute and hard fibers. As more and more firms began to produce polypropylene resin, the structure of this market changed from oligopoly to monopolistic competition. The raw jute market, on the contrary, remained essentially influenced by whatever happened in one single country - Bangladesh. Unlike the jute market, the sisal fiber market has generally been a competitive one. Sisal production is spread among various continents and producers who traditionally sold most of their fiber unprocessed, competed with each other in export markets. 4/ In the 1960's, the emergence of Brazil as a major producer and exporter of sisal fiber contributed to strengthen the competitive posture of this market. Polypropylene, therefore, faced stiffer competition from sisal than from jute producers.

22. The polypropylene products market also became more competitive in the late 1960's and early 1970's, as the number of firms engaged in textile production increased in both the United States and Western Europe. The jute manufacturers market, on the contrary, continued to be a duopolistic one and the reactions of the rivals remained fairly predictable: India exercised price leadership, while Bangladesh followed the ups and

1/ In Western Europe imports of jute goods are subject to various restrictions - tariffs and quotas, while raw jute can be imported free of duty.

2/ During the late 1960's the action of the FAO Intergovernmental Group on Hard Fiber helped to stabilize the sisal market to a considerable degree.

3/ In Western Europe imports of cordage products are subject to various restrictions - tariffs and quotas; raw fiber on the contrary, is imported free of duty. In the United States both raw fiber and harvest twines are imported duty-free. Other cordage products are subject to more stringent import restrictions.

4/ Mexico is the only producing country for which exports of finished products have traditionally been prevalent over raw fiber exports.

downs of the Calcutta market, limiting herself to offering variable discounts below prevailing prices. Again, unlike the market for jute manufactures whose structure did not change substantially in the 1960's, the sisal products market became more competitive. Sisal producers developed in the late 1960's a substantial fiber processing capacity and actively competed with each other as well as with European exporters in the United States harvest twine market. ^{1/} Prices of imported sisal twine remained low and stable in the United States and local producers of polypropylene twine, faced with stiff competition from sisal twine exporters, experienced great difficulty in penetrating this market.

23. Another structural feature of the polypropylene market which has considerably improved its stability and has helped to reduce production costs is plant location. Monomer plants were located near the raw material source and polymer and fiber plants operated near textile plants, which in turn were often located very close to the final consuming industries. This factor was particularly important in shaping the competitive relationship between polypropylene and jute textiles, which are produced thousands of miles away from final consumers. Even when, as it is the case in Western Europe, jute processing took place in consuming areas, the sources of the basic raw material were still remote and uncertain.

24. Relative product performance and product development are also important factors affecting the competitive relationship between jute, hard fibers and polypropylene. In certain end-uses polypropylene had a clear comparative technical advantage over hard fibers. Much of the substitution of polypropylene for abaca and sisal in ropes and cables was determined by the technical superiority of polypropylene - strength and resistance to corrosive agents. In some end-uses, however, polypropylene was at a comparative disadvantage vis-a-vis sisal and jute. Polypropylene harvest twine was more slippery than sisal twine and had inferior knot resistance. Similarly, polypropylene cloth for bags and carpet backing was technically inferior to jute hessians. Polypropylene narrow cloths were poorly engineered. Wide cloth for carpet backing presented a wide range of problems to carpet manufactures - dimensional instability, dyeing inefficiency and thermal sensitivity. A massive research and development effort, accompanied by personalized technical assistance to customers, succeeded not only in making polypropylene products technically acceptable, but in improving their performance to the point where they are now at a comparative advantage over natural fiber products in some important end-uses (e.g., fine gauge tufted carpets, indoor-outdoor carpets, heavy duty bags).

^{1/} The United States is the world's largest single market for sisal harvest twine and also the most competitive one as imports of harvest twine are duty-free.

25. Another competitive advantage of polypropylene manufacturers is their ability to differentiate their products, to marshal resources for advertising and promotional programs and to take full advantage of market opportunities. Their production capacity is more flexible and it can be more quickly adjusted to market demand shifts. The ability of the synthetic industry to take full advantage of every disruption in the natural fiber markets is well exemplified by what happened to jute in the United States in 1971. First a strike at American ports and then the war in the South-Asian sub-continent created an acute shortage of jute fabrics. Polyolefin textiles manufacturers promptly met the market needs and can now claim, with some justification, to have saved the US carpet industry from an impending disaster.

