# AN ABSTRACT OF THE THESIS OF

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Title _____ ECONOMIC ANALYSIS OF JUTE _____

Abstract approved **Redacted for privacy**
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Jute is one of the four international commodities which experience wide price fluctuations. Instability of price in jute and jute products creates serious problems for both producers and consumers. Fluctuation in the price of jute will affect the income received by jute growers, and also will affect the overall economy, especially in those countries where the jute industry is of major importance.

The specific objectives of this study were: (1) to determine the factors affecting supply and demand for jute, (2) to evaluate the factors influencing the price of jute, and (3) to consider the feasibility of jute production in Thailand.

Prior to the Korean War the supply of jute came largely from Pakistan and India. The high prices prevailing during and after the war stimulated the expansion of jute and allied fibers production in several parts of the world. Such expansion resulted for two important

reasons: (1) a desire to reduce the imports of jute for domestic consumption, and (2) a desire to participate in the export market at the prevailing high prices.

The two most important factors influencing the area of jute production in the current year are the price of jute and alternative crop possibilities in the previous year. About 75 percent of the change in area of jute production in Pakistan is explained by these two variables. The average price elasticity of supply was .30.

Demand for jute has changed during the past decade. When considering different regions, the analysis showed a relative decline in jute consumption in Europe, North America and other industrial countries. This trend in jute consumption has increased significantly in several predominantly agricultural regions, especially in the Far East.

The important factors influencing jute consumption are the price of jute and competing products. When considering the pattern of demand in each outlet of consumption, it was found that changes in technology, patterns of consumption and consumers preferences have tremendously affected the demand for jute. Demand for jute in packaging was affected by the development of the bulk handling system in transportation, pre-packaging of consumer goods and competition from substitute materials. Demand for jute in floor covering production was affected by changes in the pattern of carpet consumption, as

well as the uses of man-made fiber. The average price elasticities of demand for jute in packaging were -.80 and -.22 for total jute consumption.

Fluctuations in the price of jute stemmed from inelasticities of demand and supply. Under these circumstances changes in demand or supply will have a significant effect on price. Nearly 80 percent of the variation in the price of jute received by jute growers in Pakistan is explained by variations in the export price, and this figure is increased to 89 percent when the variation in jute supply in Pakistan and India is included as the second variable. The coefficient of correlation is even higher when national income is considered as another independent variable.

Characteristics of demand and supply for jute indicate that one possible way to reduce the variation in the price of jute is to maintain more stability in both demand and supply. Such stability, however, is not easy to obtain without cooperation from all countries involved. The programs need to be operated at both national and international levels.

With respect to the production of jute in Thailand, several factors should be considered. The opportunity to increase jute production depends on the price of jute received by jute growers, which in turn depends on the world market. Relatively high world jute prices will stimulate jute production in Thailand.

ECONOMIC ANALYSIS OF JUTE

by

SOPIN TONGPAN

A THESIS
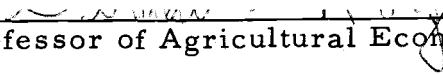
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the requirements for the
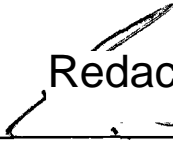degree of

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CHAPTER I

INTRODUCTION

## The Problem

Jute has not occupied an eminent place in the economy of

Thailand until very recently when jute production as well as

prices increased very significantly.  Changes occurred in area,

production, value of export, and also the price of raw jute.  The

area of jute planted has risen from 295 thousand rais[1]/ in 1959

to 1,786 in 1961.  During the same period, jute production in-

creased from 54 thousand metric tons in 1959 to nearly 351

thousand metric tons in 1961, or nearly 650 percent within three

years.  The value of jute export jumped from 88 million baht[2]/

in 1959 to 626 million baht in 1961; from an insignificant position

in foreign exchange earnings to third in 1961, following rice and

rubber.  The price of raw jute within the country increased ab-

ruptly from 2.24 baht per kilogram in 1959 to 3.17 baht in 1960

[1]/  Rai is a unit of land area.  One rai is equal to 0.395 acres or
0.16 hectares.

[2]/  Baht is the Thai monetary unit.  About 21 baht are equal to
one dollar.

and 3.61 baht in 1961. If the situation of increasing production, export, and prices exist for a long time, it should improve the well-being of the growers and also the economy of the country. On the other hand, no one could predict that the price of raw jute in 1962 would suddenly drop to 2.13 baht per kilogram and that the area of jute production would decline to one-half the previous year. [1] Undoubtedly, both production and export will show a tremendous decline. These changes will adversely affect the overall economy of the country. It will affect both foreign exchange and the people who are involved in the production and the marketing of jute.

Jute production also plays an important role in the economies of other jute producing countries, namely Pakistan and India. Pakistan is the largest producer of raw jute. Jute constitutes the chief crop of that country. The export of raw jute and jute products is the largest source of foreign exchange, accounting for about 45 percent annually. India is the largest jute manufacturing country and also produces a considerable amount of raw jute. Jute is very important in India, since it accounts for

[1] From preliminary survey by Department of Agricultural Economics, Kasetsart University.

more than 20 percent of foreign exchange earnings. Jute is now

playing an important role in several other countries such as Brazil,

Taiwan, Burma and Nepal. With respect to these countries, fluc-

tuations in jute production and price will adversely affect their eco-

nomies.

During the last decade the price of jute and jute production

have fluctuated widely in Pakistan, India and other jute producing

countries. An investigation of price fluctuations of twelve important

agricultural products in the world market reveals that only rubber,

cocoa and tea prices fluctuated more severely than prices of jute

(22, p. 17). This means jute is one of the four products whose

prices exhibit a high degree of instability. Changes in the price of

jute not only create serious economic problems to jute growers and

to the economy of the country, but also problems in growth of pro-

duction. It is not easy for the government to set up a policy for in-

creasing jute production and establishing price programs when the

production of jute itself frequently fluctuates. With regard to new

jute producing countries, especially Thailand, the government is

trying to encourage jute production with a view towards increasing

income to jute growers as well as giving rise to an additional source

of foreign exchange. The instability of jute production, therefore,

would create problems for the government and other groups

involved in this industry. The program set up by government for improving production, pricing arrangements, jute manufacturing, or any program in the long run would be largely unfulfilled. In addition, incomes of jute growers, as well as of the nation, will fluctuate from year to year.

Most of the jute produced in Thailand is exported, and only small quantities are consumed within the country. Thus the jute industry in this country is linked entirely with the world market. Changes in any action dealing with jute supply and demand will inevitably affect the jute industry in Thailand. Any programs for encouraging production or improving prices would not be possible without considering the movements of jute in the world market. Establishing long run programs based on the favorable events of the last few years would inevitably fail. The failure in any program, especially crop production, would discourage the growers from investing their resources in future production and will undoubtedly affect the success of other programs. Unsuccessful programs in the past have provided lessons that can be used in planning future programs.

An attempt to study the causes of instability of jute will furnish a valuable tool to many people involved in jute industries, particularly Thailand. The study of supply and demand should

provide an adequate background in considering price fluctuation.
Therefore, the factors affecting supply and demand will be examined in detail in this study. The factors influencing prices will be considered. A brief digression on the prospects of supply and demand will provide basic information on the market of jute in the future. It is hoped that this study will provide a broad knowledge about the jute industry which will be of benefit to many people, especially those in Thailand.

## Purposes of Study

(1) To determine the factors affecting supply and demand for jute in the world market.

(2) To evaluate the factors influencing the price of jute.

(3) To consider the feasibility of jute production in Thailand.

## Scope and Limitations

The term jute belongs to the botanical family tiliaceae and genus chorhorus. The exact number of species is at the present time unknown. To date, 97 species have been listed. Only two species yield a commercial fiber, Corchorus capsularis (white or desi) and Corchorus olitorious (tossa or boggi). These two species

are largely confined to Pakistan and India and some adjacent areas.

Jute requires a deep fine soil and a warm wet climate for planting.

Another prerequisite of jute production is sufficient water for

retting the plant. Jute production largely depends on weather con-

ditions. Too much rain is harmful and damage will occur if a

drought is prolonged. Jute is, therefore, a sensitive crop, re-

quiring exact seasonal requirements (2, p. 3884; 21, p. 132; 24,

p. 8-9).

In the past, a large number of varieties of fiber plants

have been produced in many countries, in an effort to achieve in-

dependence from India and Pakistan jute supplies. Today only

three plants can be regarded as effective alternatives, namely,

Hibiscus cannabinus, Hibiscus sabdariffa, and Urena lobata.

The most important is Hibiscus cannabinus. This variety is gen-

erally known as "kenaf," which has been grown in different parts

of the world under such names as kenaf in Cuba, "mesta" or

"bibli" jute in India and Pakistan, "til" in Egypt, "da" in West

Africa, "stockroos" in South Africa, and "Cuban kenaf" in

Thailand. [1] Hibiscus sabdariffa differs from Hibiscus cannabinus

and is largely grown in Malaya and Ceylon. The main production

---

[1] Kenaf grown in Northeast Thailand is mostly so-called Chinese
Kenaf (Hibiscus pungens L. )

areas of Urena lobata are Madagascar, Brazil where it is known

as guaxima and the Congo, where it is known as paka. Of these

three varieties, kenaf is the most important both in production

and trade. Kenaf can be grown under less exacting conditions, such

as relatively dry climate and also it is not particularly sensitive to

soil types. Therefore, kenaf can be grown in many countries where

weather and physical conditions are not suitable for jute (3, p. 3893-

3899; 9, p. 1; 23, p. 363).

With respect to the fibers from jute and kenaf, it was found

that the good quality kenaf from some areas was better than jute.

First class quality can be used as a substitute for jute. The lower

grades of kenaf can be used by mixing them in various proportion

with jute depending on the quality of fibers and the quality desired

of the end products (7, p. 364).

The terms jute and kenaf are often referred to incorrectly.

Sometimes they are used together in production and trade under

the name of jute or jute and allied fibers. Some sources of infor-

mation use them separately. Confusion appears in different coun-

tries as well as different stages in the marketing system of a par-

ticular country. This confusion is compounded when different

words are employed. For convenience and to avoid confusion,

jute only will be used in this study. In some cases the term jute

and allied fibers will be used in the place of "jute." The reader

should keep in mind that when reference is made to production in

Pakistan, India and Nepal, it will usually mean jute. However,

other countries, especially Thailand, produces allied fibers of

which the most important is kenaf.

This study deals largely with supply, demand and prices.

Each of these areas was examined briefly without using detailed

analysis. A number of factors were determined in order to pre-

sent the background necessary in considering the trends of supply

and demand for jute. Specific problems in such areas as the me-

thod of production, cost analysis, jute manufacturing and trading

were excluded from this study. Factors affecting supply, demand

and prices will be emphasized. Production and price analyses that

do appear in this study are limited to raw jute only.

In the last chapter, which is devoted to considering jute

production in Thailand, many topics were omitted; the main fac-

tors which will be significant in determining jute production in the

future have been briefly surveyed. Details concerning production

and marketing systems were entirely neglected.

The most significant limitation of this study is the area of

study which involved only a few countries. As the result of limita-

tions of time and availability of information, the study covered

only the most important countries in considering supply and demand

as well as prices.

CHAPTER II

THE SUPPLY OF JUTE

At this juncture a brief survey of world supply of jute is necessary. This survey not only gives some indication of the trend of jute production, but also can give some basic ideas with regard to demand and price analysis.

A study of the present jute supply also gives background in considering the supply of jute in the future. Changes in the pattern of world jute supply also will affect the demand for jute or vice-versa. The purposes of this chapter are to briefly describe the changes in jute supply which have occurred in the past and analyze the factors affecting jute supply.

Jute Production

On the Indian-sub-continent, the jute plant has been grown from time immemorial as a source of textile fiber. After the first export of raw jute in the latter part of the eighteenth century to England, the amount of export gradually increased. After the

Industrial Revolution the amount of export increased as successes

were achieved in the mechanical production of yarn in the mid-

nineteenth century. In 1855, spinning machines had been imported

to India. After that time, steady progress was made as raw jute

supplies increased and new world markets were opened. The ex-

panding supply of raw jute coupled with the increasing demand for

jute products helped establish India as the largest manufacturer of

jute in the world (15, p. 1-22).

Prior to the partition of India, the production of jute was an

Indian monopoly as practically the whole of the world crop was then

grown in united India. Nearly 98 percent of the raw jute supply in

the world came from India. The dominant share of jute came from

the eastern region of Bengal which normally produced more than

four-fifths of the total Indian output. After the partition of India

in 1947, the position of jute supply was changed. East Bengal, the

most important jute producing area, was awarded to Pakistan (4,

p. 3881; 20, p. 132). After losing this raw jute area to Pakistan,

India which required the bulk of raw jute for jute industry was

forced to increase production of raw jute in order to reduce im-

ports from other countries. However, this increased output was

not sufficient because most of the fertile land was used for produc-

tion of food crops. As a result, a large part of raw jute

consumption in India was obtained by import, largely from Pakistan, the world's largest supplier.

Before World War II, India and other countries produced raw jute in sufficient quantities to meet world demand. At the end of the war scarcity and high prices for jute stimulated an expansion of jute production in the consuming countries all over the world. Such expansion resulted from two important reasons; (1) to reduce the import of raw jute and jute products and (2) to try to export at relatively high prices. In some areas where jute production was not economical, the development of production of allied fibers was stimulated.

The scarcity of jute and high prices occurred again during and after Korean War. This made for a great expansion for jute and allied fibers in many other countries. Attempts to increase production stemmed not only from the fluctuation of prices of jute products, but also the desire to be self-sufficient in jute product consumption, mostly jute bags.

During the last ten years, jute and allied fibers were produced in a number of countries. The most important among these are Pakistan, India, Thailand, Mainland China, Brazil and Taiwan. Other countries are Nepal, Congo, Burma, South Vietnam, Spain, United Arab Republic, and South Aftrica. The relative position of

the shares in world jute supply has changed during the last decade.

Table 1 shows the share each jute producing country has of total production. Pakistan is somewhat less significant in jute supply now, compared with 1951-1953. It produced nearly 50 percent of total raw jute during 1951 to 1953 but declined to 37 percent in 1961-1962. India showed a slight gain in position during the last

Table 1. Shares of selected countries in world jute production and allied fibers, average 1951-53, 1954-57, 1958-60 and 1961-62 (Appendix Table 1).

| Country | 1951-53 Average | 1954-57 Average | 1958-60 Average | 1961-62[1] Average |
|---|---|---|---|---|
| | ------- Percent of world production --------- | | | |
| Pakistan | 49.0 | 42.0 | 39.0 | 37.0 |
| India | 36.0 | 41.0 | 38.0 | 38.0 |
| Mainland China | 9.0 | 10.0 | 12.0 | 11.0 |
| Thailand | 0.4 | 1.0 | 2.0 | 4.0 |
| Brazil | 1.0 | 2.0 | 2.0 | 2.0 |
| Taiwan | 0.4 | 1.0 | 1.0 | 0.4 |
| Other countries | 4.2 | 3.0 | 6.0 | 7.6 |
| Total world production | 100.0 | 100.0 | 100.0 | 100.0 |

[1] Preliminary

four years when compared with the period of 1951 to 1953. All

other countries have gradually increased their relative importance

in production.

Allied fibers have shown a tremendous increase in some

countries, namely Thailand. Allied fibers increased from ten

thousand metric tons in 1955-56 to 140 thousand metric tons in

1961-62. Brazil increased its production from 40 thousand metric

tons to 60 thousand metric tons during the same period. Jute pro-

duction has shown some increase in Nepal, Taiwan and Mainland

China. The rapid increase in jute production and allied fibers

can be seen in the Far East where total production rose from two

million metric tons in 1955-56 to nearly three million metric tons

in 1961-62. Considering the overall jute production in the world,

there has been an increase from 2.4 million metric tons in 1955-

56 to 3.45 million metric tons in 1961-62. This is shown in Figure

1 and Appendix Table 1.

The important reasons for increases in production have

been partly due to the improvement in yield and largely due to the

expansion in acreage. The outstanding expansion in jute acreage

can be seen in Taiwan and Brazil. The acreage of allied fiber has

increased in Thailand from 8.3 thousand hectares in 1955-56 to

139 thousand hectares in 1960-61. In India there has been only a

Million metric tons
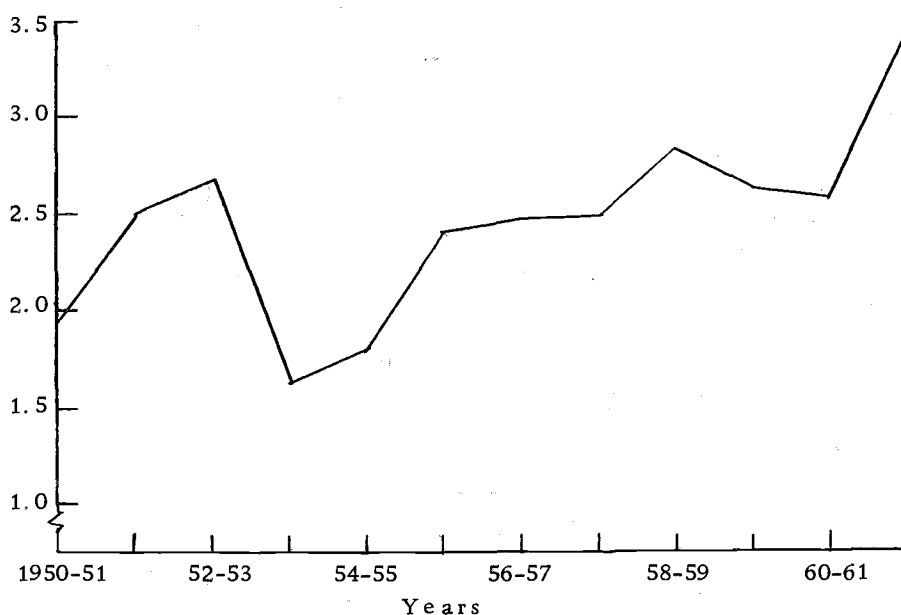


Figure 1. Jute and allied fiber production in the world, 1950-51
to 1961-62. [1]

[1] Provisional
Source: (41, p. 7).

slight increase in acreage (Appendix Table 2).

When considering the yield of jute in different countries,
there has been little evidence of any upward or downward trend.
Even though some slight yield increases are evident in some coun-
tries, the trends are not significant enough to have much impact on
the world supply of jute (Appendix Table 2).

## Factors Affecting Production

Fluctuation in annual production may be a factor creating price instability. An analysis of factors affecting production provides a valuable tool in considering annual supply, and therefore, prices. An attempt to stabilize supply will also to some extent reduce price instability. The analysis of the factors affecting production is presented in two major parts; (1) estimating supply functions and (2) an examination of other factors.

### Estimating Supply Functions

Since Pakistan is the largest producing country of jute, changes in production in this country will, therefore, greatly affect all jute production in the world. Therefore, only Pakistan will be considered in this phase of the analysis.

A simple linear regression model, using the method of least-squares, was used to fit the supply curve shown in Figure 2. The price per maund received[1] in the previous year by growers was used as the independent variable. This is the price which jute growers respond to within a production period. In other words, the area of jute produced in the current year is a response to a one-year time lag in prices paid to jute growers. From 1951 to

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[1] Maund is a unit to measure quantity of jute. One maund is equal to 82. 29 pounds.

Price$\frac{1/}{}$/Maund (t-1)
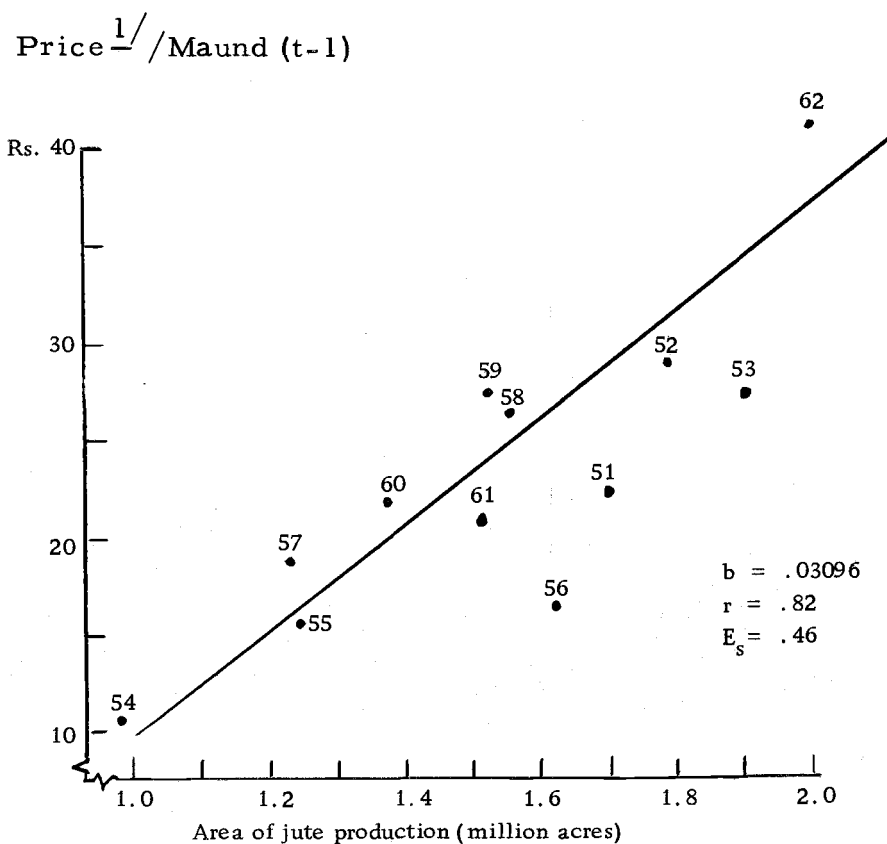


Figure 2.  Estimated supply curve, fitted by method of least
squares, representing price-area planted relationship
of jute, Pakistan, 1950-51 to 1961-62 (Data taken from
Appendix Table 3)

$\frac{1/}{}$  Rupee is the Pakistan and Indian monetary units; about 4. 76
rupees are equal to one dollar.

1962, a positive correlation that moved up and down together in both series was observed in 8 out of 12 years.

The computed b- value is -03. The computed r- value is .82 and is significant at the one percent level. The computed average elasticity of supply for the entire price-quantity series was .46.

When average elasticity of supply was computed separately between the higher and lower prices, it was found that when the price of jute is higher, elasticity of supply was .48, and .43 when prices are lower. In other words, the response in planted area to high prices of jute is higher than the response to lower prices.

The method of least squares also was used to fit the supply curve of jute in India and is shown in Figure 3. The average price per maund in Calcutta was used as the independent variable. This is assumed to be the price which jute growers respond to in the short run, or in one production year. The area of jute planted was used as the dependent variable. The computed b- value is .02. The computed r- value is .85 which is significant at the one percent level. The computed average elasticity of supply for the entire price-quantity series was .42.

Price$^{1/}$/Maund (t-1)

Rs. 60

52

53

62

50

40

51

61

56

58

57

55

30

54

59

60

20

b = .01989
r = .85
$E_s$ = .42

1.2    1.4    1.6    1.8    2.0    2.2

Area of jute production (million acres)
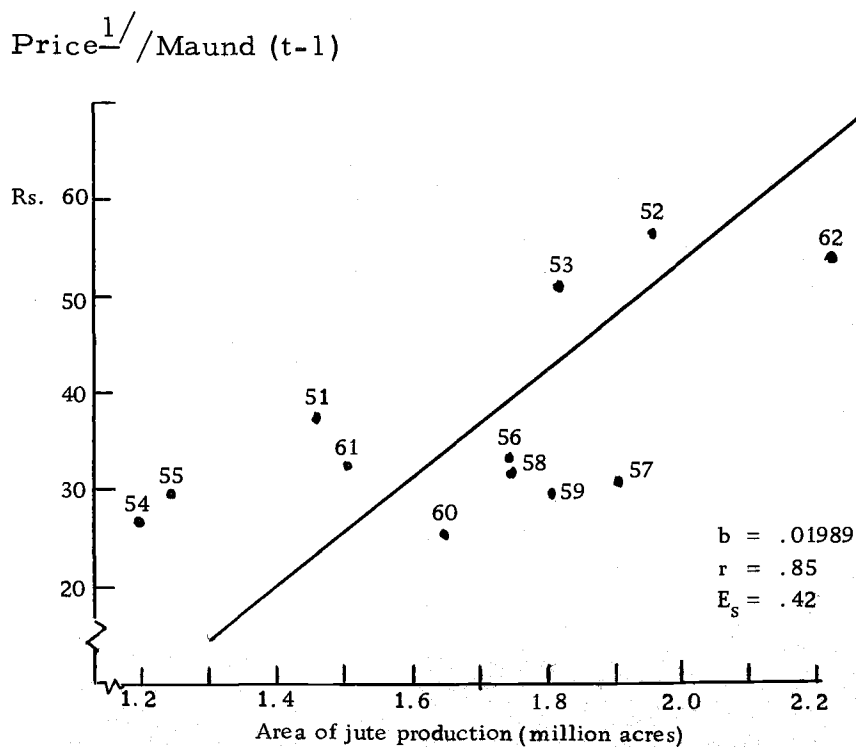
Figure 3.  Estimated supply curve, fitted by method of least
squares, representing price-area planted relation-
ship of jute, India, 1950-51 to 1961-62 (Data taken
from Appendix Table 4)

$\underline{1/}$  Rupee is the Pakistan and Indian monetary units; about 4.76
rupees are equal to one dollar.

The Use of Predictive Model

In the analysis of factors influencing area of jute production, the objective was to set up a mathematical model to represent the relationship between the independent variables and the dependent variable. From the model determine: partial regression coefficients (b- value), t- values for testing the significant, regression, residual and total sum of squares, error of estimate (s); coefficient of multiple correlation (R) and the coefficient of determination ($R^2$).

The mathematical model is as follows:

$$Y = B_0 + B_1 X_{1t-1} + B_2 X_{2t-1} + e$$

where  Y = Annual jute area production in Pakistan, 1950-1962

$B_0$ = constant term

$X_{1t-1}$ = Price received by jute growers in the previous years in Pakistan, 1950-1962

$X_{2t-1}$ = The relative price of jute to price of rice in Pakistan, 1950-1962

$B_1, B_2$ = Parameters to be estimated by the partial regression coefficients.

e  =  Unexplained random error, assumed to be normally and independently distributed with mean 0 and variance $\sigma^2$.

Using the abbreviated Doolittle method for the simultane-
ous solution of linear equations, the following values were com-
puted:

$b_o$ = 1.40818

$b_1$ = .01972 (t = 2.28063) [1]

$b_2$ = .00280 (t = -1.71442)

s = .16373

R = .86830

$R^2$ = .75394

The estimating equation is as follows:

$$\hat{Y} = 1.40818 + 0.01972\ X_{1t-1} - 0.00280\ X_{2t-1}$$

From the above equation, an estimated annual jute area
production in Pakistan is shown in Table 2. These values are also
presented in graphic form in Figure 4.

This analysis indicates that about 75 percent of the change
in the jute producing area in Pakistan is explained by the two in-
dependent variables included in the estimating equation.

A change of one Rupee in price per maund of raw jute,
considered by itself, was on the average accompanied by a change
in the same direction of about 20,000 acres of jute area.

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[1] Significant at the five percent level.

Table 2. Actual and estimated area of jute production in Pakistan and related variables affecting the area of jute production, 1950-51 to 1961-62 (Appendix Table 3).

| Year | Y Actual area | Y Estimated area | $X_{1t-1}$ Price of jute in previous year | $X_{2t-1}$ Relative price of jute to rice |
|---|---|---|---|---|
| | ------ Mill. acres --------- | | Rs/maund | |
| 1950-51 | 1.71 | 1.45 | 22.12 | 140.73 |
| 1951-52 | 1.78 | 1.65 | 28.69 | 67.51 |
| 1952-53 | 1.91 | 1.72 | 27.37 | 79.98 |
| 1953-54 | 0.97 | .99 | 10.69 | 220.95 |
| 1954-55 | 1.24 | 1.32 | 15.44 | 139.25 |
| 1955-56 | 1.63 | 1.47 | 16.02 | 89.70 |
| 1956-57 | 1.23 | 1.51 | 18.84 | 95.22 |
| 1957-58 | 1.56 | 1.57 | 26.36 | 127.54 |
| 1958-59 | 1.53 | 1.64 | 27.48 | 111.21 |
| 1959-60 | 1.38 | 1.47 | 21.70 | 130.74 |
| 1960-61 | 1.52 | 1.46 | 20.72 | 125.75 |
| 1961-62 | 2.00 | 2.05 | 41.00 | 56.09 |

Estimating Equation

$$\hat{Y} = 1.40818 + 0.01972 X_{1t-1} - 0.00280 X_{2t-1}$$

| | |
|---|---|
| Error of Estimate (s) | .16373 |
| Coefficient of Multiple Correlation (R) | .86830 |
| Coefficient of Multiple Determination ($R^2$) | .75394 |

Million acres
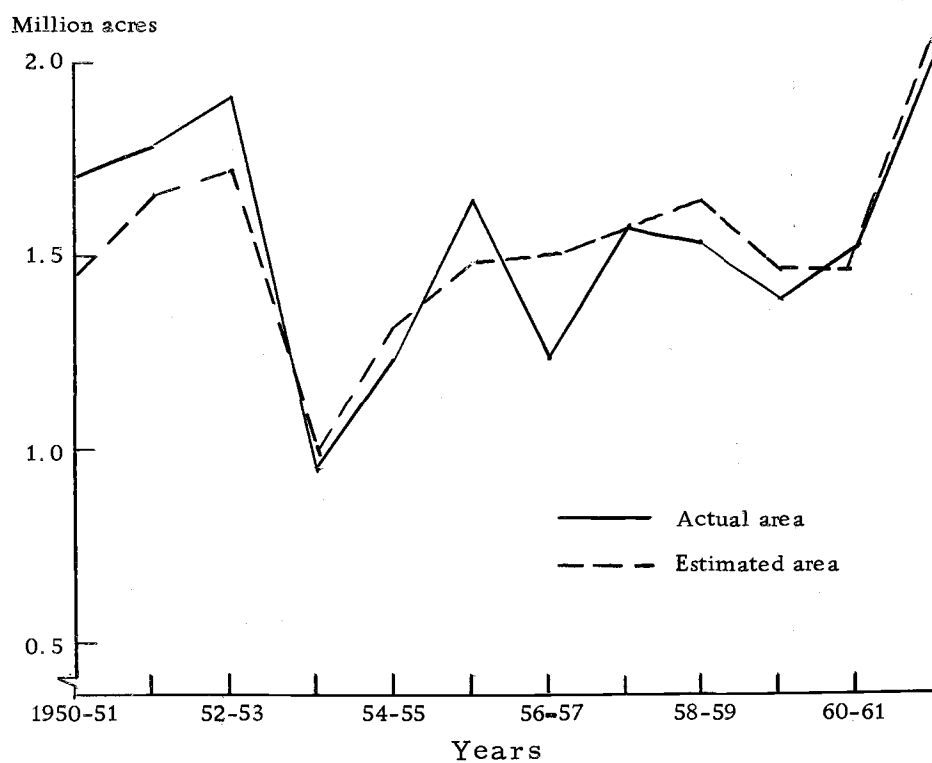


Figure 4.   Actual and estimated annual area of jute production,
Pakistan, 1950-51 to 1961-62.

A change of one percent in the relative price of jute to rice, considered by itself, was on the average accompanied by a change in the opposite direction of 2, 800 acres of jute area.

The average price elasticity of supply was .30.

## Other Factors Affecting Production

Weather condition: Weather conditions affect area production, particularly in some years. This has been true in all countries where production depends mostly on weather conditions. The largest fluctuations in jute production occurred in Pakistan, largely due to weather conditions. This was especially true in 1949-50, 1959-1960 and 1960-61. The first period was affected by excessive rain while drought was the important factor for the last two seasons.

Government programs: In some periods, government interventions have been necessary to stabilize prices or encourage production. In Pakistan, the Jute Regulation Act was imposed for controlling acreage planted in 1940. Although the purpose of the act was never fully realized, it had some effect on jute production. Other programs such as price guarantees, production improvement, and others have impact on jute production.

### Summary and Implication

The study of relevant economic factors affecting jute production has been considered. The most important factors are price of jute, price of alternative crops, and weather condition. Since the weather factor is unpredictable, it is eliminated from further consideration.

Although the analysis shows no statistically significant relationship between changes in relative price of jute to price of rice and jute acreage, it was still important enough to be considered. Because rice is the staple food of the people in Pakistan and is largely grown on fertile land, it will compete with jute for land, labor, and equipment.

Change in price of jute is the only important factor influencing changes in jute production. During 1948 to 1960 when the Jute Regulation Act was effective, 9 out of 13 years the actual acreage exceeded the authorized acreage. Less than the licensed area was planted during the remaining four years (24, p. 17). This illustrates not only the failure of administration, but also price motivation on the part of farmers. It happened that the actual acreage was more than the licensed area if the licensed area dropped sharply while the reverse was also true. This appears to

have resulted from the inability of farmers to make quick adjust-
ments as they normally plan to plant approximately the same acre-
age in each subsequent year.

There have been a number of studies relative to the re-
sponsiveness of jute production to changes in relative price of
jute to other crops. Stern found that the area ratio of jute to rice
moved closely together with the relative price of jute to rice, and
also with other crops. He showed that during 1839 to 1939, about
50 to 56 percent of the change in area of jute production could be
explained by changes in price of rice and other crops (29, p. 206).
An FAO study showed that 65 percent of the changes in area of
jute production in Pakistan for the period 1947-48 to 1955-56, can
be explained by changes in the price of rice. The percentage was
higher when considered in some specific areas (18, p. 22).

One implication of the findings of the present analysis is
that the price system seemed to work fairly pervasively in jute
production where producers rely on rather primitive methods of
production. This conclusion appears to be well established for
other crops in many other countries. The conclusion also could
be drawn that not only in the short-run was jute production partly
determined by the price of competing crops or rice, but also in
the long run. That is, jute production in Pakistan will depend on

the pressure of the population and the available food supply. When an increase in rice production is urgently needed, this might be one of the reasons for retarding jute production.

Judged on the basis of this fundamental analysis none of the factors seem to have singly influenced an increase or decrease in the area of jute production in any one year. All relevant factors seem to have had their effect during one or more years. The assumption that price of jute in the previous year served as the most important among all the factors seems reasonable. This will become more true as the marketing system, especially transportation and price information, are improved.

CHAPTER III

THE DEMAND FOR JUTE

Before attempting to study the demand for jute in specific

uses, it is necessary to examine the overall total demand for this

product. The outstandi ng features in total consumption in differ-

ent parts of the world will provide some idea about the pattern of

jute consumption.

## Trend in Jute Consumption

An attempt has been made to estimate the total uses of

jute goods by approximating their availability in each individual

country. The net foreign balance plus home production, omitting

from consideration stocks of new and used goods, should give an

approximation of total domestic jute consumption.

There were several factors that affected the relative im-

portance of different regions in jute consumption such as the scale

of agricultural output, the size of farm unit, the nature of produc-

tion, the extent to which production moves in commercial chan-

nels, the extent of non-agricultural requirements, the degree of

competition from substitutes, technical developments in

transportation, the level of industrial development and the progress of technology.

The trend in total jute goods available for home use has been on the decline in some regions while increasing in the others. Table 3 shows total jute goods available in several periods, namely, 1937, and the average during the periods 1948-1950, 1957-1958, and 1959-1960. Total available jute dropped sharply after the war during the period 1948-1950, but regained the prewar level by 1957-1958. On examining the individual regional patterns, several significant points were noticed:

(a) A continuous decline in relative importance in North America, compared with stable demand existing in Western Europe which has only declined slightly since the prewar period.

(b) Quantities available for home use in the Far East and Eastern Europe have increased significantly compared with the prewar level.

(c) No pronounced trend could be observed in Africa, Oceania, Near East and Latin America. Although in Latin America there has been some falling off in recent years after reaching above prewar levels during 1948-1950 and 1957-1958.

Table 4 shows that over one-half of the world's require-ments of jute goods are satisfied by imports. Since the war, this

Table 3.  Total jute goods available for home use: regional pat-
tern, 1937, average 1948-50, 1957-58 and 1959-60.

| Region | 1937 | 1948-50 Average | 1957-58 Average | 1959-60 Average |
|---|---|---|---|---|
| World Total | 2104 | 1809 | 2177 | 2751 |
| (Thousand metric tons) | | Percent of world total | | |
| North America | 23 | 19 | 16 | 14 |
| Oceania | 5 | 8 | 5 | 5 |
| Western Europe | 27 | 20 | 24 | 20 |
| Eastern Europe | 4 | 5 | 13 | 18 |
| Latin America | 10 | 11 | 11 | 8 |
| Near East | 3 | 3 | 3 | 3 |
| Far East | 22 | 27 | 26 | 25 |
| Africa | 6 | 7 | 6 | 7 |

Source:  (42)

Table 4.  Total importation of jute as percentage of total jute
available for home use: regional pattern, 1937, aver-
age 1948-50, 1957-58 and 1959-60.

| Region | 1937 | 1948-50 Average | 1957-58 Average | 1959-60 Average |
|---|---|---|---|---|
| World Total Available | 2104 | 1809 | 2177 | 2751 |
| (Thousand metric tons) | | Import as percentage of total available | | |
| World | 56 | 51 | 43 | 40 |
| North America | 75 | 79 | 80 | 86 |
| Oceania | 98 | 97 | 97 | 96 |
| Western Europe | 29 | 36 | 25 | 29 |
| Eastern Europe | 1 | 12 | 5 | 12 |
| Latin America | 80 | 81 | 76 | 70 |
| Near East | 92 | 95 | 94 | 86 |
| Far East | 41 | 19 | 21 | 12 |
| Africa | 100 | 79 | 79 | 76 |

Source:  (42)

proportion has declined to about 40 percent in 1959-1960. The largest importing regions are the Near East, Oceania, Latin America and North America, respectively. If imports are compared with the total available in these regions, North America is the largest region absorbing jute products from the world market. This trend has slightly increased compared with decreases in Latin America and the Near East. The percentage of imports in the Far East has sharply decreased as a result of a large expansion in jute production in recent years. A similar occurrence has taken place in Africa. Western Europe has been fairly stable with perhaps some slight decline in the ratio of imports to total available jute for domestic use together with a slight decrease in jute manufacturing industries.

When considering imports with total available for home use, one can conclude that, while total demand has recovered to prewar level and has shown rapid increases during recent years, some regions have changed their consumption patterns for jute, thereby affecting the international market.

### Demand for Jute in Floor Coverings

Floor covering industries, or more specifically carpet industries, use various surface fibers such as wool, cellulose,

cotton, stable nylon and other materials. Carpet production also required as backing materials, quantities of jute, kraft cord, cotton and man-made fibers. Although the exact figures on jute consumption in carpet making were not available every year, it appears that considerable amounts of jute are used in carpet industries.

Production of floor coverings in the world is rather highly concentrated in four countries, namely, the United States, the United Kingdom, Belgium and Western Germany. The United States produces nearly 50 percent of total production (38, p. 6). However, the level of floor coverings consumption differs from country to country. Differences not only being confined to the amount of consumption, but also the preferences in types. The apparent consumption per capita was higher in the United Kingdom than in other industrial countries during the prewar period. After the war, the level of consumption in other countries increased slightly, although the United Kingdom still maintains the highest level of use per person. The major cause of variation in carpet consumed may be the climate, carpet being less suitable in warmer countries. Considering total amount of carpet consumption (excluding linoleum), the United States is the largest consumer in the world (38, p. 6-7). More detailed analysis in this section will be

concerned mainly with the United States, since the relevant information was available.

The demand for jute in floor coverings is affected by two main factors, the demand for floor coverings themselves, and production and demand for different types of floor coverings since the amount of jute used per unit of output varies considerably from type to type. These two aspects are examined separately below.

Carpet Consumption

Since World War II, carpet consumption in the United States has been greater than in any other country. Changes have appeared not only in total consumption but also in consumption per household. Total shipments rose from 65 million square yards in 1951, to 110 million square yards in 1956, and to 160 million square yards in 1961. The square yard consumption per household increased from 1.45 square yards per household in 1951 to 2.26 square yards in 1956 and was 2.23 square yards in 1961 (1, p. 15).

Increases in consumption appeared to keep pace with the increases in other factors, namely, consumer disposable income and population. If one considers the changes in disposable income per person with consumption of total floor coverings per person, the rate of growth of consumption in floor coverings has been

greater than the rate of increase in disposable income. The per-

centage of total disposable income spent on floor coverings was

relatively stable between 1951 and 1961. This type of expenditure

accounted for nearly 0.20 percent of total disposable income. In

1961 it was estimated that there were about 40 million households

with either wall-to-wall carpet or a rug four by six feet or larger

in the living room. This figure shows a nearly 50 percent increase

compared with 1955, when only 31 million households had such soft

floor coverings (1, p. 16-17). From these facts it would appear

that carpet consumption will increase as disposable income and

population increase. This assumption was also found to be true in

other countries. The consumption of carpet per head in the United

Kingdom was found to be almost entirely dependent on income. In

1958 the income elasticity of carpet consumption was 2.25, while

the price elasticity was not significantly different from zero (38,

p. 8).

## The Pattern of Floor Coverings Production

The pattern of the carpet industry in the United States has

changed rapidly in the past 10 years. Since 1951 the total consump-

tion of woven type has declined sharply while tufted carpeting has

expanded rapidly. Carpet consumption in 1951-1952 was nearly

91 percent woven type (Axminster, Wilton, Velvet) and only nine

percent tufted. By 1961, tufted carpet accounted for about 72 per-

cent of all carpeting used in the United States (1, p. 6). It can be

seen that the pattern of the carpet industry in the United States has

been changed as a result of a change in the pattern of carpet con-

sumption.