E. The Oil Crisis and Its Short-Term Impact on the Production Costs of Polypropylene Resin and Products

26. The second half of 1973 and the beginning of 1974 witnessed some fundamental changes in the pricing of crude oil. Between October 1, 1973 and January 1, 1974, posted prices of crude oil - in terms of Saudi Arabian Light (34°), f.o.b. Ras Tanura - increased from about \$3.00 to about \$11.65 per barrel. Estimated market prices for this grade of crude oil correspondingly increased from \$2.7-3.1 to \$9.6 per barrel. 1/ The embargoes and production cuts which followed the Arab-Israeli conflict in the Fall of 1973 generated short-term shortages of crude oil and naphtha for petrochemical products. The scarcity of oil pushed chemical feedstock prices to abnormally high levels, much above those which could have been expected simply as a result of the increase in crude oil prices. 2/ The market for polypropylene resin was seriously upset by the sudden change in both the availability and prices of propylene. The most serious disruptions took place in Western Europe and Japan where propylene is obtained from naphtha. Generally, the polypropylene resin market picture was further confused by the existence of various forms of governmental price controls in many developed producing countries.

27. From the availability point of view, the market for crude oil, naphtha and chemical feedstocks returned to near-normal levels in the second quarter of 1974. Crude oil prices also seem to have stabilized around \$11 per barrel c.i.f. Naphtha prices - which had reached extremely high levels in early 1974 - are still fluctuating, but around a declining trend.

1/ The estimated market price for Saudi Arabian Light, f.o.b. Ras Tanura, of \$9.60 per barrel is inclusive of the effects on export prices of the new participation agreements between foreign companies and oil producing countries which went into effect on January 1, 1974.

2/ Spot prices of chemical feedstocks reached astronomical levels. Spot prices, however, usually refer to relatively small transactions and thus tend to give a distorted picture of the market where large purchases and sales of chemicals are made on medium-long term contract basis.

28. The short term impact of the change in crude oil prices on the costs of polypropylene feedstocks in the United States and Western Europe can be gauged from Table 4. 1/ In the United States 1974 propane prices are expected to be about 100 percent above mid-1973 levels. Similarly propylene prices are expected to be in 1974 between 4.5 and 6.5 ¢/lb. as compared with 3.25 ¢/lb. in mid-1973. 2/ In Western Europe propylene prices are projected to be in 1974 about 300 percent above mid-1973 and about twice as high as in the United States. Ethylene prices are also expected to follow a similar trend.

29. The shortage of crude oil that Western Europe experienced in late 1973 and early 1974 forced chemical producers to compete actively with other end-users - particularly oil refineries producing gasoline - for the limited amounts of available naphtha. Chemical producers, who had in the past chosen naphtha as their basic feedstock on the ground of its inherently limited value to refiners, found themselves facing strong competition from gasoline demands and in need to pay high prices to attract hydrocarbons from alternative uses. This type of direct competition, which had remained until the recent past limited to marginal naphtha, suddenly widened into competition for part of the bulk of the naphtha stream. High naphtha prices determined in turn a drastic change in chemical derivatives pricing. The direct opportunity costs of hydrocarbons became the key to chemical derivatives prices.

30. Limited availability and rising costs of propylene put strong pressure on polypropylene resin prices which increased sharply from their mid-1973 levels. In July 1974 polypropylene resin 3/ prices were at \$463 per ton in the United States - 31 percent above mid-1973 levels - and at about £ 280 per ton in the UK - 75 percent above mid-1973 levels. Prices in other Western European countries were reported to be marginally above UK levels. 4/ Higher costs for propylene accounted in part for the faster rise of polypropylene prices in Western Europe than in the United States. Moreover, temporary disruptions of trade flows - partially caused by different types of price controls imposed by Western European governments - created stronger apprehensions about possible prolonged shortages of resin among users. The polypropylene market rapidly turned into a sellers market and Western European producers met little resistance to their large price increases.

1/ The 1974 price estimates rest on the assumption that realized crude oil prices - in terms of Saudi Arabian Light, f.o.b. Ras Tanura - will remain at \$9.6 per barrel.

2/ Propylene prices are extremely difficult to assess with precision since old and new contracts overlap to a considerable extent.

3/ Homopolymer resin suitable for textile applications, delivered to customers.

4/ At about £ 300 per ton.

Table 4 : UNITED STATES AND WESTERN EUROPE: MARKET PRICES OF
CRUDE OIL, CHEMICAL FEEDSTOCKS AND POLYPROPYLENE RESIN,
1970, MID-1973 (ACTUAL), 1974 (ESTIMATED) AND
PROJECTIONS TO 1980

	Unit	1970	Mid-1973	1974 (estimated)	1980 (projected)
-----current \$ terms-----					
<u>United States /1</u>					
Crude Oil (domestic)	\$/bbl.	3.2	3.8	5.25 /3	----
Crude Oil (imported)	\$/bbl.	2.5	4.5	11.0 - 11.5	16.0
Naphtha (imported)	\$/MT	27.0	59.0	125.0 - 140.0	170.0
Propane	ct/gal.	4.0	6.0	10.0 - 15.0	32.0
Ethylene	ct/lb.	3.0	3.50	6.0 - 8.0	17.0
Propylene	ct/lb.	2.75	3.25	4.5 - 6.5	13.0
Polypropylene Resin	\$/MT	419.0	364.0	441.0 - 463.0	780.0
<u>Western Europe /2</u>					
Crude Oil	\$/bbl.	2.2	3.8	11.0	15.5
Naphtha	\$/MT	23.0	55.0	120.0 - 135.0	165.0
Ethylene	ct/lb.	3.25	4.2	12.0 - 15.0	19.0
Propylene	ct/lb.	3.0	3.7	10.0 - 12.0	15.0
Polypropylene	\$/MT	442.0	392.0	624.0 - 672.0	870.0

/1 Gulf Coast contract basis (except for PP resin which is c.i.f. factory).

/2 F.o.b. Rotterdam (except for PP resin quoted c.i.f. factory for the UK).

/3 Old oil (60% of domestic production and 43% of US refinery capacity).

Source: IBRD, Economic Analysis and Projections Department.

31. Polypropylene resin prices are still on the rise in the United States, but the average for 1974 is not expected to be higher than \$463 per ton. In Western Europe 1974 prices are projected to average around \$625-672 per ton, 35 to 45 percent above US levels. (See Table 4.)

32. Estimates of the short-term impact of the oil crisis on the production costs of polypropylene resin and manufactures are set out in Table 5. The estimate of the direct impact takes into account the increase in the production costs of polypropylene resin due to higher feedstock and energy prices and straightforwardly traces out the effect of the rise in the cost of the basic input (the resin) on the production cost of the outputs (fabrics and twine). This type of calculation presupposes a vertically integrated industry where polytwine and fabrics manufacturers are also polypropylene resin makers. This is not the case in practice. Polypropylene textile manufacturers purchase their resin from chemical companies and pay the ongoing market price. ^{1/} The estimate of the total impact of the change in oil prices, therefore, starts from the market price of polypropylene resin (instead of the estimated total increase in production costs) and also takes into account the change in energy costs as well as the effect of general inflation on all other input costs.

33. The estimates shown in Table 5 indicate that while the direct impact of the change in oil prices on the production costs of polypropylene textiles is theoretically quite modest - except for harvest twine in Western Europe - the total impact, which includes the effect of general inflation, ^{2/} is more substantial. From mid-1972 to mid-1974 the production costs of polypropylene cloth for bags and carpet backing are estimated to have risen by about 18 percent in the United States and by 32-33 percent in Western Europe. Similarly, the costs of polypropylene harvest twine are estimated to have gone up by 25 percent in the United States and 52 percent in Western Europe. ^{3/}

^{1/} Even when, as it is the case in the United States, production of polypropylene textile products is largely in the hands of subsidiaries of large petrochemical companies, intercompany charges for the resin should reflect its opportunity cost (or market price).

^{2/} In theory, one should differentiate between trend inflation rates and the higher rates induced by the changes in oil prices. The distinction, however, would be extremely difficult. To simplify the task, the entire change in inflation rates between 1973 and 1974 is here treated as one of the indirect effects of the oil crisis.

^{3/} The increase in the manufacturing costs of polypropylene harvest twine is much larger than in the case of cloth for bags and carpet backing since in twine-making the resin accounts for a much greater share of the total production costs.