Changes in the carpet industry directly affect the demand

for jute. Table 5 shows the requirements for jute in different

types of carpet production. Jute is used in woven carpet at a rate

of 1.15 to 1.43 pounds per square meter. However, jute is used

in tufted carpet at the rate of only 0.82 to 0.84 pounds per unit.

Woven carpeting also requires more jute than linoleum. These

figures indicate a loss of jute consumption in the carpet industry

when the pattern of production changed from woven carpet to tufted

carpet.

The exact amount of jute consumption in carpet making was

not available every year. Available data does show that a consider-

able amount was used in carpet making. In 1954 and 1958 approxi-

mately 96 and 67 million pounds of jute, respectively, were used

in carpet industry (31, p. 192) In 1961, it was estimated that

about 45 to 50 million pounds of jute were consumed in the carpet

industry (1, p. 29). These figures give a general idea of jute

Table 5.  Jute consumption per unit of output of main type of floor
coverings.

| Floor coverings | Country | Jute consumption per square meter |
|---|---|---|
| | | -----pound------ |
| Carpet | | |
| Woven wool | United States (1954) | 1.39 |
| | France (1954 | 1.37 |
| All Woven (mainly wool) | United Kingdom (1954) | 1.32 - 1.43 |
| | Netherlands (1953- 1956) | 1.15 - 1.26 |
| Cotton | Belgium (1954-1957) | 0.48 |
| Tufted | United States (1957- 1958) | |
| | Avg. for all tufted carpet | 0.84 |
| | United Kingdom | 0.82 |
| Jute | United Kingdom (1937) | 2.29 |
| | (1948) | 2.51 |
| Linoleum | United Kingdom (1959) | |
| | (a) with jute backing | 0.75 |
| | (b) avg. all linoleum | 0.51-0.57 |

Source: (38, p. 8)

consumption for carpet making in the United States.

Declines in jute consumption for carpet making was largely
affected by the changes in carpet production, from woven to tufted
carpet.  The smaller requirement for backing materials was true
not only for jute but also other materials, namely, cotton.  The
consumption of cotton was about 63 million pounds in 1956, but
dropped to 50 million pounds in 1961.  Decreases in jute and

cotton consumption for carpet making are due not only from changes in the pattern of production but also competition from man-made fibers (32, p. 201). Man-made fibers were extensively used in the linoleum industry. Jute consumption in the linoleum industry has been trending toward felt-base varieties. In the United Kingdom, it was estimated that by the beginning of 1960, between one-quarter and one-third of all linoleum produced used felt-base backing, whereas in the early 1950's jute backing was invariably used.

In summary, increases in carpet consumption can be expected when income and population increase. However, such increases in carpet consumption will not lead to a proportionate increase in the consumption of jute. This, of course, was due to change from woven to tufted carpets, which require less jute per unit of output. Jute consumption for backing material in carpet making was also affected by the substitution of other materials. The main reason for a trend away from jute backing appears to be based on technical aspects and consumer preference rather than costs.

## Demand for Jute in Packaging

The uses of jute goods for packaging accounted for more than the other uses in total jute consumption. It was estimated that about 60 percent of all jute goods entering international trade were in the form of bags, or packaging goods. This figure would be even higher if used bags are considered. With regard to world production of jute goods, jute fabrics and jute bags are the most important. In India bags produced accounted for from 60 to 65 percent of total jute products, and in Pakistan about 75 to 80 percent. This figure would be higher if new jute producing countries are considered. Other jute manufacturing countries such as the United Kingdom, Western Germany and some other produce more fabrics and yarn than bags. The end use of these products is usually in the form of bags, or for packaging. In the United States the annual consumption of jute for packaging between 1950 to 1962 was approximately 82 percent of total jute consumption (17, p. 58). Therefore, to examine the demand and factors affecting demand for jute in packaging would represent examination of a substantial part of total demand for jute.

Available information shows that the United States is the largest consuming country of jute goods in the world. During 1940

to 1961, about 14 percent of total jute production was consumed in the United States (42, p. 3, 11). Therefore, the study in this section will be largely concerned with the United States, by considering the trend of consumption and factors affecting consumption.

## Demand for Burlap Bags in the United States

The important materials used in the manufacture of bags in the United States, as elsewhere, are jute, cotton, craftpaper and certain man-made fibers. Burlap bags made from jute fabric, provide a cheap material for ordinary packaging purposes, mostly for agricultural products such as feed, potatoes, sugar, flour, rice, and fertilizer. The advantages of burlap over other bag materials include not only price but also durability. The burlap bag is a very durable fiber and re-usage in the packaging field is extensive. The burlap bags can be re-used a number of times, depending on the product carried, the distance and destination of the trips and the facilities available for collecting, reconditioning and merchandizing used bags. Therefore, for some agricultural products, burlap bags are the most suitable for packaging.

Between 1948 and 1949, paper bags were used more than all others, comprising nearly 64 percent, while burlap and cotton

bags accounted for only 24 and 12 percent, respectively (39, p. 4).

Changes in bag materials were greatly affected by jute shortages

during and after the war which made the price of raw jute and jute

goods high. This situation occurred again during and after Korean

War. The proportion of burlap used for bags in 1950 to 1952 period

declined from the 1948-1949 period. Burlap's share was only 17

percent, and that of cotton only 8 percent. This means 75 percent

of all bags were made of paper. The crisis of the jute industry

during the last two wars has greatly affected the demand for jute.

The high price of jute during the wars was the main reason which

stimulated the use of other materials. However, even though the

crisis in the jute industry receded after the war, the level of bur-

lap consumption did not improve very much. Burlap's share was

only 17 and 18 percent during 1953 to 1955 and 1956 to 1958, while

paper still continues to improve its position. Loss of jute, there-

fore, was not only affected by price but also by other factors.

Between 1950 and 1962 the annual consumption of burlap

for bag making was rather constant or declined slightly. The

quantity consumed ranged from 587 million yards in 1961 to 691

million yards in 1956. The consumption of cotton in bag making

declined rapidly from 557 million yards in 1950 to 261 million

yards in 1961 (30, p. 7). The rate of decline in the consumption

of cotton was significant.[1] On the other hand, the consumption of paper materials for bag making increased from 743 thousand metric tons in 1950 to 889 thousand metric tons in 1961. The rate of consumption of paper increased significantly (Appendix Table 5).

No direct correlation exists between the consumption level of burlap, cotton and paper for bag making. Burlap consumption remained stable through the recent decade while cotton consumption declined more than 50 percent. However, the gain in paper consumption for bag making appears to have had little effect on the loss of cotton, that is, paper gained only 18 percent during the same period. Other factors may affect the consumption of materials for packaging. More research is necessary.

## Factors Affecting Demand

Several factors affect the demand for burlap consumption for bag making, or more specifically, demand for burlap bags. The important factors are; price, availability of substitute materials, consumer preference and price of related goods. Demand also is affected by changes in technology. This section will first consider the development of a demand equation and predictive model. Other factors such as substitute materials, bulk handling and prepackaging also will be considered.

[1] Significant at the one percent level.

Estimating Demand Function: A simple linear regression model using the method of least-squares was used to fit the demand curve shown in Figure 5. The annual price of burlap bags during 1950 to 1961 was used as the independent variable, and the annual burlap consumption for bag making in the same period was used as a dependent variable.

The computed b- value is -10.68. The compute r- value is -.91, and is significant at the one percent level. The computed value of average price elasticity of demand for the entire period is -.36. The values are re-computed for the period 1953-1961, and in this instance the b- value is -.15.06, r =-.77 and is significant at the five percent level. The price elasticity of demand during 1953-1961 was -.43.

The same procedures were used with total burlap consumption as shown in Figure 6. The annual wholesale price of burlap was used as the independent variable and annual burlap consumption as a dependent variable. The compute b- value is -12.38, r- value is -.78 which is significant at the one percent level. Average price elasticity of demand for total burlap consumption between 1948 to 1961 was -.22.

The Use of Predictive Model: A multiple linear regression model was used to estimate demand of burlap for bag making.
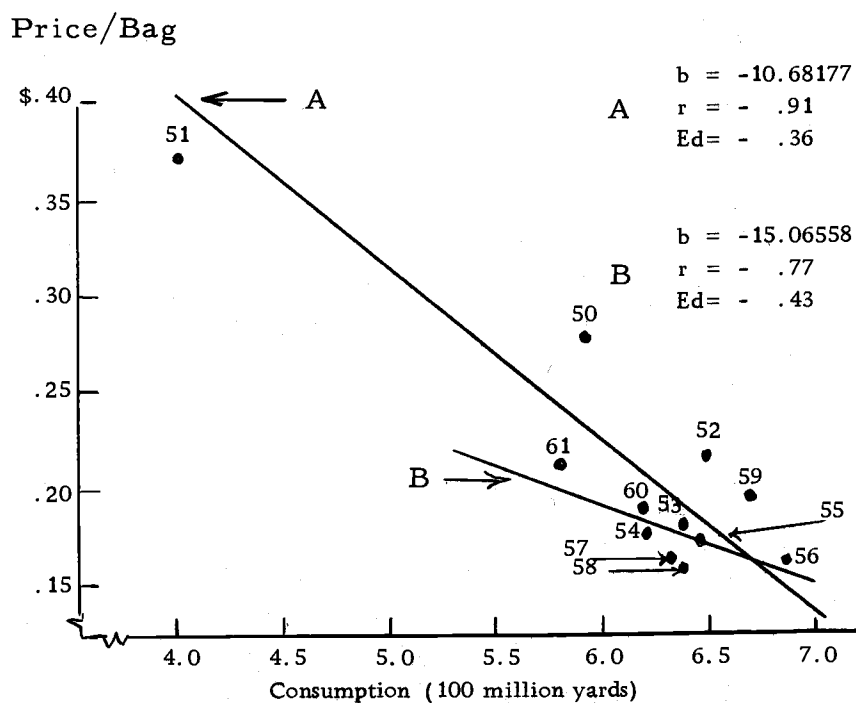
Figure 5. Estimated demand curve, fitted by the method of least squares, representing price-quantity relationship of burlap for bag making, United States, 1950 to 1961 (Data taken from Appendix Table 5).

Price/Yard
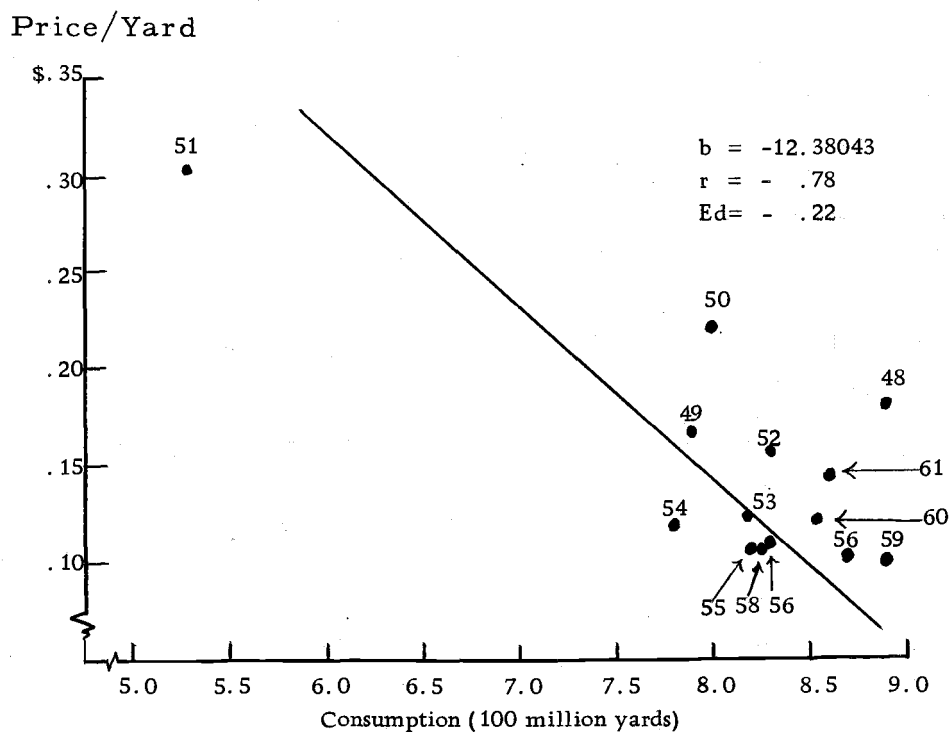


Figure 6. Estimated demand curve, fitted by the method of least squares, representing price-quantity relationship of total burlap, United States, 1948 to 1961 (Data taken from Appendix Table 5)

From the model the following information was determined: partial regression coefficients (b- value), t- value for testing the significance of each b- value, regression, residual and total sum of squares, error of estimate (s), coefficient of multiple correlation (R) and the coefficient of multiple determination ($R^2$).

The mathematical model is as follows:

$$Y = B_o + B_1 X_1 + B_2 X_2 + e$$

where  Y = Annual consumption of burlap for bag making in the

United States 1950 to 1961

$B_o$ = constant term

$X_1$ = wholesale price of burlap bags, United States, 1950

to 1961

$X_2$ = wholesale price of cotton bags, United States, 1950

to 1961

$X_3$ = wholesale price of paper bags, United States, 1950

to 1961

$B_1$, $B_2$, $B_3$ = parameters to be estimated by the partial

regression coefficients.

e  = unexplained random error, assumed to be normally and

independently distributed with a mean 0 and variance

$\sigma^2$.

Using the abbreviated Doolittle method for the simultaneous solution of linear equations, the following values were computed:

$b_o$ = 9.18398

$b_1$ = -.24035 (t = -6.74781) [1]

$b_2$ = .33524 (t = -4.15047) [1]

$b_3$ = -.52312 (t = -4.14956) [1]

s = .40577

R = .90934

$R^2$ = 82690

The estimating equation is as follows:

$$\hat{Y} = 9.18398 - .24035\ X_1 + .33524\ X_2 - .52312\ X_3$$

From the above equation an estimated annual burlap consumption for bag making is shown in Table 6. These values are also presented in the graphic form in Figure 7.

This analysis indicates that about 83 percent of the change in annual burlap consumption for bags in the United States is explained by the three variables.

A change of one cent in the price of burlap bags, considered by itself, was on the average accompanied by a change in the opposite direction of about 24 million yards in burlap consumption for bag making in the United States.

[1] Significant at the one percent level.

Table 6. Actual and estimated annual consumption of burlap for bag making and related variables affecting annual burlap consumption, United States, 1947 to 1961 (Appendix Table 5).

| Year | Y Annual burlap consumption | | $X_1$ Price of burlap bags | $X_2$ Price of cotton bags | $X_3$ Price of paper bags |
|---|---|---|---|---|---|
| | Actual | Estimated | | | |
| | --- hundred mill. yds ---- | | ----------- cents per bag ------------ | | |
| 1947 | 8.31 | 7.75 | 26.34 | 30.08 | 9.90 |
| 1948 | 7.00 | 6.73 | 23.59 | 26.74 | 11.00 |
| 1949 | 6.20 | 6.29 | 21.81 | 23.20 | 10.38 |
| 1950 | 5.90 | 6.77 | 27.65 | 27.65 | 10.14 |
| 1951 | 4.07 | 4.24 | 37.33 | 30.36 | 11.77 |
| 1952 | 6.50 | 5.76 | 21.61 | 23.63 | 11.77 |
| 1953 | 6.39 | 6.49 | 18.15 | 23.36 | 11.77 |
| 1954 | 6.21 | 6.40 | 17.95 | 23.04 | 11.84 |
| 1955 | 6.48 | 6.81 | 17.37 | 23.74 | 11.77 |
| 1956 | 6.91 | 7.12 | 16.40 | 24.89 | 12.35 |
| 1957 | 6.31 | 6.39 | 16.55 | 23.27 | 12.64 |
| 1958 | 6.43 | 6.05 | 16.04 | 22.71 | 13.18 |
| 1959 | 6.74 | 6.86 | 16.89 | 25.08 | 12.76 |
| 1960 | 6.22 | 6.47 | 18.80 | 25.36 | 12.79 |
| 1961 | 5.87 | 5.67 | 21.10 | 24.46 | 12.70 |

Estimating Equation

$$\hat{y} = 9.18398 - .24035\, X_1 + .33524\, X_2 - .52312\, X_3$$

| | |
|---|---|
| Error of Estimate (s) | .40577 |
| Coefficient of Multiple Correlation (R) | .90934 |
| Coefficient of Multiple Determination ($R^2$) | .82690 |

100 million yds.
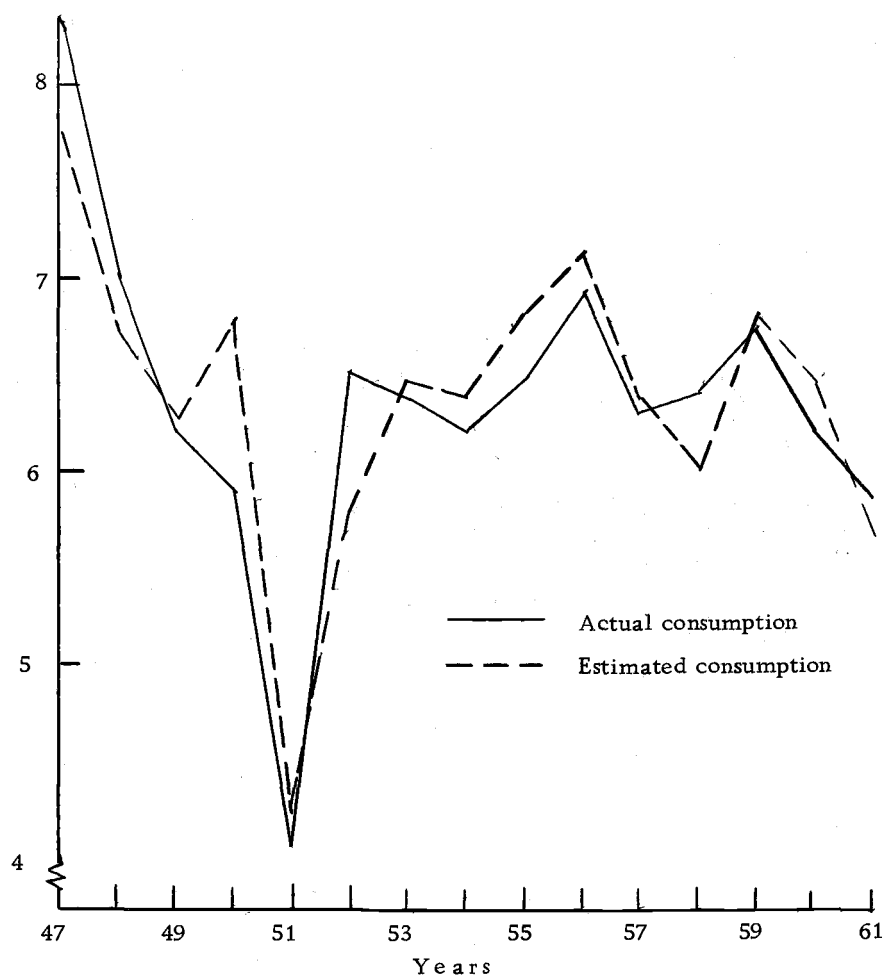


Figure 7.  Actual and estimated burlap consumption for bag
making, United States, 1947 to 1961.

A change of one cent in the price of cotton bags, considered by itself, was on the average accompanied by a change in the same direction of about 33 million yards of burlap consumption.

A change of one cent in the price of paper bags, considered by itself, was accompanied on the average by a change in the opposite direction of about 52 million yards of burlap consumption.

Elasticities were computed. The average price elasticity of demand was -.80. The cross elasticity of burlap consumption with respect to cotton bags was 1.32 and -.97 with respect to paper bags.

This analysis indicated that during the period 1950 to 1961, from the standpoint of price, paper bags and burlap bags were not competitive at all. A decrease in consumption of burlap bags, statistically, was accompanied by an increase in the price of paper bags or vice-versa. Since these materials are naturally competitive, it would not be reasonable to interpret that the decline in burlap consumption was due to the increase in the price of paper even though it has been shown to be a significant relationship. The changes in burlap consumption, therefore, to some degree at least must be affected by exogeneous factors such as technological factors, consumer preferences, and others.

Statistically it can be concluded that during 1950 to 1961, the variation in price of cotton bags and paper bags as well as price of burlap bags had a significant affect on burlap bag consumption. The cross elasticities between these materials are relatively large.

The influence of relative prices on the relative consumption of burlap and cotton bags was considered separately in order to examine the interchangeability between these two materials. A simple linear regression was used to estimate the use of burlap for bag making as a percentage of cotton used for bag making with regard to the change in the percentage of price.

The regression equation may be expressed as follows:

$$Y = 453.53786 - 2.95597 \ X \ \underline{1/}$$
$$r^2 = .74$$

Where X is the price ratio, and Y is the consumption ratio. The above $r^2$ value shows that 74 percent of the change in the relative consumption of burlap bags to cotton bags is explained by the change in the relative prices of burlap bags to cotton bags. The values are shown in Figure 8. This analysis indicates that changes in the price of cotton or burlap bags has significantly affected burlap consumption. This effect will be discussed further in the next sections.