Table 5: UNITED STATES AND WESTERN EUROPE: ESTIMATED DIRECT AND INDIRECT IMPACT OF CHANGE IN CRUDE OIL PRICES ON THE PRODUCTION COSTS OF POLYPROPYLENE RESIN AND PRODUCTS COMPETING WITH JUTE AND HARD FIBERS, END-1972 TO MID-1974 AND MID-1974 TO 1980

Unit	Production Costs (end-1972)		Production Costs (mid-1974)				Production Costs (1980)	
			Direct Impact /a	% increase (end 1972-mid 1974)	Total Impact /b	% increase (end 1972-mid 1974)	Total Impact /b	% increase (mid 1974-1980)
United States (current \$/£ terms)								
PP Resin	ct/lb.	13.5	16.5	(22.2)	17.1	(26.7)	28.0	(63.7)
PP Carpet Backing /1	ct/sq. yd.	12.7	13.5	(6.3)	15.0	(18.1)	20.5	(36.7)
PP Cloth for Bags /2	ct/sq. yd.	10.0	10.6	(6.0)	11.8	(18.0)	16.0	(35.6)
PP Harvest Twine	ct/lb.	30.0	34.0	(13.3)	37.5	(25.0)	54.5	(45.3)
Western Europe (UK Basis)								
PP Resin	p/lb.	6.1	9.4	(54.1)	9.8	(60.7)	13.0	(32.7)
PP Carpet Backing /1	p/sq. yd.	5.4	6.3	(16.7)	7.2	(33.3)	9.3	(29.2)
PP Cloth for Bags /2	p/sq. yd.	4.4	5.0	(13.6)	5.8	(31.8)	7.4	(27.7)
PP Harvest Twine	p/lb.	12.00	15.8	(31.7)	18.2	(51.7)	24.5	(34.6)

/a Estimated increase in the production costs of PP resin considering only the change in feedstocks and utilities costs and the corresponding increase in production costs of finished products caused only by the change in PP resin costs.

/b Estimated total increase in the production costs of PP resin - including inflation - and of the corresponding total increase in production costs of finished products based on the change in market prices of PP resin and including inflation. (From end-1972 to mid-1974 PP resin prices increased by 31.0% in the United States - from 16.0 to 21.0 ct/lb. and by 75.0% in the UK - from 7.25 to 12.7 p/lb. Between 1974 and 1980 PP resin prices are expected to increase by 69% in the United States - from 21.0 to 35.5 ct/lb. and by 30% in the UK - from 12.7 to 16.5 p/lb.)

/1 PP woven primary carpet backing cloth equivalent to jute backing 150/9 oz.

/2 PP woven cloth equivalent to jute hessian 40/10 oz.

Sources: IBRD, The Future for Hard Fibers and Competition from Synthetics, Working Paper No. 156, June 1973; IBRD, Jute and the Synthetics, Working Paper No. 171, January, 1974; Trade and Industry sources (interview data).

F. The Oil Crisis and the Short-Term Changes in the Prices of Jute and Sisal Fibers and Products in Relation to Polypropylene Resin and Products

34. At the time of the oil crisis commodity prices were already on the rise. World production and income grew at an exceptionally high rate in 1972-73. The rapid demand growth placed heavy pressure on the supply of a number of commodities. Exchange rate uncertainties, high rates of inflation in industrial countries and some commodity speculation also contributed to push up primary commodity prices during 1973.

35. Sisal and jute fiber prices showed a sharply different behavior during 1973. While jute prices remained stable throughout the year, sisal prices moved sharply upward and reached peak levels in December, 1973. 1/ Sisal prices continued to rise in early 1974 and have since remained fairly stable around the new peak levels of February 1974. Jute prices, on the contrary, after a moderate increase in the first quarter of 1974 began to move up in the second quarter and continued to rise in the third quarter of the year (see Table 6). The reported sharp fall in jute acreage in Bangladesh gave rise to uncertainties about total export availabilities during the 1974-75 jute season which were reflected in the upward movement of fiber prices. The recent floods in Bangladesh, moreover, have compounded the existing uncertainties about world jute supplies in 1974-75 and contributed to the hardening of jute market prices.

36. At the finished product stage, jute hessian prices went up sharply from January to May 1974, largely as a consequence of mill strikes in Calcutta which severely curtailed output at a time of relatively strong demand. After the strike settlement, electric power cuts limited severely the expected production recovery of the Calcutta mills. The shortage of finished products - compounded by speculative activities in the market - sent jute hessian prices up by over 45 percent during the first six months of 1974 (see Table 6). Carpet backing prices also increased by about 35 percent during the first nine months of 1974. 2/ Prices of sisal products are more difficult to monitor than those of jute. In the United States, however, sisal baler twine prices were reported to have trebled between June 1973 and June 1974, while from April 1973 to April 1974 the price of sisal twine also increased by about 42 percent in the United Kingdom.

1/ Persistent droughts in key producing countries - particularly in East Africa - kept sisal in short supply for three consecutive years: from 1971 to 1973. Prices began to rise in 1972 and continued to climb during 1973. By December 1973 c.i.f. prices of East African UG grade sisal had reached £362.5 per ton, as compared with an average of £70 per ton in 1971.

2/ The government of India sharply increased the export duty on hessian and carpet backing following the sudden rise of jute cloths prices.

Table 6: UNITED KINGDOM AND UNITED STATES: RECENT TRENDS IN THE PRICES OF RAW JUTE, SISAL AND MANUFACTURES
RELATIVE TO THOSE OF POLYPROPYLENE RESIN AND MANUFACTURES, 1973-74

	1973, Quarterly Averages				1974, Quarterly Averages				ANNUAL AVERAGES	
	1st quarter	2nd quarter	3rd quarter	4th quarter	1st quarter	2nd quarter	3rd quarter	4th quarter (projected)	1973 actual	1974 projected
UNITED KINGDOM										
Sisal Fiber, E.A. UG, c.i.f. UK.	100.0	110.0	138.3	174.0	253.2	262.3	264.9	264.9	100.0	200.3
Jute Fiber, BWD, c.i.f. UK.	100.0	100.5	99.6	101.7	103.6	113.5	124.7	133.3	100.0	118.2
PP Resin, delivered	100.0	100.0	100.0	100.0	140.6	175.0	175.0	181.3	100.0	168.0
Jute Hessian, 40/10 oz. c.i.f. UK	100.0	100.8	94.0	101.2	127.6	149.0	137.4	130.5	100.0	137.6
PP Cloth equivalent, ex-UK, delivered	100.0	100.1	102.0	102.9	113.1	114.3	116.2	120.0	100.0	114.6
Jute Carpet Backing, 9 oz./36, ex-UK	100.0	98.2	n.a.	103.0	109.9	n.a.	139.7	154.4	100.0	134.1
PP Carpet Backing, 2.83/36, ex-UK	100.0	96.6	103.4	104.5	110.3	114.5	131.0	135.2	100.0	119.6
UNITED STATES										
Jute Hessian, 40/10 oz., spot New York	100.0	104.8	101.6	102.1	127.5	156.1	142.8	137.6	100.0	138.1
PP Cloth equivalent, ex USA, delivered	100.0	100.0	100.0	100.0	100.0	108.0	108.0	108.0	100.0	106.0
Jute Carpet Backing, 9 oz./36, c.i.f. USA	100.0	95.7	100.0	102.3	98.7	104.2	134.0	124.3	100.0	115.9
PP Carpet Backing, 3.5 oz./36, delivered	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: World Fibers News, London (weekly)
Fiber Market News, New York (triweekly)
Trade and Industry Sources (Interview Data)

37. Unlike jute and sisal, polypropylene manufactures prices increased only moderately in 1974. Part or the whole increment in production costs was absorbed by manufacturers. This is particularly evident in the United States where woven polypropylene primary carpet backing is still being sold at 18 ¢/sq. yd. - the same price which prevailed in 1972 and 1973, and the price of cloth for bags increased by only 8 percent in the second quarter of 1974. Polypropylene textile manufacturers had large profit margins which helped to cushion the short-term impact of the increase in input costs. In carpet backing, moreover, long-term contracts bound some of the large manufacturers to existing prices. Excess capacity in the polyback industry also contributed to keep prices down. In the United Kingdom woven polypropylene carpet backing prices increased by about 25 percent in the first three quarters of 1974, while cloth for bags only went up by some 13 percent.

38. Comparison between projected 1974 and actual 1973 prices clearly shows that while the price position of jute fiber is likely to improve in relation to polypropylene resin, the relative price position of jute products has worsened in both the United States and Western Europe (see Table 6). The consequences of the worsening of the competitive position of jute products will be extremely serious in the United States where the slowdown in economic activity is badly hurting carpet production and sales, thereby reducing the total amount of backing needed by the carpet industry.

39. The competitive position of sisal will certainly worsen in 1974 at both the fiber and the finished product stage. The consequences of the dramatic reversal in the relative price position of sisal fiber are ominous. The ratio between sisal fiber and polypropylene resin prices in Western Europe changed from 0.61 in 1972 to 1.36 in 1973 and it is expected to be 1.65 in 1974. To be competitive with polypropylene resin in the critical harvest twine market, the ratio of sisal to polypropylene resin price should be around .45.