_____

[1] Significant at the one percent level.
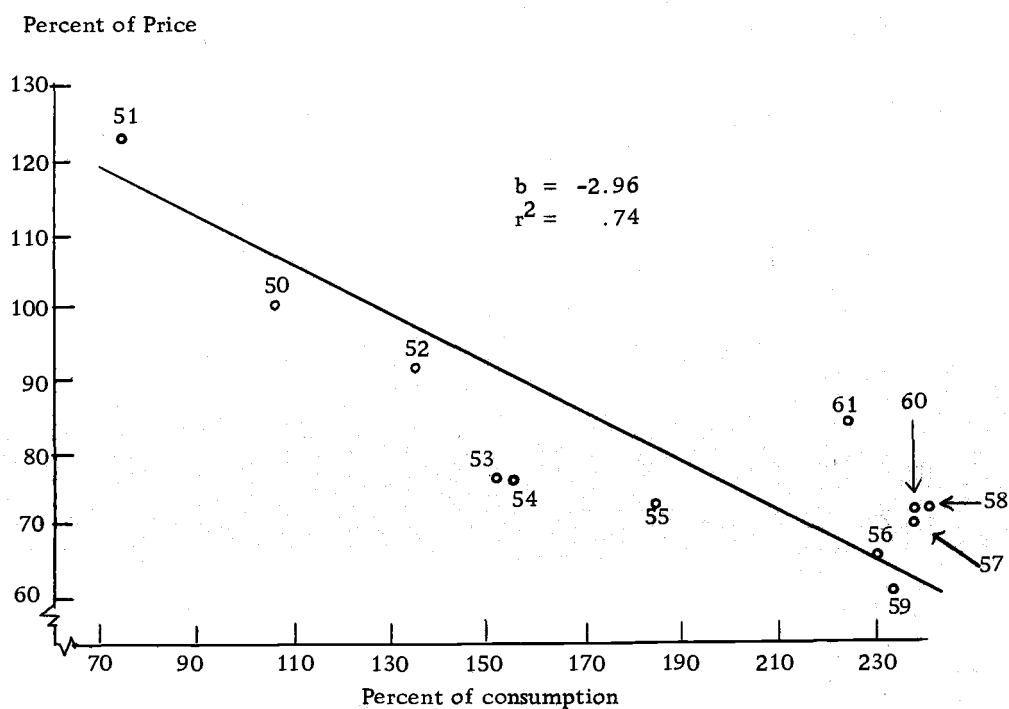
Figure 8. Relationship between relative consumption of burlap
bags to cotton bags and relative prices of bags, United
States, 1950 to 1961 (Data taken from Appendix Table
5).

Substitution Materials: Statistical evidence indicates the price of cotton bags has a significant affect on the change in burlap consumption. On the price of paper bags show the significant affect on the change in burlap consumption, but the correlation, having a positive sign, rejects the hypothesis that burlap bags compete with paper bags. Actually, both cotton and paper bags very likely are important competitors of the burlap bag industry. Under normal circumstance, both cotton and paper bags have certain advantages for packaging some products. Paper bags normally are less expensive than burlap or cotton bags, but their re-use value is limited. Cotton bags are more expensive than burlap or paper bags, but have a high re-use value not only as bags but also as household textile and work clothes.

The shortage of jute during and after the war has strengthened the competitive position of substitute packaging materials. Since the war, both burlap and cotton bags have lost their position to paper bags. The main reasons are not only high prices of burlap bags during and after the war, but during normal years the price of burlap has fluctuated widely from year to year. In comparing the prices of burlap, cotton fabric and paper for bag making between 1948 to 1961, it was found that burlap prices fluctuated more than cotton or paper (Appendix Table 9). The coefficient of

variation of burlap was 35 percent, while the coefficients of varia-

tion of cotton and paper were 12 and 10 percent, respectively.

Fluctuations of burlap price might be one important factor stimu-

lating the use of paper bags or other materials. Changes in the

price of burlap bags, cotton cloth and paper bags is shown in Fi-

gure 9.

The trend away from burlap can be attributed largely to

technological changes in the paper bag industry. Today, paper

bags, or multiwall paper shipping sacks, are used extensively for

transporting cements, fertilizers, chemicals, animal feeding stuffs,

refined sugar, flour and other finely ground material (10, p. 196).

The adoption of paper materials was rapidly developed by bag

manufacturers and users. The replacement of burlap bags by pa-

per bags has been mostly confined to the United States and Canada.

However, this trend toward paper is developing elsewhere, es-

pecially in the United Kingdom, France, Western Germany and

the Netherlands (39, p. 6). There is reason to believe that compe-

tition between paper and burlap bags may develop in other indus-

trial countries where pulp and paper supplies become more plenti-

ful, and changes in manufacture occurs.

Bags manufactured from hard fibers such as sisal, hene-

quen, sansevieria, etc., are probably of competitive significance

Price Indexes
(1957-59 = 100)
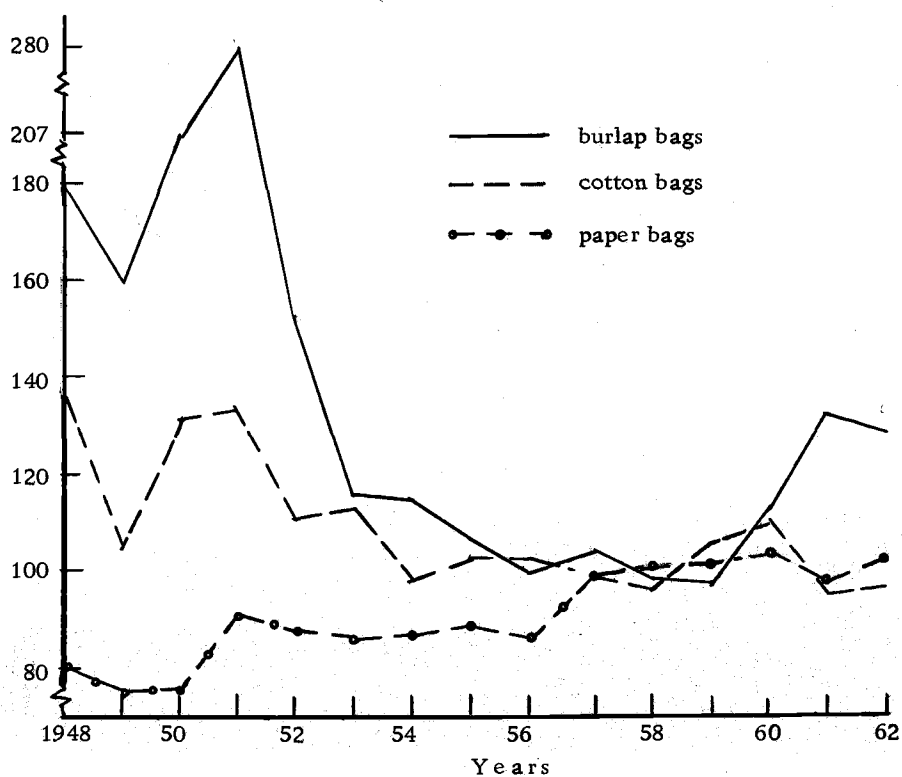


Figure 9.  Average annual wholesale price indexes of burlap
bags, paper boxes and shipping containers and
cotton print cloth, United States 1948 to 1962
(1957 - 1959 = 100).  (Data taken from Appendix
Table 9).

for burlap bags. It was roughly estimated that about 50,000 metric

ton of those fibers are converted into containers for certain prod-

ucts mostly in Latin American countries (18, p. 11). Although

this figure was relatively small when compared with total jute

consumption for packaging, the improvement in manufacturing

technique might have some affect on jute consumption in the future.

Bulk Handling: The system of bulk handling was first intro-

duced with grains some time near the end of the 19th century (15,

p. 161). Bulk handling is quick, convenient, time and labor sav-

ing and may be comparatively inexpensive once handling facilities

have been established. The bulk handling method is not only used

within a country, but is also used extensively in international

trade. It has been estimated that about 90 percent of the grain

entering international trade is bulk handled at the ports. Also,

other commodities are bulk handled, including animal feed, raw

sugar, cereals, oil seeds, cement, fertilizer and agricultural

lime (10, p. 197). Bulk handling is still growing in the countries

where labor is relatively expensive.

There is no doubt that some serious losses suffered by the

burlap bags industry have been due, to a considerable extent, to

changes in the marketing system; however, this does not mean the

complete elimination of burlap bags or other means of handling

goods. Burlap bags for storing or transporting in some cases are still required. Furthermore, some commodities which remain outside the bulk handling field are raw cotton and wool; these still use burlap for covering.

Pre-packaging: Outstanding changes in the distribution of fruit and vegetable products include packaging in small containers. Formerly foodstuffs were sent to retail stores in a relatively un-prepared condition or packaged in large containers. Most containers, especially for some kinds of fruits and vegetables, were burlap bags. The grocers packed the products in suitable units as purchased.

The trend toward pre-packaging has been going on for a longer period of time in the United States and Canada than in other countries. In these two countries certain crops are now exclusive-ly marketed in pre-packaged form. In Europe, Switzerland leads the field in pre-packaging and is closely followed by Sweden, Western Germany and the United Kingdom. This change can be expected to develop in other countries where the development in self-service stores occurs (26, p. 4).

The advantages of pre-packaging are: reducing costs of retailer; more attractive displays; and a high degree of preference by consumers when packaged in small units. From a U. S.

Department of Agriculture study, it is shown that retailers pre-
ferred pre-packaging because it reduces costs and more can be
sold to consumers. [1] [2]  Packaging in small containers, five to
ten pounds, polyethylene bags has advantages, even where costs
are higher compared to paper and burlap bags, because the pro-
ducts are attractive and preferred by consumers (14, p. 4-10).
Potatoes is an example where most small containers are polyethyl-
ene bags and some are paper bags with mesh windows, but none
are burlap bags.

It seems probable that demand for jute is adversely affected
by the gains of man-made fiber or paper bags due to the change in
the marketing system and consumers' preferences for pre-packag-
ing methods.  This situation can be expected to continue in all
Western countries where techniques in man-made fiber production
have been developed.

---

[1]  Packaging potatoes in burlap bags, if both direct and indirect
costs are considered, was expensive (14, p. 1; 25, p. 3).

[2]  In France, it was found that after pre-packaging has been in-
troduced to garlic for three years, world demand for garlic
from this country more than doubled (26, p. 5).

## Demand for Other Uses

In addition to packaging and carpet making jute can be used in other outlets. The most important are rope and twine, electrical cable cores, apparel lining and paper and tape reinforcement. Very small amounts are also used for furniture, webbing and stuffing, carpet and rug lining, automotive upholstering, roofing, and in garments (5, p. 15-18). In the United States, considerable amounts of rope and twine were consumed annually, amounting to approximately 27 and 18 million pounds in 1954 and 1958. Electrical cores used about 19 and 21 million pounds during the same period, and small amounts were used for other purposes (31, p. 192).

Uses of jute for other purposes, especially in industry, are tending to decline due to the wide use of man-made fibers. Loss of natural fibers (jute, cotton, wool) in industries to man-made fibers is rapidly increasing every year. Between 1949 and 1952, approximately 72 percent of total fiber used in industries in the United States was natural fibers. The amount consumed has declined to 52 percent in 1961 (32, p. 193).

## Conclusion

The trend of jute consumption in the United States and other Western countries tends to decline. Changes are mainly due to technological developments in packaging, transportation systems, and tastes and preferences of consumers. Loss of demand for jute in the United States and other industrial countries will probably be more serious in the future. Man-made fiber substitutes brought about by technological development are increasing in usage while jute is declining.

The level of jute consumption seems favorable in most other countries, especially the Far East and Eastern European countries. This prospect also could be expected in Africa and the Near East. Most countries in these regions are primary producing countries, or more specifically agricultural products, which regularly constitute a large proportion of the total economy. During the last few years agricultural output has greatly increased in many regions, especially in the Far East. Agricultural output increased in South Vietnam, Cambodia, Philippines, Singapore, Pakistan, India, Taiwan and Thailand (44, p. 35, 50).

The expansion in agricultural products and amounts of export, undoubtedly, will be accompanied by an increase in the use

of jute goods, particularly jute bags for packaging. Thus, jute

consumption must increase to keep pace with agricultural ex-

pansion, since the widespread development of bulk handling in

these countries is not yet economically feasible. The marketing

systems and transporting conditions are the limiting factors.

The relationship between jute consumption and agricultural

products and exports are directly correlated with industrial coun-

tries included. The relationship between total jute consumption

and agricultural output on a world basis was high. [1] It is also

true when considering the relationship between jute consumption

and agricultural exports. This relationship is shown in graphic

form in Figures 10 and 11. Therefore, we can conclude that jute

consumption will increase as the agricultural products and exports

increase in the primary producing countries.

---

[1] r- values are .91 and .93 and are significant at the one per-
cent level.

Jute
Consumption
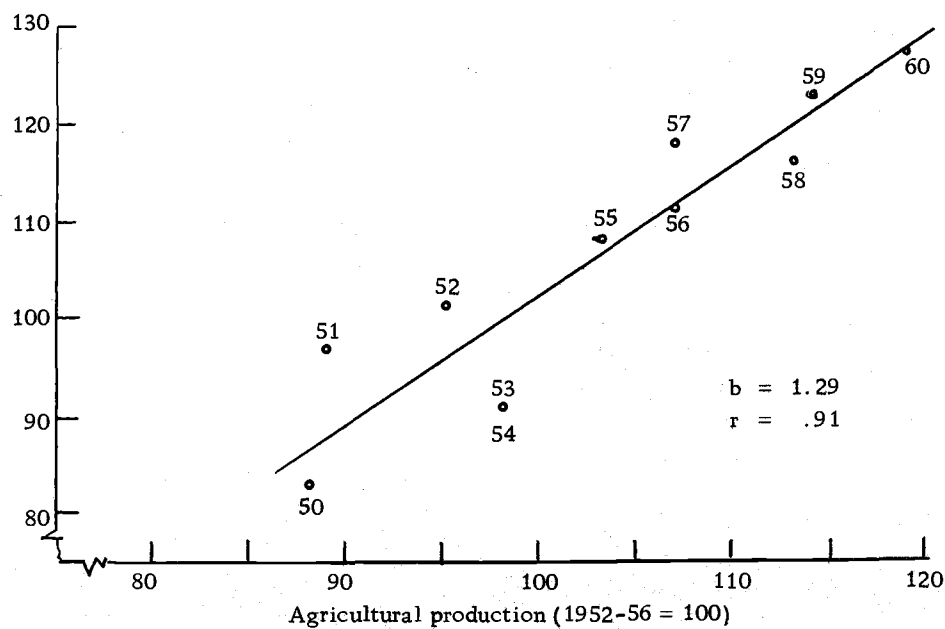
(1952-56 = 100)



Figure 10.  Relationship between jute consumption and agricul-
tural production on a world basis, 1950 to 1960
(1952 - 56 = 100) (Data taken from Appendix Table
6).

Jute
Consumption
(1952-56 = 100)
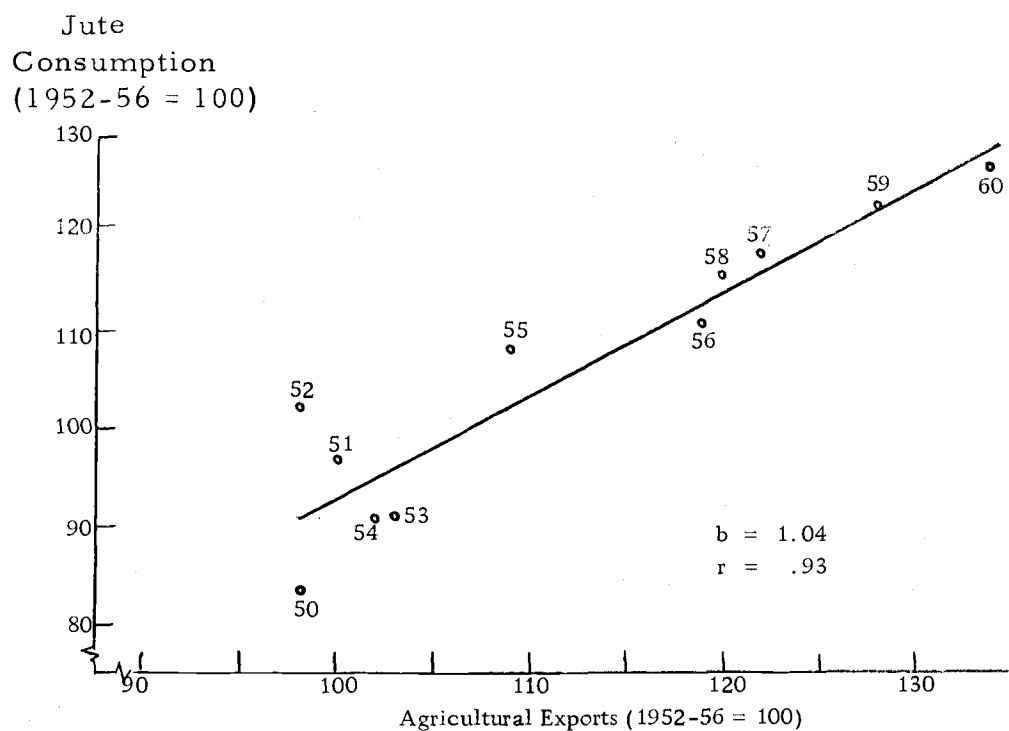


Figure 11. Relationship between jute consumption and agricultural exports on a world basis, 1950 to 1960 (1952-56 = 100) (Data taken from Appendix Table 6)

# CHAPTER IV

## PRICE ANALYSIS

The next important feature of this study is the examination

of prices. This chapter deals with fluctuations in price of jute as

well as the factors influencing prices. The analysis of prices is

not simple, since there were many factors influencing prices ei-

ther singly or jointly. These factors do not operate with equal

force in each season. It is difficult to find a jute year which can

be considered "normal" from all relevant points of view. There-

fore, this section will begin with an examination of prices in the

long run, comparing the price of jute with other commodities as

well as in different countries. The last section will be devoted to

an examination of factors affecting prices.

### Price Movements in the Long Run

In considering price of jute in the long run, price of jute

received by jute growers in Pakistan is used as the focal point.

The law of supply and demand did not operate freely in determining

prices of jute, since during some periods government regulations

were a factor. However, such intervention did not have significant

impact on price formation. Since Pakistan is the world's largest

jute supplier, changes in prices and other factors in this country

will be considered as applicable to other jute producing countries.

Production and price of jute in Pakistan is shown in Figure

12. Between 1949 and 1950 price declined rather drastically. The

main reason for this sharp decline in price, despite a fall in pro-

duction, was a declining demand in the world market. Declines

in export were also affected by non-devaluation of Pakistan cur-

rency from India. India, consequently, made smaller purchases.

The impact of non-devaluation of Pakistan currency on export of

jute from Pakistan caused a collapse in the price of raw jute. The
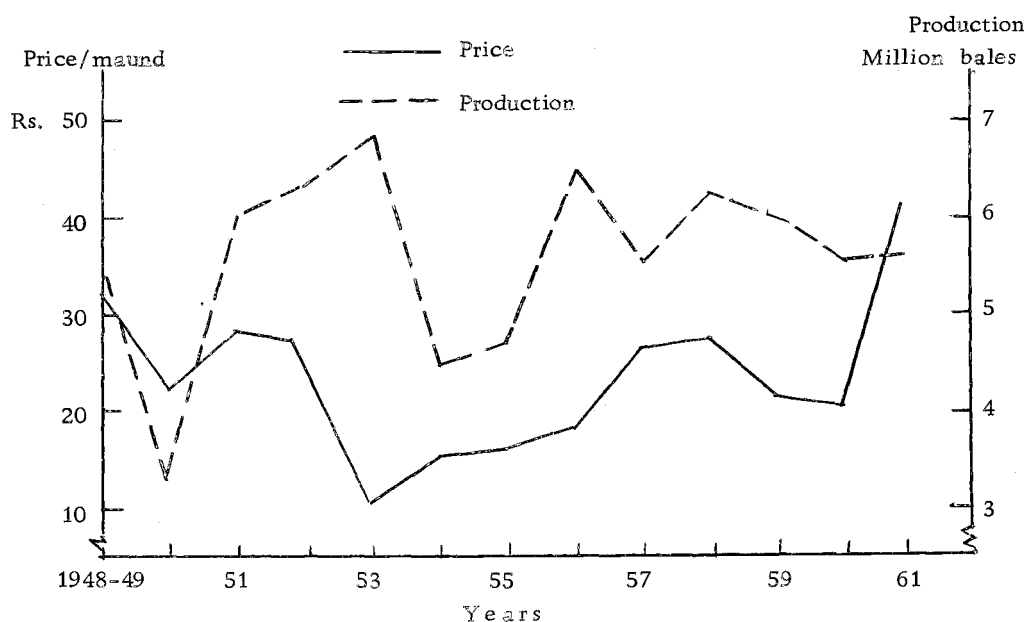
Figure 12. Price and production of jute, Pakistan 1948-49 to
1960-61 (Data taken from Appendix Table 3).

higher prices received during 1950-51 to 1951-52 were mainly the result of Korean War. After the war, production was high due to favorable weather conditions causing price to dive downward about 60 percent when compared with the preceding year. Price recovered in 1954-55, due to the effectiveness of production control, coupled with an increase in demand both overseas and within the country. Since 1954-55, price gradually increased. Rise in price was partly due to the increase in demand from other countries as well as domestic demand, and partly from devaluation of Pakistan currency in 1955 (24, p. 31). Price reached the highest level in 1957-58. In 1958-59 the price suddenly declined, chiefly due to high production in 1957-58. Also, less was exported to India, the amount declined from 112 thousand tons in 1957-58 to only 31 thousand tons in 1958-59 (24, p. 43). Price further declined in 1959-60. The declining price trend was suddenly reversed in 1960-61, rising from Rs. 20.72 per maund in 1959-60 to Rs. 41.00 per maund in 1960-61, the highest since Korean War. The important reason was the failure of jute production due to a severe drought. The fall in production occurred in both Pakistan and India. Steady demand from India and other jute manufacturing countries, as well as from Pakistan, created a bullish market resulting in the highest price since World War II.