40. The analysis of the 1974 price behavior of jute, sisal and their manufactures in relation to polypropylene resin and products prices clearly shows that despite the oil crisis and the increase in the costs and prices of synthetic products the overall competitive position of jute and hard fibers has worsened in the short-term. The short-term price inelasticities of some market demands - e.g. sisal harvest twine - might contribute to cushion the effect of the change in relative prices which occurred in 1974 on the overall demand for the natural products. Some local and temporary shortages of polypropylene resin - e.g. in the Far East, Africa and Latin America - might also help to offset some of the market losses incurred by jute and sisal in Western Europe and the United States. The fact remains, however, that in most developed consuming countries natural fibers have not only missed a unique opportunity to halt the market penetration of synthetic products, but have instead added impetus to it.

G. The Future Prices of Polypropylene Resin and Products

41. After ten years of steady decline, polypropylene resin prices were forced to turn sharply upward by the oil crisis. Barring temporary imbalances in the demand-supply situation, polypropylene resin prices can only be expected to continue to increase during the rest of the decade.

42. In the short run, prices are influenced by the utilization-capacity situation in the producing countries. Projections of capacity and utilization rates can be worked out with a sufficient degree of precision only over a relatively short period of time. Projections of capacity and utilization growth for 1974 and 1976 are summarized in Table 7. In 1974 polypropylene will be in short supply in the United States. Production of resin increased by 36 percent in 1972 and by another 25.5 percent in 1973. The industry worked at almost full capacity in 1973 and additional capacity coming on stream this year will allow for about 10 percent production growth. Not much relief is expected in 1975 and 1976 when capacity will be around 1.26 million tons, an increase of 17 percent above projected 1974 levels and the utilization to capacity ratio will still be close to .99. Industry projections to 1978 indicate that polypropylene production capacity may actually fall short of total demand, even on the assumption of a demand growth rate far below the historical trend.

43. Polypropylene demand in Western Europe seems to be now in better balance with production capacity than in the past. The projected 1974 utilization to capacity ratio is .80 as compared to .75 in 1970. The polypropylene demand-supply balance is likely to remain unchanged until 1976 and possibly 1977. Capacity-utilization estimates, however, are more tentative in Western Europe than in the United States, since in Western Europe many plants can produce either polypropylene or high density polyethylene. The longer term outlook for polypropylene in Western Europe is also more uncertain than in the United States. If total reported capacity is reasonably accurate and if announced new capacity is in fact installed, a situation of considerable excess supply could develop in the late 1970's.

44. In Japan, finally, some over-capacity seems likely to persist until 1974-75. Yet, after a period of seemingly unlimited capacity expansion which persisted until the early 1970's, when polypropylene manufacturers were sometimes forced to sell their resin at prices which barely covered variable costs, the industry has taken steps to control expansion and a better balance between production capacity and demand is likely to be achieved by 1976.

45. In the longer run - by the end of the 1970's for example - actual polypropylene resin prices can be expected to be around \$780 per ton in

By 1977, however, it is to be expected that the shift to heavier feedstocks - naphtha or gas oil - together with the increase in the cost of natural gas will make propylene considerably more expensive to produce. Industry projections of propylene prices point to a 1977 level of about 9 cents per pound, only 1-2 cents per pound below the prices which are by then expected to be prevailing in Western Europe. In the late 1970's propylene prices are forecast to move up in direct relationship to crude oil costs and to be by 1980 around 15.0 cents per pound. (See Table 4).

49. On the basis of 1980 crude oil prices at \$15 to \$16 per barrel and propylene costs at 13 to 15 cents per pound in most developed producing countries, production costs of polypropylene resin - estimated in 1972 at 13.5 cents per pound in the United States and 14.5 US cents per pound in Western Europe - would increase by the end of the 1970's to 23-25 US cents per pound. Other factors operating on the supply side are likely to reinforce this trend. The capital costs of the new polypropylene plant necessary to meet the growing demand will probably increase by as much as 45 to 55 percent, which would translate into another 2.0 to 2.5 US cents per pound rise in the costs of polypropylene resin. Operating costs are as well likely to rise mainly on account of increasing utilities and to a lesser extent of labor costs.

50. Taking into account the possible impact of technological improvements on the production costs of polypropylene resin - particularly with regard to the next generation of crackers which will come on stream in the late 1970's - it is possible to forecast 1980 polypropylene total manufacturing costs at about 28 cents per pound in the United States and 31 US cents per pound in Western Europe. These forecasts imply that between 1974 and 1980 the production costs of the resin will increase by 64 percent in the United States and by 33 percent in Western Europe (see Table 5). ^{1/} Polypropylene resin prices may therefore be expected to be in 1980 at about 35 cents per pound in the United States and 39 US cents per pound in Western Europe. The 1974 to 1980 time path of polypropylene resin prices, however, is likely to be quite different in the two major consuming areas. While in the United States prices will probably inch upward throughout the rest of the 1970's, it is to be expected that polypropylene resin prices will peak in Europe around 1976-77 and remain relatively constant throughout the remainder of the decade. Considerable excess capacity is forecast to develop in Western Europe in the second half of the seventies and resin prices could even decline marginally below the expected 1976-77 peak.

^{1/} The comparatively larger increase in US polypropylene resin costs between 1974 and 1980 reflects the expectation that feedstock prices in the United States will increase more rapidly than in Western Europe, where 1974 feedstock prices already reflect the full impact of the quadrupling of crude oil prices.

51. On the basis of the forecast 1980 prices of polypropylene resin and taking into account the likely increase in other input costs, the 1980 cost structure of polypropylene products competing with jute and hard fibers is arrived at in Table 5. With respect to 1974, production costs of polypropylene cloth for bags are expected to increase by 36 percent in the United States and 28 percent in Western Europe. Polypropylene carpet backing cloth and harvest twine are projected to go up respectively by 37 and 45 percent in the United States and 29 and 35 percent in Western Europe. Technology for conversion of resin to final products, however, varies from mature technology - in the case of primary woven carpet backing cloth - to rapidly emerging new techniques - in the case of woven and non-woven secondary carpet backings and harvest twine. The impact of technological change on the conversion costs of some of the polypropylene textile products is, therefore, difficult to predict. Particularly in the case of harvest twine, the estimates of 1980 production costs are subject to a relatively wide margin of error.

52. The future market prices of polypropylene textile products are difficult to forecast. Existing production capacities are only known approximately and expansion plans of individual producers are well guarded secrets. It is clear, however, that the large profit margins that producers enjoyed in mid-1973 were to a large extent nullified by the necessity to absorb part of the cost increases brought about by the oil crisis. Future cost increases will have to be directly passed on to consumers. By adding on to current prices the forecast increase in production costs it is therefore possible to arrive at a conservative estimate of future prices of polypropylene textiles competing with jute and hard fibers. The variance between these minimum prices and actual market prices will largely be a function of jute and hard fiber product prices.

H. The Present and Future Ceiling Prices on Jute, Sisal and Their Manufactures

53. The forecast minimum prices of polypropylene products can be taken as the ceiling for jute and hard fiber products. To be competitive with polypropylene, jute and hard fiber product prices will have to remain below the forecast minimum price of polypropylene products. In the United States, jute hessian prices are currently 48 to 78 percent above competing polypropylene cloth prices. 1/ Jute primary carpet backing is priced about 39 percent higher than woven polypropylene primary backing, while jute secondary carpet backing prices are only 8.9 percent above those of polypropylene woven secondary backing. 2/ In the short-term jute fabric prices

1/ Jute 40/7 oz. hessian is being sold at 19.1 ¢/sq. yd., and 40/10 oz. at 24.0 ¢/sq. yd. Polypropylene cloth equivalent to jute 40/7 oz. is selling at 12.9 ¢/sq. yd., while the equivalent of jute 40/10 oz. sells at 13.5 ¢/sq. yd.

2/ Jute primary backing is currently sold at 25.0 ¢/sq. yd. and secondary backing at 20.7 ¢/sq. yd. Polypropylene woven primary backing sells at 18.0 ¢/sq. yd., while woven secondary backing is being sold at 19.0 ¢/sq. yd.

need to come down drastically from present levels if a minimum of price competitiveness with polypropylene products is to be achieved. Competitive prices for jute products in 1980 could be roughly as follows: hessian 40/10 oz. at 19 ¢/sq. yd., hessian 40/7 oz. at 17.5 ¢/sq. yd., primary carpet backing at 25 ¢/sq. yd., and secondary carpet backing at 24.0 ¢/sq. yd.

54. In Western Europe, the future of jute will largely depend on the price for the raw fiber. At £ 155-160 per ton, c.i.f. jute could compete successfully with polypropylene in backing yarn for woven carpets. Current prices are about 10% higher than the estimated competitive level. In 1980 raw jute could remain competitive in this crucial end-use at about £210-220 per ton. Liberalization of imports of jute manufactures into Western Europe could considerably enhance their competitiveness vis-a-vis polypropylene. This applies mainly to jute secondary carpet backing and light hessians.