## Prices of Jute and Other Commodities

It appears that only rubber, cocoa and tea prices fluctuated

more severely than the price of jute. It would also appear that

jute prices were less stable than the price of kraft paper. The

price of cotton, which is the important material for bag making,

was far more stable than the price of jute. Comparison with over-

all agricultural products (non-food) is shown in Figure 13. This

figure shows that all agricultural products prices were compara-

tively stable.
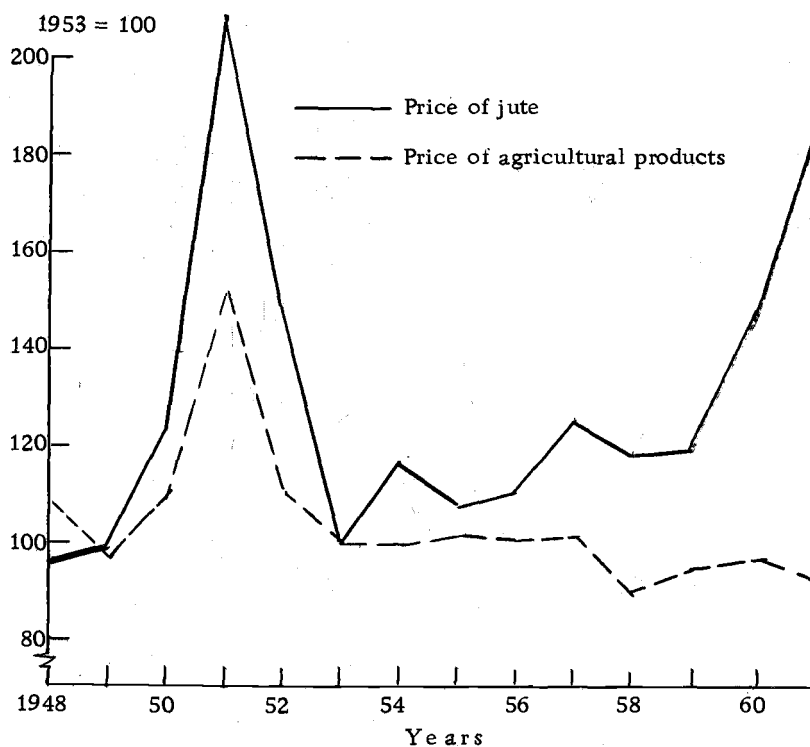


Figure 13. Indexes of agricultural products (non-food) prices
and price of jute on a world basis, 1948 to 1961
(1953 = 100) (Data taken from Appendix Table 7).

During Korean War, price of jute moved in the same direction
with agricultural products, but there was a larger difference in
amplitude.   After Korean War, price of jute fluctuated much
more than other agricultural prices.

### Price of Jute in Different Countries

Several countries in the world, namely, India, Pakistan
and the United Kingdom, consumed the bulk of raw jute.   The
prices in these three countries are shown in Figure 14.   The chart
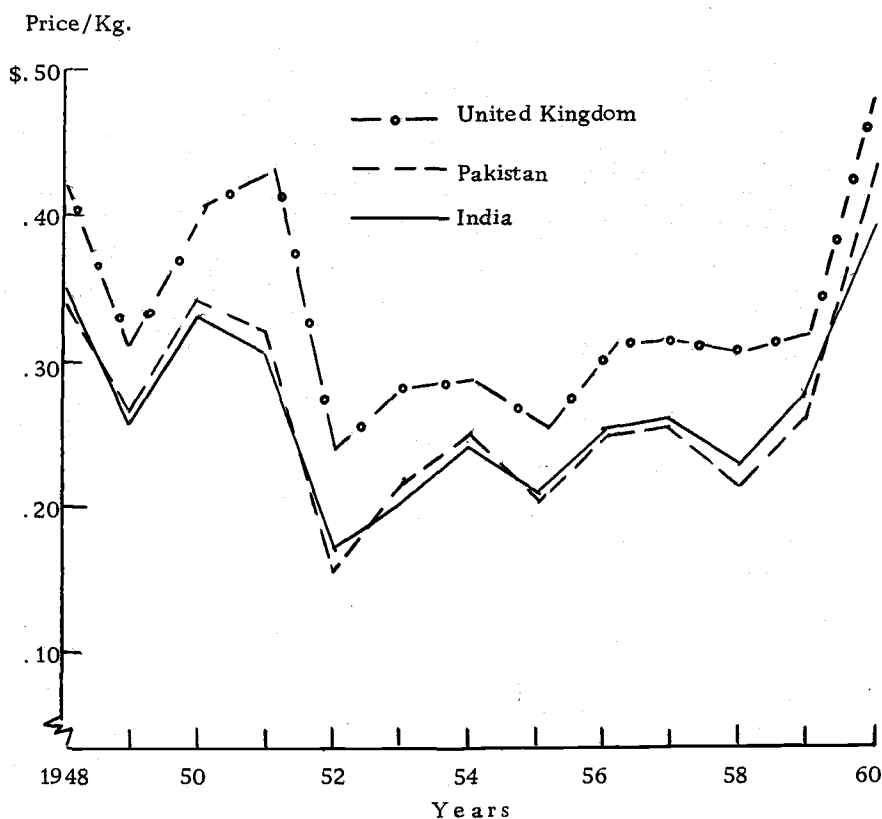
Figure 14.   Prices of raw jute in India, Pakistan and the United
Kingdom, 1948 to 1960 (Data taken from Appendix
Table 8).

shows the prices of raw jute in the three countries changed togeth-er. The prices in 1951 were high because of Korean War. After the Korean War, prices in both India and Pakistan moved in the same direction and were close together in most years.

## Price of Raw Jute and Jute Products

Generally speaking, price of jute products was almost com-pletely dependent on the price of raw jute. Other factors such as the cost of production and speculation might have some effect, but these factors are relatively insignificant.

Relationship between hessian price and price of raw jute in India during 1950-51 to 1960-61 will be considered first in equation (1), and (2) shows the relationship between sack price and price of raw jute in India during the same period. [1]

The regression equations are as follows:

(1) $Y = .16050 + .00894 X$ [2]

$r = .93$

(2) $Y = .09299 + .03315 X$ [2]

$r = .95$

---

[1] Appendix Table 4.

[2] Significant at the one percent level.

The change in price of burlap bags in the United States was almost entirely dependent on the price of burlap as the equation below shows.[1]

(3)     $Y = 5.54618 + 1.04094X$ [2]

r = .99

These three equations show that the change in price of raw jute has significantly affected the price of jute products.

## Factors Affecting Price

The economic factors which influence the price of jute are of interest to growers as well as consumers. An economic analysis of prices will provide a valuable tool to growers for planning their production and to people dealing with price stability. In a sense, price analysis serves as the starting point in considering demand and supply.

Two methods of analysis were used to analyze the effect of relevant economic variables on the price of jute. The two methods were as follows:

> Method I: An analysis of supply and demand was used to evaluate the relevant factors affecting the price of jute. Special attention was given to the factors that determine the elasticities of supply and demand.

---

[1] Appendix Table 5

[2] Significant at the one percent level.

Method II: Multiple-linear regression models were used to evaluate the influence of relevant economic factors on the price of jute.

## Nature of Supply and Demand -- Method I:

For an explanation of the fluctuation in the price of jute, it is necessary to specify the characteristics of supply and demand. The elasticities of supply and demand for jute were estimated in earlier chapters. The elasticity of supply was .30 and the elasticity of demand was -.80, both being inelastic. The inelastic supply suggests that it is difficult to change production in the short-run, or in other words, the responsiveness of production to price changes is rather slow. Elasticity of demand during the last few years has been relatively high, but it is still inelastic. This means that relatively small changes in quantity taken will result from changes in price. Therefore, the jute industry is faced with an inelastic supply and an inelastic demand. Under this circumstance, small changes in either supply or demand will result in drastic changes in prices. Jute production remains comparatively constant in the face of considerable fluctuation in price. The small changes in jute production that do take place result chiefly from changes in such physical things as weather, and show practically no response to fluctuations in price.

The Use of Predictive Models -- Method II:

Multiple linear regression was used to describe the relationship between the dependent variable and the independent variables which may influence price of jute. The model can be expressed as follows:

$$Y = B_o + B_1 X_1 + B_2 X_2 + - - - B_n X_n + e$$

Four predictive models were used to explain the relationship between the various independent variables and the dependent variable. They are as follows:

Model 1. Annual average price received by jute growers in Pakistan was used as the dependent variable. The f. o. b. price, national income, carryover and annual production of jute in Pakistan were used as independent variables.

Model 2. Annual average price received by jute growers in Pakistan was used as the dependent variable. The average export prices of jute, total jute supply in India and Pakistan and national income in Pakistan were used as independent variables.

Model 3. Annual average price of loose jute at baling center in Pakistan was used as the dependent variable. The average export prices of jute, national income, annual production and carryover of jute in Pakistan were used as independent variables.

Model 4. Annual average price of loose jute at Calcutta was used as the dependent variable. The average export prices, carryover and annual production of jute in India were used as independent variables.

For each model, partial regression coefficients (b- values), t- value for testing the significance of each b- value, error of estimate (s), coefficient of multiple correlation (R) and the coefficient of multiple determination ($R^2$) were computed.

### Model 1

The original mathematical model is as follows:

$$Y = B_o + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + e$$

where  Y = Annual average price of jute received by jute growers

in Pakistan, 1948-49 to 1960-61.

$B_o$ = constant term

$X_1$ = Annual average export price of raw jute, f. o. b.

Narayanganj, Pakistan, 1948-49 to 1960-61.

$X_2$ = National income of Pakistan at 1949-52 price, 1948-49

to 1960-61.

$X_3$ = Carryover of jute from previous year, 1948-49 to

1960-61.

$X_4$ = Annual production of jute in Pakistan, 1948-49 to

1960-61.

$B_1$, $B_2$, $B_3$, $B_4$ = parameters to be estimated by the

partial regression coefficients.

e = Unexplained random error, assumed to be normally

and independently distributed with mean 0 and vari-

ance $\sigma^2$.

Using the abbreviated Doolittle Method for the simultaneous

solution of linear equations, the following values were computed:

$b_o$ = 33.94715

$b_1$ = .58167     (t = 6.23652) [1]/

$b_2$ = -1.16545     (t = -1.61529)

$b_3$ = -1.89711     (t = -1.09874)

$b_4$ = -1.77327     (t = -.71397)

s = 3.63500

R = .92869

$R^2$ = .86246

The coefficients $b_2$, $b_3$, and $b_4$ were non-significant at

the five percent level; thus they were deleted. Only the coefficient

$b_1$ was included in the reduced model, and t-values, s, R and

$R^2$ were re-computed. The following values were computed:

$b_o$ = 4.80393

$b_1$ = .55813     (t = 6.53126) [1]/

s = 3.78470

R = .89167

---

[1]/ Significant at the one percent level.

$$R^2 = .79499$$

The following estimating equation was derived from the reduced model by substituting the b- value and deleting the error term:

$$\hat{Y} = 4.80393 + .55813X_1$$

Using the above equation, an estimated price was computed, and a graphic comparison of the actual and estimated price is shown in Figure 15.

### Model 2

The original mathematical model is as follows:

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + e$$

where, Y = (Same as Model 1)

$b_0$ = (constant term)

$X_1$ = Average unit value of export of jute and jute goods from Pakistan, 1948-49 to 1960-61.

$X_2$ = Total jute supply in Pakistan and India, 1948-49 to 1960-61.

$X_3$ = National income of Pakistan at 1949-1952 price, 1948-49 to 1960-61.

$B_1$, $B_2$, $B_3$ = (Same as Model 1)

e = (Same as Model 1)

Price/maund
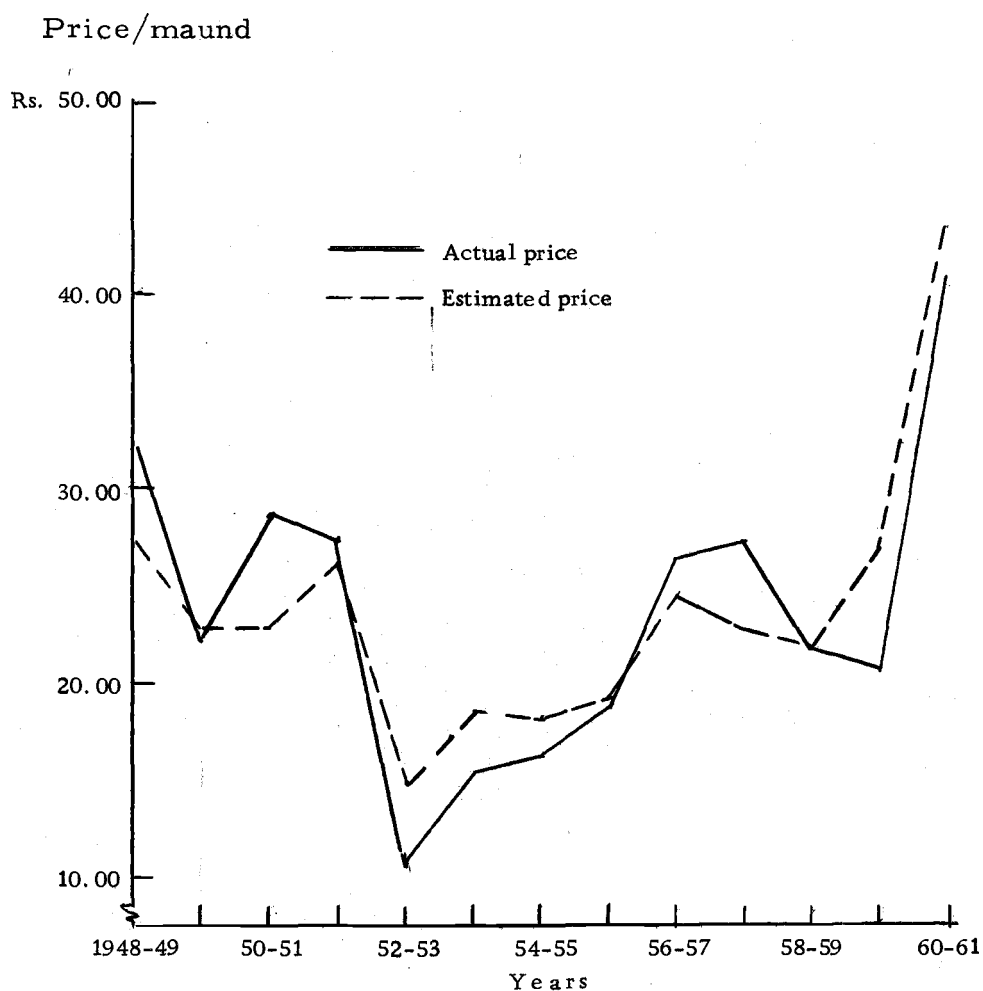


Figure 15.   Actual and estimated prices of jute (per maund)
             received by jute growers, Pakistan 1948-49 to
             1960-61.

Using the abbreviated Doolittle Method for the simultaneous solution of linear equations, the following values were computed:

$b_o$ = -.46255

$b_1$ = .72180  (t = 7.39227) [1]

$b_2$ = -.55645  (t = -.86931)

$b_3$ = .20895  (t = .38743)

$s$ = 3.18110

$R$ = .93888

$R^2$ = .88150

Both $b_2$ and $b_3$ were non-significant at the five percent level; thus they should not be included in the reduced model. However, for logical reasons, $b_2$ will be included in the reduced model, and the b- values, t- values, s, R and $R^2$ were recomputed as follows:

$b_o$ = 2.84956

$b_1$ = .73023  (t = 8.01988) [1]

$b_2$ = -.51570  (t = -.85383)

$s$ = 3.04291

$R$ = .93783

[1] Significant at the one percent level.

$$R^2 = .87952$$

The estimating equation derived from the reduced model is as follows:

$$\hat{Y} = 2.84956 + .73023 \, X_1 - .51570 \, X_2$$

Using the above equation, an estimated price was computed and is shown in Table 7. A comparison of the actual and estimated prices is shown in Figure 16.

## Model 3

The original mathematical model is as follows:

$$Y = B_o + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + e$$

where  $Y$ = Annual average price of loose jute at baling center, Pakistan 1948-49 to 1960-61.

$X_1$ = (Same as Model 2)

$X_2$ = National income of Pakistan at 1949-1952 price, 1948-49 to 1960-61.

$X_3$ = Annual production of jute in Pakistan, 1948-49 to 1960-61.

$X_4$ = Carryover of jute from previous year, 1948-49 to 1960-61.

$B_1$, $B_2$, $B_3$, $B_4$, = (Same as Model 1)

$e$ = (Same as Model 1)

$$R^2 = .87952$$

The estimating equation derived from the reduced model is as follows:

$$\hat{Y} = 2.84956 + .73023 X_1 - .51570 X_2$$

Using the above equation, an estimated price was computed and is shown in Table 7. A comparison of the actual and estimated prices is shown in Figure 16.

## Model 3

The original mathematical model is as follows:

$$Y = B_o + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + e$$

where  $Y$ = Annual average price of loose jute at baling center, Pakistan 1948-49 to 1960-61.

$X_1$ = (Same as Model 2)

$X_2$ = National income of Pakistan at 1949-1952 price, 1948-49 to 1960-61.

$X_3$ = Annual production of jute in Pakistan, 1948-49 to 1960-61.

$X_4$ = Carryover of jute from previous year, 1948-49 to 1960-61.

$B_1$, $B_2$, $B_3$, $B_4$, = (Same as Model 1)

$e$ = (Same as Model 1)

Table 7. Actual and estimated prices per maund of jute received by jute growers, and related variables affecting the prices, Pakistan, 1948-49 to 1960-61 (Appendix Table 3).

| Year | Y Price of jute received by growers per maund | | $X_1$ Average unit value of export per maund | $X_2$ Total jute supply [1] |
|---|---|---|---|---|
| | Actual | Estimated | | |
| | ---------- Rupee ------------ | | | million bales |
| 1948-49 | 32.31 | 29.28 | 44.99 | 12.36 |
| 1949-50 | 22.12 | 25.44 | 38.67 | 10.93 |
| 1950-51 | 28.69 | 25.45 | 37.29 | 8.96 |
| 1951-52 | 27.37 | 30.24 | 46.28 | 12.38 |
| 1952-53 | 10.69 | 11.41 | 21.61 | 13.98 |
| 1953-54 | 15.44 | 15.93 | 27.17 | 12.22 |
| 1954-55 | 16.02 | 17.74 | 27.62 | 10.21 |
| 1955-56 | 18.84 | 21.91 | 33.52 | 10.48 |
| 1956-57 | 26.36 | 23.30 | 36.80 | 12.43 |
| 1957-58 | 27.48 | 22.23 | 34.71 | 11.55 |
| 1958-59 | 21.70 | 21.20 | 35.01 | 13.97 |
| 1959-60 | 20.72 | 21.85 | 35.35 | 13.18 |
| 1960-61 | 41.00 | 42.15 | 61.36 | 10.65 |

Estimating Equation

$$\hat{Y} = 2.84956 + .73023 X_1 - .51570 X_2$$

Error of Estimate (s)                                    3.04291
Coefficient of Multiple Correlation (R)              .93783
Coefficient of Multiple Determination ($R^2$)      .87952

[1] Annual production and carryover in Pakistan and India.