55. Current sisal prices are completely uncompetitive with polypropylene. E.A. UG grade sisal is now selling at about £450 per ton in Western Europe. A competitive price would have to be in the neighborhood of £145 per ton. To be competitive with polypropylene in the key market for harvest twine, 1980 sisal prices would have to be around £ 190 per ton. In the United States, imported sisal harvest twine should be selling now at about \$13.5 per bale, instead of \$27 per bale. In 1980, a competitive price level for sisal harvest twine is likely to be around \$19 per bale.

I. Some of the Implications for Hard Fibers and Jute Producers

56. The picture which emerges from the analysis of past and current trends in the process of competition between jute, hard fibers and polypropylene is quite discouraging. The competitive position of natural fibers has deteriorated steadily since the beginning of the 1970's. The oil crisis has not resulted in any improvement in the short-term competitive position of jute and hard fibers. On the contrary, sisal fiber as well as jute and sisal manufactures will be in 1974 less price competitive with polypropylene than in 1973. Only the position of jute fiber has marginally improved in 1974. Even these modest gains, however, are likely to be to a large extent nullified by the expected rise in jute prices in the second half of 1974 and first half of 1975.

57. Even though a discussion of policy alternatives to cope with the present situation is outside the scope of this note, 1/ it is immediately clear that corrective measures - particularly with regard to prices - are badly needed to redress the current imbalance. Relative prices are the single most important element upon which the competition between hard

1/ A more complete discussion of the policy issues facing hard fiber and jute producers can be found in IBRD, The Future of Hard Fibers and Competition from Synthetics, Working Paper 156, June 1973, pp. 44-52 and IBRD, Jute and the Synthetics, Working Paper 171, January 1974, pp. 29-38.

fibers, jute and polypropylene is based. It is on prices that jute and sisal producers will have to make a maximum effort in the short term to achieve some price competitiveness with polypropylene. The penalty for failing to recognize the precariousness of the market position of these fibers could be their rapid disappearance as a source of employment, income and foreign exchange for producing countries.

58. In the short-term a policy aimed at minimizing market losses is the only feasible one for jute and hard fibers producers. In the medium term, aside from low prices, the next most important issue is price stability. Erratic price fluctuations, particularly evident in the case of jute cloth, are extremely distasteful to the end-users, since they introduce a further element of uncertainty in their production and sales plans. A new pricing system will have to be devised by exporters. The possibility of offering long-term contracts should be carefully studied. However, apart from improvement in the marketing mechanism, price stability depends largely on product availability. A better supply management is clearly needed for both jute and hard fibers. In the case of jute, annual crop variations depend to a large extent on the internal prices of the fiber relative to those of competing crops. Policy actions to avoid sudden deteriorations in the relative prices of jute are integral part of the supply management effort which is necessary to smooth out annual variation in the crop. In the case of sisal, greater efforts at both the national and the international level, should be directed at smoothing the 10-11 year price cycle. Better production planning and the setting up of a fiber reserve scheme seem to be the appropriate steps that producers could take to cope with the problem.

59. In the long term, productivity must be increased at both the farm and the mill level. The discouraging historical performance of jute yields clearly points to the necessity of concentrating efforts in this direction. Product development should also be an integral part of a long-term strategy for jute and hard fibers. The traditional end-markets for these fibers face either poor growth prospects - e.g. sacks, bags and cordage - or are being heavily penetrated by synthetics - e.g. carpet backing. Some markets - sacks, bags and harvest twine - are both shrinking in total size under the impact of technological innovations and changes in consumer preferences and being penetrated by synthetics. The future of jute and hard fibers can no longer remain anchored to the growth of traditional end-uses. The need for a massive research and development effort is almost self-evident. Producers must take on this crucial task. With the development of suitable synthetic substitutes for jute and hard fibers, processors in developed countries no longer have the incentive to strive for the development of the natural fibers.

60. Polypropylene resin and product prices after years of decline are now expected to increase substantially during the 1970's. Provided that a maximum effort is made by jute and hard fibers' producers to increase supplies and to bring and keep prices to competitive levels, these natural fibers can minimize their market losses during the present crucial decade. Improvements in productivity and product development can lay the foundation for a renewed period of growth for the world jute and hard fiber economies in the next decade.

Prepared by: Enzo R. Grilli