Price/maunds
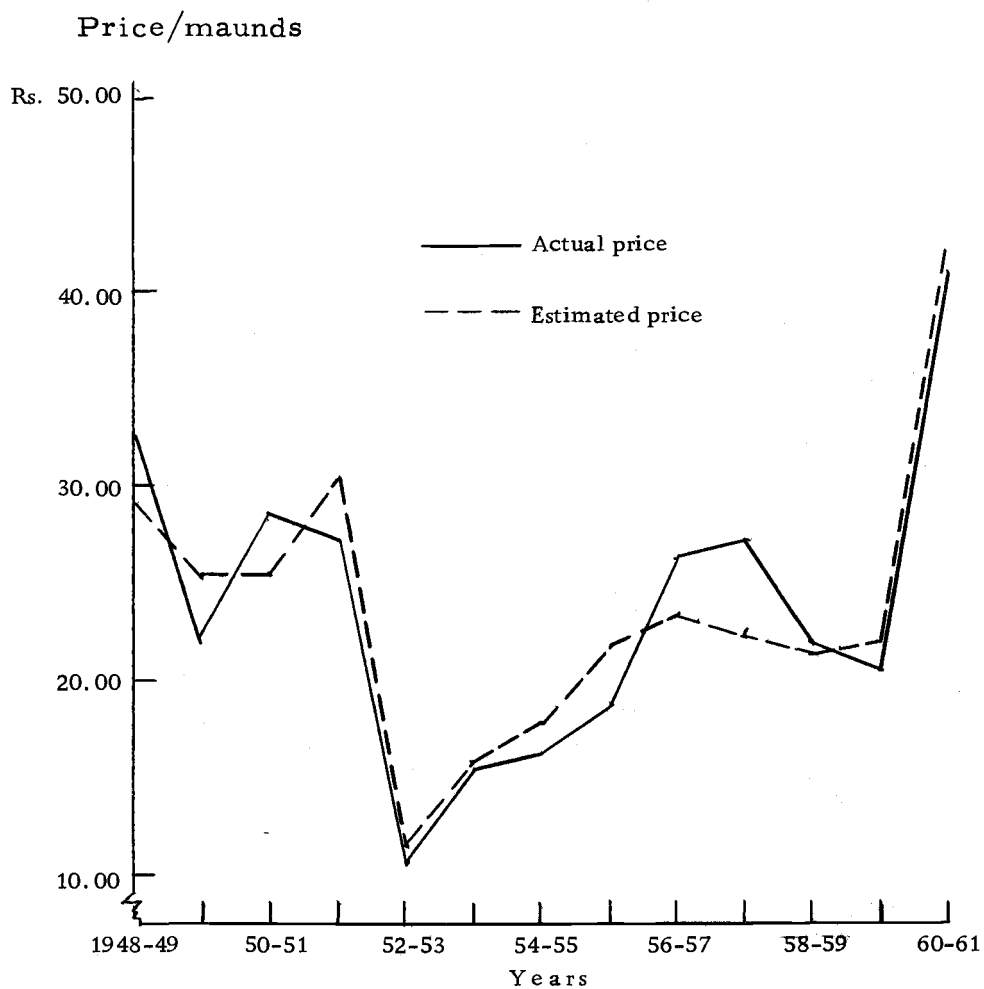


Figure 16. Actual and estimated prices of jute (per maund) received by jute growers, Pakistan, 1948-49 to 1960-61.

Using the abbreviated Doolittle Method for the simultaneous solution of linear equations, the following values were computed:

$b_o$ = -44.87834

$b_1$ = .98501    (t = 9.62592) [1]

$b_2$ = 1.37654    (t = 2.39336) [2]

$b_3$ = 1.00838    (t = .91770)

$b_4$ = 1.49412    (t = .86653)

s = 2.99535

R = .97136

$R^2$ = .94355

Both $b_3$ and $b_4$ were non-significant at the five percent level, thus they were not included in the reduced model.

Using only $X_1$ and $X_2$ in the reduced model is independent variables, the b- values, t- values, s, R and $R^2$ were re-computed as follows:

$b_o$ = -32.04780

$b_1$ = .93789    (t = 11.16166) [1]

$b_2$ = 1.20501    (t = 2.52948) [2]

s = 2.84841

R = .96757

$R^2$ = .93619

---

[1] Significant at the one percent level.

[2] Significant at the five percent level.

The estimating equation derived from the reduced multiple regression model is as follows:

$$\hat{Y} = 32.04780 + .93789\ X_1 + 1.201501\ X_2$$

From the above equation an estimated price was computed and is presented in Table 8. A graphic comparison of the actual and estimated prices is shown in Figure 17.

### Model 4

The original mathematical model is as follows:

$$Y = B_o + B_1 X_1 + B_2 X_2 + B_3 X_3 + e$$

where  $Y$ = Annual average price of jute at Calcutta, 1947-48 to 1960-61

$X_1$ = Annual average unit value of export price of jute and jute goods from India, 1947-48 to 1960-61.

$X_2$ = Carryover of jute from previous year, 1947-48 to 1960-61.

$X_3$ = Annual production of jute in India, 1947-48 to 1960-61.

$B_1$, $B_2$, $B_3$ = (Same as Model 1)

$e$ = (Same as Model 1)

Using the abbreviated Doolittle Method for the simultaneous solution of linear equations, the following values were computed:

Table 8. Actual and estimated prices per maund of loose jute at baling center and related variables affecting the prices, Pakistan, 1948-49 to 1960-61 (Appendix Table 3).

| Year | Y Price of loose jute per maund | | $X_1$ Average unit value of export per maund | $X_2$ National Income |
|---|---|---|---|---|
| | Actual | Estimated | | |
| | ----------- Rupee ------------- | | | 1,000 mill Rs. |
| 1948-49 | 32.40 | 30.34 | 44.94 | 17.0 |
| 1949-50 | 22.12 | 26.42 | 38.67 | 17.2 |
| 1950-51 | 30.31 | 24.90 | 37.25 | 18.3 |
| 1951-52 | 28.61 | 33.12 | 46.28 | 18.1 |
| 1952-53 | 11.63 | 10.49 | 21.61 | 18.5 |
| 1953-54 | 16.45 | 16.91 | 27.17 | 19.5 |
| 1954-55 | 18.65 | 17.81 | 27.62 | 19.9 |
| 1955-56 | 23.29 | 22.98 | 33.52 | 19.6 |
| 1956-57 | 29.42 | 27.61 | 36.80 | 20.9 |
| 1957-58 | 25.66 | 25.89 | 34.71 | 21.1 |
| 1958-59 | 23.42 | 26.06 | 35.01 | 21.0 |
| 1959-60 | 25.13 | 26.22 | 35.35 | 21.7 |
| 1960-61 | 54.51 | 52.67 | 61.36 | 22.6 |

Estimating Equation

$$\hat{Y} = -32.04780 + .93789 X_1 + 1.20501 X_2$$

Error of Estimate (s) 2.84841
Coefficient of Multiple Correlation (R) .96757
Coefficient of Multiple Determination ($R^2$) .93619

Price/maund
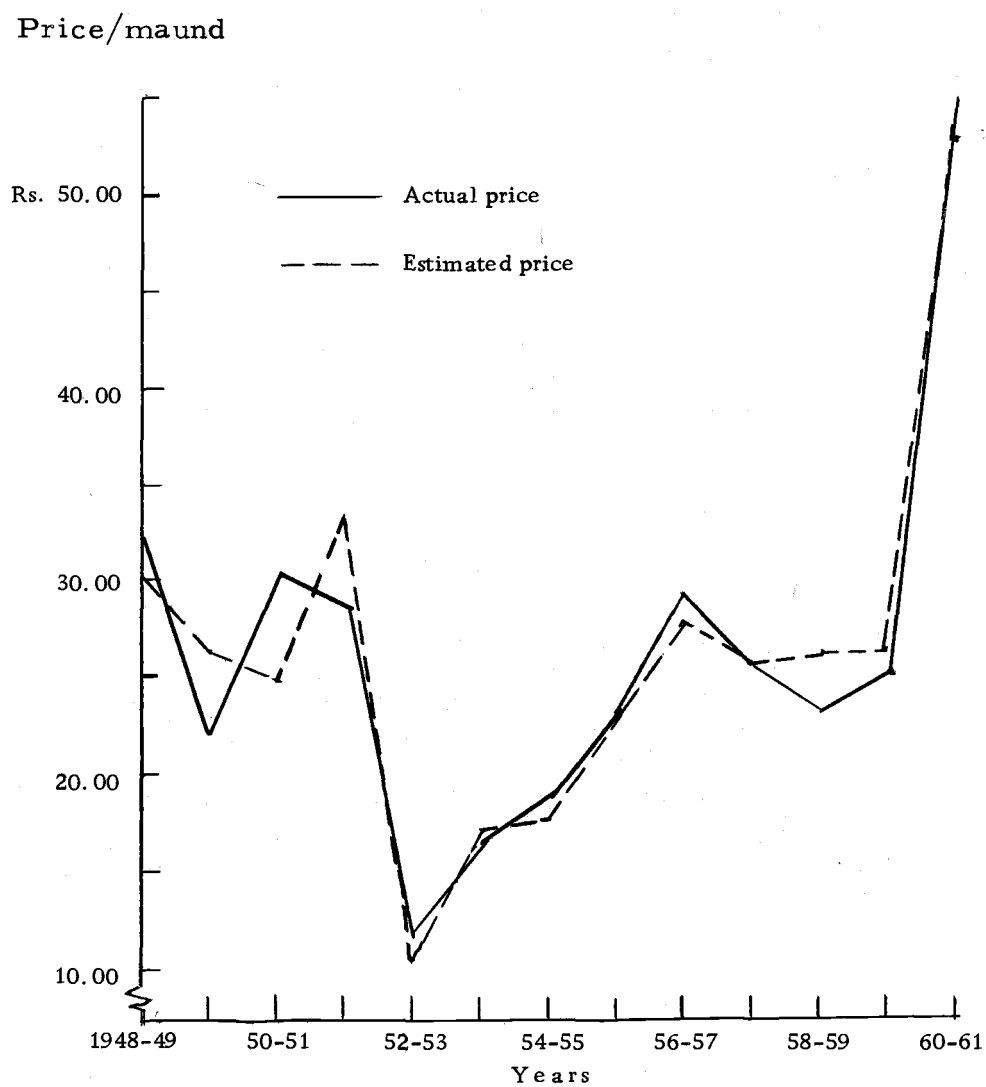


Figure 17. Actual and estimated price of loose jute (per maund)
at jute baling center, Pakistan 1948-49 to 1960-61.

$b_o$ =   38.31779

$b_1$ =     .32409      $(t = 3.28852)$ [1]/

$b_2$ = -11.01461      $(t = -2.02796)$

$b_3$ = -2.35225      $(t = -1.41492)$

s   =   6.16851

R   =     .84127

$R^2$ =     .70774

Both $b_2$ and $b_3$ were non-significant at the five percent

level, the t- values were high enough to retain them in the model.

The following estimating equation was derived from the ul-

tiple-linear regression model by substituting the b- values in the

place of the B- values and dropping the error term:

$$\hat{Y} = 38.31779 + .32409\ X_1\ -11.01461\ X_2\ -2.35225\ X_3$$

Using the above equation, the estimated price was computed

and presented in Table 9. A comparison of the actual and estimated

prices is shown in Figure 18.

Summary of Estimating Equations:

Model 1. This analysis indicates that about 79 percent of the

change in the price recieved by jute growers in Pakistan during

1948-49 to 1960-61 is explained by one independent variable

---

[1]/ Significant at the five percent level.

Table 9. Actual and estimated prices per maund of loose jute and related variables affecting the prices, Calcutta, 1947-48 to 1960-61 (Appendix Table 4).

| Year | Y Price of loose jute per maund | | $X_1$ Average unit value of export per maund | $X_2$ Carryover | $X_3$ Annual production |
|------|--------|-----------|--------|--------|--------|
| | Actual | Estimated | | | |
| | ---------- Rupee ------------- | | | ---- Million bales ----- | |
| 1947-48 | 36.12 | 34.27 | 50.84 | 1.50 | 1.66 |
| 1948-49 | 42.30 | 38.05 | 56.21 | 1.24 | 2.05 |
| 1949-50 | 37.36 | 43.07 | 54.76 | 0.52 | 3.09 |
| 1950-51 | 56.12 | 49.18 | 83.16 | 0.76 | 3.26 |
| 1951-52 | 50.90 | 53.58 | 112.28 | 0.92 | 4.68 |
| 1952-53 | 27.00 | 33.92 | 59.83 | 1.17 | 4.59 |
| 1953-54 | 29.30 | 34.84 | 53.41 | 1.21 | 3.13 |
| 1954-55 | 32.66 | 38.54 | 53.52 | 0.93 | 2.93 |
| 1955-56 | 30.18 | 34.33 | 48.71 | 0.89 | 4.20 |
| 1956-57 | 32.41 | 31.56 | 48.63 | 1.12 | 4.29 |
| 1957-58 | 29.68 | 20.90 | 43.89 | 1.10 | 4.05 |
| 1958-59 | 25.15 | 21.71 | 42.92 | 1.67 | 5.16 |
| 1959-60 | 33.07 | 27.40 | 42.14 | 1.24 | 4.60 |
| 1960-61 | 53.11 | 43.48 | 60.43 | 0.45 | 4.03 |

Estimating Equation

$$\hat{Y} = 38.31779 + .32409\ X_1 - 11.01461\ X_2 - 2.35225\ X_3$$

| | |
|---|---|
| Error of Estimate (s) | 6.16851 |
| Coefficient of Multiple Correlation (R) | .84127 |
| Coefficient of Multiple Determination ($R^2$) | .70774 |

Price/maund
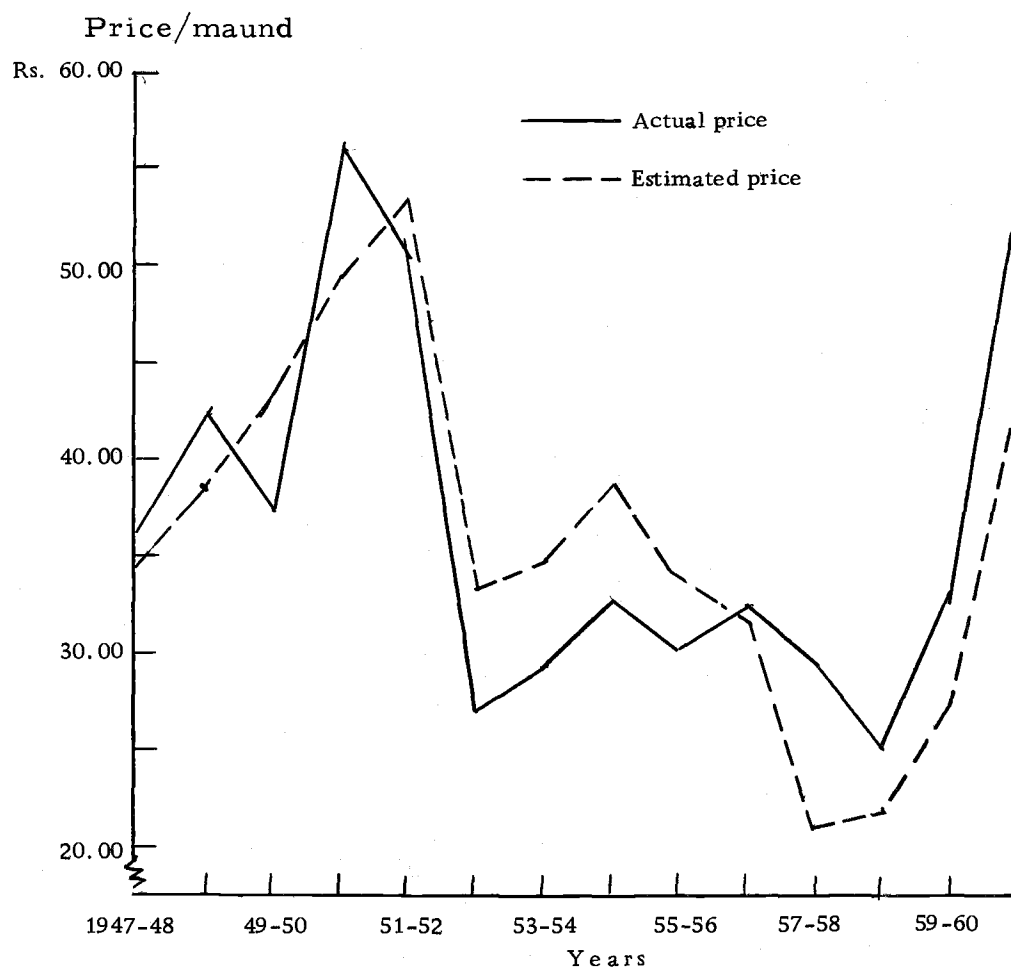


Figure 18.  Actual and estimated price of loose jute (per maund)
Callcutta, 1947-48 to 1960-61.

included in the estimating equation:

A change in one rupee per maund of the export price of jute,
f. o. b. price, considered by itself, was on the average accompanied
by a change in the same direction of about Rs. 0. 56 per maund in
the price received by jute growers.

Model 2.  This analysis indicates that about 88 percent of the
change in the price received by jute growers in Pakistan during
1948-49 to 1960-61 is explained by the two independent variables
included in the estimating equation:

A change in one rupee per maund of the average unit value
of export of jute and jute goods, considered by itself, was on the
average accompanied by a change in the same direction of about
Rs.  0. 73 per maund in the price of jute received by jute growers.

A change of one million bales of jute supply in Pakistan
and India, considered by itself, was on the average accompanied
by the change in the opposite direction of about Rs.  0. 51 per
maund in the price of jute received by jute growers.

Model 3.  This analysis indicates that about 94 percent of the
change in the price of loose jute at baling center in Pakistan during
1948-49 to 1960-61 is explained by two independent variables in-
cluded in the estimating equation:

A change in one rupee per maund of the average unit value

of export of jute and jute goods, considered by itself, was on the average accompanied by a change in the same direction of about Rs. 0.94 per maund in the price of loose jute at baling center.

A change in one thousand million rupee of the national income in Pakistan, considered by itself, was on the average accompanied by a change in the same direction of about Rs. 1.2 per maund in the price of loose jute at baling center.

Model 4. This analysis indicates that about 71 percent of the change in the price of jute in Calcutta during 1947-48 to 1960-61 is explained by the three independent variables included in the estimating equation:

A change in one rupee per maund of the average unit value of export of jute and jute goods, considered by itself, was on the average accompanied by a change in the same direction of about Rs. 0.32 per maund in price of jute in Calcutta.

A change in one million bales of carryover of jute, considered by itself, was on the average accompanied by a change in tne opposite direction of about Rs. 11.01 per maund in the price of jute in Calcutta.

A change in one million bales of jute production in India, considered by itself, was on the average accompanied by a change in the opposite direction of about Rs. 2.35 per maund in the price of jute in Calcutta.

## Summary and Implications

The study of relevant economic factors affecting the price of jute was limited because of a lack of adequate time series data. In price analysis, several other factors could be of some importance in explaining variations. Some of these are government regulations of price and monetary and fiscal policies.

The most important factor influencing the domestic price of jute was the export price of jute and jute goods, or in other words, the demand from foreign markets. The change in demand or export price was statistically significant and explained a considerable amount of the variation in the domestic price of jute. The other variable considered in Model 4, carryover in India, was not quite significant but was included anyway, because it was of some importance in explaining price. The national income in Pakistan variable also was significant as shown in Model 3, but did not have much impact on the price of jute. Annual production in both Pakistan and India could have been omitted in the analysis because this variable was not significant. [1]

[1] Logically, changes in jute production in Pakistan and India should have significant effect in the price of jute. These two countries produce nearly 80 percent of total world jute production. However, statistical analysis during the period covered shows that annual production has little impact on prices. This lack of relationship may be due to deficiencies in the data or other factors.

Implications drawn from a supply and demand analysis are based on the assumption that the supply and demand functions are inelastic (computed average elasticity of supply was .30 and -.80 for the average elasticity of demand). It is assumed that these elasticity coefficients are satisfactory estimates of the true price-quantity relationships in both cases. The inelasticities of supply and demand suggest a serious problem in terms of fluctuation in price of jute.

The relatively inelastic demand for jute is a serious problem facing jute producers, because the fluctuation in supply in the short-run tend to be reflected in drastic price fluctuations. Successful attempts to stabilize demand in the short-run as well as supply will stabilize price. However, even moderate fluctuations in demand and, or supply generate relatively large fluctuations in price. Stabilization policies are easy to recommend but difficult to implement.

CHAPTER V

JUTE PRODUCTION IN THAILAND

A brief survey on jute production and jute consumption in
Thailand will give some fundamental background in determining
the feasibility of jute production in the future. The main features
of this chapter will be to examine gunny bag consumption, and
consider the factors which may influence jute production in the
future.

### Area and Production

Jute and kenaf have been known to the people in some areas
in the central and northeast parts of Thailand for a long time, for
use as rope and twine. Jute production has increased slightly with
the expansion of domestic demand for rope and twine. During the
last ten years jute and kenaf production has increased as a conse-
quence of the increased demand both for domestic consumption
and export. Since the first gunny factory was established in 1951,
jute consumed by gunny industry has shown a slight increase. The
amount of exports was relatively small and fluctuated considerably
from year to year due to the fluctuation of jute supply in the world
market. During the last decade demand has rapidly increased both

from local gunny bag factories, which have increased from one to three factories, and also from abroad.

In recent years kenaf and jute have become important commodities in the country. The area planted to jute and kenaf during the last ten years are shown in Table 10.

Table 10 shows that the area planted to kenaf and jute remained relatively stable in the period before 1956, where the variations in annual production were not sizeable. After 1955, the area of production fluctuated and notable increases occurred between 1957 and 1960. Planted area of kenaf rose from 78 thousand rais in 1957 to 877 thousand rais in 1960, and area planted to jute increased from 12 to 26 thousand rais during the same period. From 1960 to 1961, the area of kenaf and jute production doubled, going from 877 thousand rais to 1,720 thousand rais for kenaf and from 26 to 66 thousand rais for jute.

The expansion of production of kenaf greatly increased in the plateau area of the Northeastern part of the country, namely the provinces of Chaiyapoom, Nakorn Rajsima, Mahasarakam, Roi-et, Khonkaen, Kalasin and Ubol. Jute is grown mainly in the central part of the country where the elevation is low and there is rich alluvial soil. The most important provinces are Ayuthya and Nakorn Sawan (35, p. 30-31.

Table 10.  Area planted to kenaf and jute in Thailand, average
           1950-55, 1956 to 1961.

|              | Number of rai planted | |
| Year         | kenaf | jute |
| --- | --- | --- |
|              | -------- 1,000 rai ------------ | |
| Average  1950-55 | 56 | 13 |
| 1956         | 109 | 16 |
| 1957         | 78 | 12 |
| 1958         | 127 | 13 |
| 1959         | 278 | 17 |
| 1960         | 877 | 26 |
| 1961         | 1,720 | 66 |

Source:  (33, p. 69, 71).

Table 11 shows total production and yield per rai of kenaf
and jute.  Production of kenaf increased from 21 thousand metric
tons in 1957 to 181 thousand metric tons in 1960, and nearly 400
thousand metric tons in 1961.  Jute production has also shown

Table 11.  Production and yield per rai of kenaf and jute,
           Thailand,  average 1950-55, 1956 to 1961.

|              | Production | | Yield per rai | |
| Year         | kenaf | jute | kenaf | jute |
| --- | --- | --- | --- | --- |
|              | -- 1,000 metric tons -- | | --------- Kg. --------- | |
| Average 1950-55 | 17.0 | 2.0 | 124.0 | 151.0 |
| 1956         | 17.0 | 2.5 | 157.4 | 178.6 |
| 1957         | 21.0 | 2.8 | 272.7 | 233.3 |
| 1958         | 29.6 | 2.9 | 233.1 | 223.1 |
| 1959         | 50.0 | 3.9 | 180.5 | 229.4 |
| 1960         | 181.3 | 6.2 | 208.4 | 238.5 |
| 1961         | 339.3 | 11.6 | 201.8 | 184.1 |

Source:  (33, p. 68, 71).

great increase, going from nearly three thousand metric tons in 1957 to nearly 12 thousand metric tons in 1961. Two causes are mainly responsible for this tremendous increase in production; area and yield  While area of production steadily increased in only a few years, yield per rai fluctuated from year to year  Fluctuations in yield are largely due to weather condition, and the effect of new expansion of planting area.

The causes of rapid increase in production during the last few years can be explained by several factors. The most important is price. Increase in prices in the world market stemmed from crop damages in Pakistan and India during 1959-60 and 1960-61, resulting from adverse weather conditions. Therefore, shortage of jute occurred in jute manufacturing countries. The depletion of supplies and fear of a shortage of new crop pushed prices up to a very high level, the highest since World War II. The price of jute in Bangkok increased from 2.32 baht per kilogram in 1958 to 2.46 baht in 1959. Price rose to 3.57 baht and 3.98 baht per kilogram in the second and the fourth quarter of 1960. In the first quarter of 1961, the price was at a record high of 5.41 baht per kilogram (47, p. 35).

Changes in price has had a tremendous effect on kenaf and jute production  Growers try to take advantage of high prices by

expanding the area of production as much as they could. Also jute

dealers encourage production hoping to make a profit from high

prices, and several measures taken by the government to encourage

production. These factors resulted in a great increase in jute pro-

duction, which brought Thailand from the unknown ranks in kenaf

and jute production to rank third in the world in production

When the new crop reached the market in the last quarter

of 1961, coupled with a favorable crop in many countries, the

price of jute dropped suddenly. Prices of raw jute in Dundee,

Scotland dropped from £209 to £129 per ton in the same year

(10, p. 185). Price of jute in Bangkok also declined as the world

jute situation returned to a normal level. Price of jute per kilo-

gram dropped from 5.41 baht in March to 2.55 baht in December,

1961. After this sudden decrease in price, it was estimated that

planted area of kenaf and jute in 1962 dropped about 50 percent

from 1961

Changes in price of raw jute considered together with changes

in area and production explain much of the increase in jute produc-

tion in Thailand.

Several other factors could affect the area planted to kenaf

and jute, such as, weather conditions and government regulation

on clearing land. It, however, appears that price of raw jute

which the farmer received in the previous season is the most important factor in determining production.

## Jute Disappearance

The annual production of jute is mainly distributed for domestic consumption and export. Domestic consumption is largely consumed by the gunny bag industry, and a relatively small amount goes for other purposes.

Table 12 shows amount of jute exported and consumed by gunny bag factories. Jute exports from Thailand have expanded

Table 12. Export and value of jute and kenaf and amount consumed by gunny bag factories, Thailand 1955 to 1962.

| Year | Consumed by gunny bag factories [a] | Export [b] | Value of Export [c] |
|---|---|---|---|
| | --- Metric tons --- | | -- Mill. baht -- |
| 1955 | 3,625 | 2,936 | 8.5 |
| 1956 | 4,924 | 5,859 | 18.6 |
| 1957 | 4,993 | 14,761 | 46.1 |
| 1958 | 6,325 | 27,642 | 69.4 |
| 1959 | 7,084 | 37,317 | 88.3 |
| 1960 | 9,629 | 61,769 | 230.0 |
| 1961 | 12,379 | 143,477 | 626.5 |
| 1962 [1] | 6,359 | 141,605 | 357.4 |

[1] January - June

Source: a/ 1955-56 (34, p. 48)   b/ (33, p. 114)   c/ (47, p. 31)
1957-62 (47, p. 30)

remarkably in recent years. Exports steadily increased between 1955 and 1962. In 1961 export of jute rose to a record level of 143,477 metric tons as compared with 61,769 metric tons in 1960 and 37,317 metric tons in 1959. In the first six months of 1962, jute export already amounted to 141,605 metric tons. It is therefore expected that the total export of jute in 1962 will again register a new high record.

Value of exports increased from 8.5 million baht in 1955 to 230 and 626 million baht in 1960 and 1961, respectively. It was observed that the tonnage exported during the first six months of 1962 nearly equaled 1961, but the value was relatively low when compared with the previous year, due to the decline in the price of jute.

Most of the jute was exported to Belgium, Italy, Japan, Germany, United Kingdom, Burma, Vietnam, Hongkong and the United States. However, in 1961 exports had expanded significantly to countries such as India, Burma, and other European countries (34, p. 42-44)

Most of the low grade fibers were utilized by gunny bag factories, while good grades were exported. The amount of jute consumed by gunny bag factories increased every year from nearly four thousand metric tons in 1955 to 12 thousand metric tons in

1962. The amount of consumption, however, has not kept pace with

the rate of increase in total production. The limited production

capacity of the factories is the major factor limiting jute consump-

tion.

The uses for other purposes was estimated at about 0.6,

1.0, 1.5 thousand metric tons in 1959, 1960 and 1961. Therefore,

a considerable amount of stock of jute at the end of the year was

estimated amounting to approximately 9, 39, and 317 thousand

metric tons at the end of 1959, 1960 and 1961 (45, p. 20; 46, p. 14).

### Gunny Bag Consumption in Thailand

Thailand consumed a considerable amount of gunny bags

for packaging agricultural products, both in domestic trade and

for export. Limitations involved in agricultural production make

bulk handling and packaging impractical. Therefore, demand for

gunny bags is closely related to the volume of agricultural produc-

tion.

Table 13 shows the annual consumption of gunny bags.

Even though the amount consumed varied every year, the trend is

upward. Approximately 30 million bags were consumed annually,

except 1961, which set a new high record of about 34 million bags.

The changes in consumption from year to year could be

explained by two main factors. First, consumption within the country which requires bags for all commodities from paddy to charcoal, from producer to final consumer need replacement in some years. Therefore, the amount of consumption varies as a cycle of replacement exists. Second reason is that the gunny bags used in packaging for export vary in proportion to the quantity of goods exported. For export purposes, the bags can serve only one trip; therefore, the annual consumption varies with the amount of export of rice, corn and other products.

Table 13. Import, production and consumption of gunny bags, Thailand 1955 to 1961.

| Year | Import [a] | Production [b] | Total consumption |
|------|--------|------------|-------------------|
| | ------------ Million bags ------------ | | |
| 1955 | 25.1 | 2.9 | 28.0 |
| 1956 | 16.5 | 3.6 | 20.1 |
| 1957 | 29.2 | 4.0 | 33.2 |
| 1958 | 17.7 | 4.5 | 22.2 |
| 1959 | 19.7 | 5.0 | 24.7 |
| 1960 | 21.2 | 6.8 | 28.0 |
| 1961 | 25.3 | 8.8 | 34.1 |

Source: [a] 1955-1956 (34, p. 50)     [b] 1955 (34, p. 50)
        1957-1961 (47, p. 41)         1956-1961 (47, p. 36)

Most gunny bags requirements are met by import. Both new and used bags are mostly imported from India and Pakistan with some coming from Singapore and Hongkong. The value of gunny bag imports not only depends on the amount consumed but

also prices from countries of origin. The average annual value of gunny bags imported was about 133 million baht during 1950 to 1960, and nearly 200 million baht in 1961 (33, p. 126).

## Gunny Bag Industry in Thailand

The development of gunny bag factories in Thailand was started in the last decade. The three gunny bag factories now in operation have a capacity of production of about 10 million bags annually. Two new factories with a capacity of production of 17 million bags, will be operating in the near future.

The first three factories have been operated from the beginning of the industry. The factories produce only gunny bags. The quantity produced has increased annually from three million bags in 1955 to nearly nine million bags in 1961. The consumption of raw jute (with approximately 1.4 kilograms per one bag) increased in proportion to output, going from four thousand tons in 1955 to 12 thousand tons in 1961.

There are problems, both technical and economic, facing the gunny bag industry. Unless these problems are overcome, the ultimate aim to be self-sufficient in bag consumption can not be realized. The major problem of the existing factories which are operating is cost per unit of output. The high cost of

production directly affects the price of gunny bags. During 1955-1957, the price per gunny bag produced in these three factories was about 8.98 baht. The price of imported gunny bags from India was only 6.04 baht during the same period (34, p. 49).

The high cost of production can be explained by several factors. The first is the lack of full utilization of machinery. The full capacity is ten million bags, but production amounted to only five million bags during 1955 to 1959. In other words, the machinery and plant were utilized only at half of capacity. Undoubtedly, this increases the cost per unit, or average cost.

The reasons for low capacity are technical and lack of raw material. On the technical side, most of the machines are worn out and obsolete. All three sets of machines had been utilized in other countries before being installed in Thailand. To produce at full capacity, therefore, it is necessary that up-to-date machinery be obtained and some may be repaired. On the raw material problem, the factories do not have enough capital to stock raw kenaf requirements through the year. Except the last few years, the factories have been operated during the jute harvesting season. This also creates a problem in labor.

The other important problem is the quality of gunny bags. The quality of gunny bags produced within the country is relatively

low when compared with the imported gunny bags. The low quality is caused by the low efficiency of machinery as well as the quality of raw materials.

Therefore, the two important characteristics of gunny bags produced in Thailand are costs and quality. With a view to attaining a competitive position with foreign countries, the gunny bag factories must embark on schemes of modernization, or improve the existing machinery to enable them to produce at lower average cost. To insure an adequate supply of raw material for the factories to produce throughout the year, enough capital must be available to purchase raw materials. Sufficient capital not only provides enough raw material but also provides more opportunity to obtain good quality raw material at lower prices during the harvesting season. When the buying of raw material is competitive with other buyers, adequate capital seems to be the most important factor. With regard to the quality of gunny bags, the quality of kenaf must be improved immediately. This matter will be discussed in more detail later.

When these problems are overcome coupled with the plan for expansion in production and the two new factories are in operation, much can be expected from the industry. It is estimated that the production of gunny bags can be 44 million annually

(47, p. 37). At this quantity, the program to attain self-sufficiency

in gunny bag consumption would be possible.

## Government Policies in Gunny Bag Importing

Many attempts have been made by the government to regu-

late gunny bag importing. The purpose has been to stabilize price

of gunny bags, and to some degree to subsidize the domestic gun-

ny bag industry.

The changes in price of gunny bags affects both domestic

and export activities, producers as well as exporters. During the

last ten years, price of gunny bags has fluctuated widely due to

the price of raw materials, also profit speculation by importers

created problems that affected the overall economy.

Gunny bag imports have been controlled by the government

since 1953. The importers need permission from the government

to import gunny bags. The regulations have been changed fre-

quently, according to the situation. During the last few years,

such changes have been aimed at protecting the gunny bag industry.

One outstanding regulation is to establish the ratio of imports by

allowing gunny bag importers to import gunny bags at any amount,

but they must buy a fixed amount of gunny bags produced within the

country under an established ratio. For example, the ratio in 1953

was one to three. That means the importer must buy one gunny

bag produced within the country for three units imported. The

ratio can be changed. This procedure was withdrawn in 1960 be-

cause of the shortage of gunny bags. The quota system has been

employed instead of fixing the ratio. The objectives of government

control have been to stabilize price and supply, as well as to stimu-

late domestic gunny bag production. Since August, 1962, import-

ing, selling and pricing of gunny bags have been entirely controlled

(47, p. 40-42).

### The Possibility of Jute Production

An attempt to consider the possibility of jute production in

Thailand seems to be complicated by several problems. There

are two important factors to be examined which are production and

demand. Each of these has its own characteristics and determi-

nants. The best way to determine the possibility is to explore the

relevant factors affecting production and demand.

### Production

The production of jute, like any other crop, can be increased

either by increasing its area or by raising yield per rai, or both.

During the last few years the area of production has been expanded

rapidly. The expansion has been largely the utilization of new
area. This practice, undoubtedly will destroy some of the nation's
forest resource and violate some regulations. It is the aim of
the government to prohibit such practice and to place land clearing
and development under strict control. Therefore, increases in
jute production by expanding area is generally impossible. If the
area can not be increased very much and increased production is
yet required, some other plans must be explored and exploited to
reach the goal. The most sensible plan is the improvement of old
land and increasing yield. Both involve the employment of such
factors as the use of fertilizer, seed improvement and pest and
disease control. The other facilities should be provided, the most
important one being credit.

## Quality

The quality of jute in Thailand, as mentioned before, is
rather low. This is largely due to insufficient water for retting.
Most of the jute production or kenaf is grown in the Northeastern
region where water is scarce. A shortage of water for retting
could be overcome by the construction of retting ponds and re-
excavation of the old canals which have either silted up or are not
of sufficient size. The quality of jute also can be improved through

seed improvement and better methods of production.

Improvement in quality will be of little consequence unless marketing is improved. Such improvement includes grading and price information. Jute growers in Thailand, like growers of all other crops, have little or no idea of the principles underlying grading. They usually sell their raw jute in ungraded condition. The price they receive depends completely on the buyer. Therefore, the growers lose heavily by deliberate underestimation of the quality of their fibers by the buyers. Thailand's grading system should be based on that followed in international trade. In order to establish a suitable basis for commercial grading, these criteria should be considered; color, length, luster, cleanliness, proportion of root and strength. After grades are established, the public should be informed as to the disadvantages of selling raw fibers in ungraded condition. At the same time, price information should be improved, then the growers can fully realize the benefits of a grading system.

Prices

The effects of price on production was considered in earlier sections. How much the jute grower responds to price change may be the solution to explaining the change in production. Therefore,

any attempt to expand jute production without improving the price

may be impossible. There are several factors which ultimately

determine the price of raw jute. The most important are supply

and demand. Supply was considered in the previous section. De-

mand, both export and domestic, is briefly considered at this

time.

Jute from Thailand must compete with jute from Pakistan

and other exporting countries. It has already been stated that

most jute produced in Thailand is of low quality. The possibility

for Thai jute to compete in the international markets appears dim.

Improvements in quality are essential and this will take consider-

able time. However, even if Thailand can improve both produc-

tion and quality, other considerations are cost of production, the

comparative advantage in income to growers from other alternative

crops, and export prices with a view to competing with other coun-

tries.

Domestic consumption of jute probably is the ultimate solu-

tion of jute production in Thailand. The annual consumption of

gunny bags and its industries have been considered. An increase

in gunny bags consumption can be expected, which means jute con-

sumption will increase in the same proportion. In 1961 more than

12 thousand metric tons of raw jute were used for producing nearly

nine million bags. It was estimated that five jute factories can

produce 44 million bags. With the amount of raw jute used for

one bag being approximately 1.4 kilograms, this means about 62

thousand metric tons of raw jute can be consumed in the country.

This amount would absorb only about one-seventh of jute produc-

tion in 1961. However, during a normal year the highest produc-

tion was less than 50 thousand metric tons. Therefore, with a

little encouragement by government, jute production can be stabi-

lized to meet demand of domestic gunny bag industry.

How much should the price of raw jute be? It depends

partly on demand for domestic consumption, and partly on demand

for export. Changes in production are greatly influenced by price

of raw jute in the world market. Therefore, whatever the en-

couragements in jute production for home consumption or for ex-

port, price of raw jute will largely depend on price in the world

market. Price policy should be based on such factors as jute pro-

duction and activity in the gunny bag industry, as well as in the

world market.

In summary, several factors seem to be involved in the

possibility of jute production in Thailand. Increase in production

can be accomplished by increasing area of production, yield per

rai, quality of fibers and change in some instances. How much

jute production can be increased depends on both demand for export and for home consumption. It would be too risky to increase jute production for export only. With respect to the domestic gunny bag manufacture, only a limited amount of increase in raw jute production is required. The possibility for increase depends on price of raw jute, which must be considered from both the internal and external points of view.

CHAPTER VI

CONCLUSION

Prospects of Supply of Jute

It is not easy to consider the supply of jute in the future,

since changes in production are determined by several factors.

For the major jute exporting countries, world demand for jute

seems to be the most important factor. For the minor jute pro-

ducing countries, where jute production expanded because of the

high price of raw jute in the world market and from a spirit of

national self-sufficiency for jute consumption, comparative costs

must be considered.

After the crisis in the jute market in 1960-61, a number of

countries are trying to expand jute production. Governments at-

tempt to encourage jute production in order to contribute to the

diversification of agriculture through the introduction of an addi-

tional cash crop with a ready market, providing a basis for creat-

ing or expanding a manufacturing industry capable of absorbing

surplus labor, and finally, as a means of saving foreign currency

through the substitution of domestically grown or manufactured

fibers for imported products, or earning it through exports of

high grade fiber unsuitable for spinning locally. Government en-

couragement ranges from technical assistance to the payment of

guaranteed prices to growers. Jute production programs have

been set up in many countries. Pakistan hopes to increase jute

production to 1.3 million tons by 1965, about a 91 percent increase

over 1962 (24, p. 84). The Third Indian Five-Year Plan also aims

at a jute production of 1.06 million tons in 1966, this means an in-

crease of 15 percent over the 1961 season (41, p. 4). Further

expansion in jute production has been encouraged in several other

countries such as Burma, Taiwan, Brazil and South Vietnam.

How much those countries can expand their production seems to

depend on the price of raw jute received by jute growers. It was

estimated that by 1970 total jute production in the world (excluding

centrally-planned countries) will increase to 2.77 to 2.97 million

tons, or an increase of about 33 to 54 percent over the 1960-61

season (19, p. II-79).

Jute supply in the future depends on current

production in jute producing countries, where production has ex-

panded rapidly with a rise in jute prices. In the future, when

jute production returns to a normal level, and price declines to

lower levels, no one can predict whether jute production will in-

crease or not.

## Prospects of Demand for Jute

Jute consumption in industrial countries has declined slightly as a result of technological developments. However, jute consumption in primary producing countries has increased rapidly due to the expansion of agricultural production. The growth in demand for jute, therefore, is related to the growth in population and income, since the growth in agricultural production is related to the national income. It is, therefore, necessary to predict the demand for jute in the future within the framework of economic development and on the basis of stated assumptions as to future rates of growth in population and per capita income, further assuming that the price of jute products will remain at reasonable levels. Under these assumptions, jute consumption in less-developed countries will show a steady increase.

An expansion of jute production is most likely in the major jute consuming countries. The increase in demand, therefore, will be mainly met by jute produced within the country more than by import. It was estimated that the amount of imports related to consuming countries will decline slightly in the next ten years. Any substantial expansion in jute production would, however, on the basis of the above assumptions, result in a significant

weakening in the world jute market (19, p. II 78 - II 80).

## Price Stabilization

Both supply and demand for jute in the short run are relatively inelastic. Variations in supply and/or demand tend to be reflected in severe price fluctuations. A large crop thus, results in a relatively low, and a small crop in a relatively high price. Methods to stabilize price of jute should be considered.

Thomsen characterized price policy into the following types (37, p. 202):

> (1) those designed to adjust production to demand;
> (2) those designed to regulate the flow of commodities into consumption channels in order to stabilize or hold up prices sometimes called 'controlled distribution'; (3) those intended to increase the demand for specific farm products; and (4) those directed toward reducing the marketing charges deducted from consumer expenditures for farm products and their derivatives.

From the above characteristics of price policy, therefore, any action taken along these lines will help to stabilize price. Prospects for price stabilization fall in the framework of considering production adjustment or production control, distribution control, increased demand, and reduced marketing charges.

Production control was directly employed in Pakistan between 1940 and 1960 through acreage licensing. It proved largely

ineffective because jute growers consistently overplanted their al-
lotments. The method of fixing minimum price of jute which is in-
direct control of jute production was exercised in both India and
Pakistan and several other countries. It also was completely in-
effective, largely because of the lack of funds to administer the
program.

Controlled distribution and an attempt to reduce the impact
of price speculation on the market was started in both India and
Pakistan during 1962, by developing a buffer stock operation pro-
gram, in such a way as " to keep the fluctuations of prices within
a range of 10 percent either way" (22, p. 18).

An international buffer stock agency was formed to stabilize
the price after World War I. The stated purposes of this operation
were to create a more stable condition in the production of storable
raw materials, in the income of producers, and in the cost to final
consumers. It operates by purchasing products when the market
is weak and releasing them when the market is strong. A success-
fully operated buffer stock program would reduce fluctuations in
price largely by eliminating the speculative element present at all
stages of marketing. At the present time, tin is the only inter-
national commodity arrangement making use of buffer stocks.
There are, however, a number of international commodities

agreements for such products as coffee, rubber, beef, wheat and rice. Some of those agreements arose out of private arrangements, but mostly through government support. The most important feature of the agreements is export quotas (22, p. 18; 28, p. 77-86).

The operation of a buffer stock program in any country, and especially in less-developed countries is difficult. There are problems involving both financial and technical consideration. Furthermore, it is difficult for any one nation to control the price of an international commodity such as jute, where prices are determined on the world market. Without cooperation from other countries, such a program can not be effective.

Buffer stock operations for jute on an international basis should be considered to solve the problem of price fluctuations. There are problems facing jute buffer stock operation. These problems include: homogeneity of products, administration, price level, and financial problems (28, p. 90-91).

The stabilization of price of jute by a single program must be considered as ineffective. Supply and distribution control, reducing price speculation and expanding demand for jute should all be considered together for developing effective price stabilization programs. Policies to stabilize demand and supply both indirectly

and directly in the important jute producing countries should be
employed to some extent. Jute manufacturing countries which re-
quire the bulk of raw jute for stock could stabilize price to some
degree, as well as reduce the impact of speculation within the
country. Development of new uses for jute should be done in
every producing countries and at the international level. The ten-
dency to use less jute for packaging must be offset if at all possible
by an increased demand for new uses to compensate for the loss in
existing uses. Methods for stabilizing price should be considered
at both the national and international level. Programs in indivi-
dual producing countries together with international agreements
and buffer stocks could stabilize price of jute to some degree.
The success of such programs depends entirely on the coordination
and cooperation and fuller exchange of information at all stages
between the producers of raw jute and the consumers. Further
studies dealing with demand, supply and cost of production in dif-
ferent countries should be done. More information in the jute in-
dustry is badly needed in order to develop effective international
programs. Successful programs in price stabilization will give
mutual benefits to all involved countries.

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APPENDIX

Table 1. World production of jute and allied fibers 1955-56 to 1961-62.

| Country | 1955/56 | 1956/57 | 1957/58 | 1958/59 | 1959/60 | 1960/61 | 1961/62[1] |
|---|---|---|---|---|---|---|---|
| | ------------------- Million metric tons --------------------- | | | | | | |
| Pakistan - Jute [2] | 1.01[3] | 0.99 | 1.03 | 1.08 | 0.97 | 1.01 | 1.26 |
| India - Jute | 0.76[3] | 0.78 | 0.74 | 0.94 | 0.82 | 0.72 | 1.13 |
| - Mesta | 0.21 | 0.27 | 0.23 | 0.27 | 0.20 | 0.20 | 0.31 |
| Thailand- Jute | -- | -- | -- | -- | -- | 0.01 | 0.01 |
| - Kenaf | 0.01 | 0.02 | 0.02 | 0.03 | 0.05 | 0.08 | 0.14 |
| Nepal - Jute | 0.04 | 0.04 | 0.04 | 0.04 | 0.05 | 0.05 | 0.05 |
| Taiwan - Jute | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 | 0.02 | 0.01 |
| Other Far East | -- | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 |
| Total Far East | 2.05 | 2.11 | 2.08 | 2.39 | 2.12 | 2.10 | 2.93 |
| Brazil - Jute | 0.02 | 0.03 | 0.03 | 0.03 | 0.03 | 0.04 | 0.05 |
| - Quazima | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.01 |
| - Malva | | | | | | | |
| Africa | 0.02 | 0.01 | 0.01 | 0.02 | 0.02 | 0.02 | 0.02 |
| Other Countries | -- | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| World. excluding Sino-Soviet area | 2.11 | 2.19 | 2.15 | 2.47 | 2.20 | 2.18 | 3.02 |
| China - Mailand | 0.26 | 0.26 | 0.30 | 0.30 | 0.39 | 0.36 | 0.37 |
| USSR [4] | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 0.04 | 0.05 |
| Others [4] | -- | -- | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Total Sino-Soviet Area | 0.29 | 0.29 | 0.34 | 0.35 | 0.44 | 0.41 | 0.43 |
| World Total | 2.40 | 2.48 | 2.49 | 2.82 | 2.64 | 2.59 | 3.45 |
| of which: Jute[4] | 1.91 | 1.93 | 1.92 | 2.19 | 2.00 | 1.93 | 2.61 |
| Kenaf and other Allied fibers [4] | 0.49 | 0.55 | 0.57 | 0.63 | 0.64 | 0.66 | 0.84 |

[1] Provision

[2] Includes some 30-40.000 tons of Mesta annually.

[3] Official crop forecasts.

[4] Partly estimated.

Source: (41. p. 7).

Table 2. Area and yield under jute and allied fibers in selected countries, 1955-56 to 1961-62.

| Countries | | 1955/56 | 1956/57 | 1957/58 | 1958/59 | 1959/60 | 1960/61 | 1961/62 [1] |
|---|---|---|---|---|---|---|---|---|
| Area | | ---------------- Thousand hectares -------------------- | | | | | | |
| Pakistan [2] | - jute | 661 | 498 | 632 | 618 | 556 | 614 | 834 |
| India | - Jute | 704 | 772 | 705 | 733 | 682 | 619 | 914 |
| | - Mesta | 231 | 297 | 309 | 334 | 285 | 281 | 385 |
| Taiwan | - Jute | 15.0 | 13.6 | 6.8 | 12.6 | 17.9 | 16.3 | 12.0 |
| Thailand | - Kenaf | 8.3 | 17.2 | 12.3 | 20.3 | 44.3 | 139.2 | -- |
| Brazil | - Jute | 21.5 | 26.0 | 27.1 | 25.8 | 23.8 | 25.9 | 36.2 |
| Yield | | ------------------ 100 kg. per hectare ------------------------ | | | | | | |
| Pakistan | - Jute | 15.3 | 20.1 | 16.4 | 17.6 | 17.5 | 16.6 | 15.2 |
| India | - Jute | 10.8 | 10.1 | 10.4 | 12.8 | 12.3 | 11.8 | 12.4 |
| | - Mesta | 9.1 | 9.0 | 7.6 | 8.1 | 7.1 | 7.4 | 8.0 |
| Taiwan | - Jute | 12.5 | 12.8 | 13.4 | 13.5 | 13.4 | 12.8 | 12.2 |
| Thailand | - Kenaf | 11.8 | 9.8 | 17.0 | 14.6 | 11.3 | 13.0 | -- |
| Brazil | - Jute | 11.4 | 12.2 | 12.1 | 12.1 | 13.6 | 13.9 | 13.2 |

[1] Provision

[2] Includes small quantities of mesta

Source: (41. p. 8)

Table 3. Jute production, carryover, price, and national income, Pakistan, 1948-49 to 1961-62.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Year | Area planted | Production | Carryover | Price received by growers | Price at baling center[1] | Export price f.o.b. [2] | Average unit export value[3] | National Income [4] |
| | mill. acres | -- million bales -- | | -------------- Rupee per maund --------------- | | | | (1000 mill.rupees) |
| 1948-49 | -- | 5.48 | 2.24 | 32.31 | 32.40 | 41.78 | 44.94 | 17.0 |
| 1949-50 | -- | 3.33 | 1.84 | 22.12 | 22.12 | 32.07 | 38.67 | 17.2 |
| 1950-51 | 1.71 | 6.01 | 1.59 | 28.69 | 30.31 | 32.34 | 37.29 | 18.3 |
| 1951-52 | 1.78 | 6.33 | 0.75 | 27.37 | 28.61 | 38.07 | 46.28 | 18.1 |
| 1952-53 | 1.91 | 6.82 | 1.89 | 10.69 | 11.63 | 18.04 | 21.61 | 18.5 |
| 1953-54 | 0.97 | 4.50 | 3.06 | 15.44 | 16.45 | 24.48 | 27.17 | 19.5 |
| 1954-55 | 1.24 | 4.66 | 1.85 | 16.02 | 18.65 | 22.63 | 27.62 | 19.9 |
| 1955-56 | 1.63 | 6.50 | 0.73 | 18.84 | 23.29 | 25.51 | 33.52 | 19.6 |
| 1956-57 | 1.23 | 5.51 | 0.52 | 26.36 | 29.42 | 34.68 | 36.80 | 20.9 |
| 1957-58 | 1.56 | 6.20 | 0.86 | 27.48 | 25.66 | 31.68 | 34.71 | 21.1 |
| 1958-59 | 1.53 | 6.00 | 0.94 | 21.70 | 23.42 | 30.65 | 35.01 | 21.0 |
| 1959-60 | 1.38 | 5.55 | 1.34 | 20.72 | 25.13 | 39.51 | 35.35 | 21.7 |
| 1960-61 | 1.52 | 5.62 | 0.62 | 41.00 | 54.51 | 69.83 | 61.36 | 22.6 |
| 1961-62 | 2.00 | -- | -- | -- | -- | -- | -- | -- |

[1] White botton for 1948-49 to 1957-58 and White B botton for 1958-59 to 1960-61.

[2] Exports firsts, Pucca bales at Narayanganj, converted from price per bale on the basis of 82.29 pounds per maund.

[3] Price per maund convert from price per ton on the basis of 82.29 pounds per maund.

[4] At 1949-1952 price.

Source: Columns 1, 2, 3, and 4 (24, p. 39, 28-29)    Column 5. (17, p. 69)    Columns 6, 7 (41, p. 19, 16)
Column 8 (43, p. 194).

Table 4. Jute production, carryover and prices, India, 1947-48 to 1960-61.

| Year | (1) Area planted | (2) Production | (3) Carryover | (4) Price in Calcutta [1] | (5) Average unit export value [1] | (6) Price of hessian (yard) | (7) Price of sack |
|---|---|---|---|---|---|---|---|
| | (1000 acres) | --(1000 bales)-- | | Rupee per maund | | Rupee per unit | |
| 1947-48 | 652 | 1685 | 1500 | 36.12 | 50.84 | .55 | 1.18 |
| 1948-49 | 834 | 2055 | 1242 | 42.30 | 56.21 | .48 | 1.39 |
| 1949-50 | 1163 | 3089 | 524 | 37.36 | 54.76 | .54 | 1.54 |
| 1950-51 | 1411 | 3283 | 762 | 56.12 | 83.16 | .72 | 1.89 |
| 1951-52 | 1951 | 4678 | 924 | 50.90 | 112.28 | .64 | 2.06 |
| 1952-53 | 1813 | 4592 | 1176 | 27.00 | 59.83 | .44 | 1.01 |
| 1953-54 | 1198 | 3129 | 1206 | 29.30 | 53.41 | .45 | 1.04 |
| 1954-55 | 1243 | 2928 | 930 | 32.66 | 53.52 | .45 | 1.17 |
| 1955-56 | 1739 | 4197 | 886 | 30.18 | 48.71 | .39 | 1.10 |
| 1956-57 | 1908 | 4288 | 1120 | 32.41 | 48.63 | .43 | 1.14 |
| 1957-58 | 1742 | 4052 | 1100 | 29.68 | 43.89 | .41 | 1.07 |
| 1958-59 | 1811 | 5158 | 1678 | 25.15 | 42.92 | .41 | 0.95 |
| 1959-60 | 1685 | 4605 | 1244 | 33.07 | 42.14 | .43 | 1.13 |
| 1960-61 | 1529 | 4030 | 449 | 53.11 | 60.43 | .56 | 1.68 |

[1] Average price converted from bale to maund on the basis of 82.29 pounds per maund.

Source: Columns 1, 2, 4 and 5 (40, p. 13, 15, 16)
Columns 3, 6, and 7 (16, p. 30, 64)

Table 5. Total consumption of burlap, cotton and shipping sack paper for bag making, bag and burlap prices, United States, 1947 to 1962.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| | Total | Consumption in bag making | | | Price per bag [1] | | | Price of burlap [3] |
| Year | consumption of burlap | burlap | cotton | shipping sack paper | burlap | cotton | Paper | |
| | --------- Million yards -------- | | | 1,000 tons | -------------- cents -------------- | | | cents/yd |
| 1947 | 880 | 831 | 714 | 671 | 26.34 | 30.08 | 9.90 | 22.15 |
| 1948 | 886 | 700 | 614 | 567 | 23.59 | 26.74 | 11.00 | 18.35 |
| 1949 | 794 | 620 | 653 | 510 | 21.81 | 23.20 | 10.38 | 16.83 |
| 1950 | 800 | 590 | 556 | 743 | 27.65 | 27.65 | 10.14 | 22.15 |
| 1951 | 532 | 407 | 546 | 806 | 37.33 | 30.36 | 11.77 | 30.02 |
| 1952 | 827 | 650 | 481 | 716 | 21.61 | 23.63 | 11.77 | 15.68 |
| 1953 | 825 | 639 | 420 | 668 | 18.15 | 23.36 | 11.77 | 12.35 |
| 1954 | 782 | 621 | 397 | 797 | 17.95 | 23.04 | 11.84 | 11.99 |
| 1955 | 826 | 648 | 351 | 834 | 17.37 | 23.74 | 11.77 | 11.28 |
| 1956 | 876 | 691 | 299 | 852 | 16.40 | 24.89 | 12.35 | 10.43 |
| 1957 | 831 | 631 | 265 | 867 | 16.55 | 23.27 | 12.64 | 10.98 |
| 1958 | 832 | 643 | 268 | 819 | 16.04 | 22.71 | 13.18 | 10.44 |
| 1959 | 895 | 674 | 271 | 899 | 16.89 | 25.08 | 12.76 | 10.19 |
| 1960 | 856 | 622 | 259 | 880 | 18.80 | 25.36 | 12.79 | 12.28 |
| 1961 | 871 | 587 | 261 | 889 | 21.10 | 24.46 | 12.70 | 14.15 |
| 1962 [2] | -- | 661 | 210 | -- | -- | -- | -- | -- |

1/ New 100-lbs. flour bags at St. Louis.
2/ Estimated.
3/ 40" 10 oz. New York.

Source: Column 1, 8 (17, p. 59)    Columns 2, 3 and 4 1947-49 (12, p. 18)    Columns 5, 6, and 7 (17, p. 59)

Table 6.  Indexes of volume of world jute consumption, production
agricultural production, exports of agricultural commo-
dities, 1950 to 1961.  (1952 - 56  =  100)

| Year | (1) Jute Consumption[1] | (2) Jute Production[2] | (3) All Agricultural Commodities[3] | (4) Exports Agricultural Commodities[4] |
|------|------|------|------|------|
| | ----------------------------- 1952-56 = 100 ---------------------- | | | |
| 1950 | 83 | 89 | 88 | 98 |
| 1951 | 97 | 113 | 89 | 100 |
| 1952 | 101 | 120 | 95 | 98 |
| 1953 | 91 | 73 | 98 | 103 |
| 1954 | 91 | 83 | 98 | 102 |
| 1955 | 108 | 109 | 103 | 109 |
| 1956 | 111 | 113 | 107 | 119 |
| 1957 | 118 | 113 | 107 | 122 |
| 1958 | 116 | 128 | 113 | 120 |
| 1959 | 123 | 120 | 114 | 128 |
| 1960 | 127 | 118 | 119 | 134 |
| 1961 | -- | 153 | 119 | 136 [5] |

[1]  Total available for home use.

[2]  Jute and allied fibers

[3]  Excluding Mainland China, Mongolia, N. Korea and N. Vietnam.

[4]  Excluding Sino-Soviet area.

[5]  Estimated.

Source:  Column 1  (42, p. 31)
Columns 2, 3 and 4 (41, p. 6)

Table 7.  Indexes of selected agricultural commodity, and all agricultural products
prices, 1948-1961.
(1953 = 100)

| Year | (1) Jute mill first c. i. f. U. K. | (2) Rubber R.S.S..N.I Singapore | (3) Cotton American middling 15/16 c. i. f. Liverpool | (4) Rice U.S. Zenith extra fancy at dock | (5) Agricultural products [1] |
|---|---|---|---|---|---|
| | ----- | ----- | 1953 = 100 | ----- | ----- |
| 1948 | 96 | 63 | 64 | 103 | 108 |
| 1949 | 99 | 57 | 66 | 76 | 97 |
| 1950 | 123 | 161 | 111 | 80 | 110 |
| 1951 | 208 | 251 | 135 | 91 | 151 |
| 1952 | 147 | 142 | 86 | 95 | 111 |
| 1953 | 100 | 100 | 100 | 100 | 100 |
| 1954 | 116 | 99 | 87 | 82 | 100 |
| 1955 | 108 | 169 | 73 | 88 | 102 |
| 1956 | 111 | 143 | 77 | 82 | 101 |
| 1957 | 125 | 131 | 85 | 87 | 101 |
| 1958 | 118 | 119 | 60 | 90 | 90 |
| 1959 | 119 | 150 | 62 | 83 | 94 |
| 1960 | 148 | 160 | 60 | 76 | 96 |
| 1961 | 185 | 124 | 61 | 80 | 92 |

[1] Non-food.

Source: (42, p. 20-21)

Table 8.   Prices of raw jute in India, Pakistan and the United
           Kingdom, 1948 to 1960.

| Year | India [1] | Pakistan [2] | United [3] Kingdom |
|------|-----------|--------------|--------------------|
| | ---------------- U.S. cents/kg. -------------------- | | |
| 1948 | 35.4 | 35.2 | 42.3 |
| 1949 | 25.7 | 26.6 | 31.9 |
| 1950 | 33.4 | 35.4 | 40.7 |
| 1951 | 30.7 | 33.0 | 43.0 |
| 1952 | 17.4 | 15.6 | 23.7 |
| 1953 | 20.2 | 20.5 | 28.2 |
| 1954 | 22.2 | 24.2 | 28.7 |
| 1955 | 20.7 | 19.7 | 25.7 |
| 1956 | 24.6 | 24.2 | 30.8 |
| 1957 | 25.7 | 23.2 | 30.9 |
| 1958 | 23.4 | 21.3 | 30.4 |
| 1959 | 27.8 | 25.3 | 32.2 |
| 1960 | 39.0 | 43.9 | 48.0 |

[1]   Raw, baled, mill firsts, Calcutta.

[2]   Raw, baled, export firsts, f.o.b., Chittagong.

[3]   Raw, baled, Pakistan mill firsts c.i.f., Dundee.


Source: (13)

Table 9.  Average annual wholesale price indexes for selected
container materials.  United States 1948 to 1962
(1957-59 = 100)

| Year | Burlap | Paper box and shipping containers | Cotton print cloth |
|------|--------|-----------------------------------|--------------------|
|      |        | (1957-59 = 100 )                  |                    |
| 1948 | 180. 0 | 79. 1  | 136. 3 |
| 1949 | 159. 7 | 74. 4  | 105. 4 |
| 1950 | 207. 3 | 74. 9  | 131. 2 |
| 1951 | 278. 9 | 91. 6  | 133. 7 |
| 1952 | 152. 0 | 88. 0  | 110. 9 |
| 1953 | 115. 7 | 86. 4  | 113. 1 |
| 1954 | 114. 7 | 87. 4  | 99. 8  |
| 1955 | 106. 7 | 89. 2  | 103. 8 |
| 1956 | 100. 0 | 86. 8  | 103. 4 |
| 1957 | 103. 9 | 99. 1  | 98. 4  |
| 1958 | 98. 3  | 100. 2 | 96. 1  |
| 1959 | 97. 8  | 100. 6 | 105. 5 |
| 1960 | 113. 4 | 103. 9 | 109. 5 |
| 1961 | 133. 9 | 98. 4  | 94. 9  |
| 1962 [1] | 129. 9 | 101. 7 | 96. 7 |

[1] January - May

Source: (48, p. 8-9)