



The Effect of the Growing Constraint of Subsistence Farming on Farmer Response to Price: A Case Study of Jute in Pakistan

by

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INTRODUCTION

During the last decade or so, substantial empirical work has been done on farmer response to price in the underdeveloped countries¹. Most of the research effort, however, is lacking theoretical rigour and is heavily oriented towards the estimation of area (output) supply functions and the verification of the existence of economic incentives.

The purpose of this study is to extend the research horizon by emphasizing and elaborating the role of certain constraints in determining the degree of farmer response to price which is one of the aspects of economic performance.

We believe that the level of farmers' economic performance varies directly with their ability to exploit the opportunities within the horizon. It was maintained elsewhere that the basic reason for farmers' low level of economic performance lies in the fact that their ability to exploit given and well-understood opportunities is reduced by various constraints — physical (climate, water availability, *etc.*), technological (lack of more productive technical knowledge and knowhow, *etc.*) and institutional (the practice of subsistence farming) [12]. It is hypothesized that the economic performance of farmers deteriorates as the

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¹Some of the well-known studies are: P. T. Bauer and B. S. Yamey [1]; J. R. Behrman [2]; R. Clark [3]; E. Dean [4]; C. K. Eicher [5]; W. P. Falcon [6 ; 7]; R. Freire [9]; W. D. Hopper [10]; S. M. Hussain [11]; R. Krishna [15]; J. D. Kaul [14]; M. Mangahas, A. E. Recto and V. W. Ruttan [17]; Mubyarto [18]; R. M. Stern [26]; L. R. Venkataramanan [30].

constraints on their ability to exploit a given opportunity set tighten, and vice versa.

To test this hypothesis on a limited scale, we confine to the opportunities provided by the area allocation among competing crops in response to price. The area-allocation opportunity set is chosen since it is empirically identifiable and the relevant data are easily available. Moreover, the level of economic performance can be indexed by the extent (or degree) of area response to price for the individual crops. The only constraint that could easily show variation in time and space within a given geographical and socio-economic unit is the constraint of subsistence farming².

Thus, this paper will attempt to show the effect of a varying constraint, *i.e.*, subsistence farming, on farmer response to price in the area-allocation opportunity set. The theoretical and empirical analysis is conducted for East Pakistan which seems to be a very well-suited socio-economic unit.

The paper is divided into three main parts. Part I outlines the basic structure of a utility-maximization model for a farmer who is both a potential producer and an actual consumer of one of the competing crops. An attempt is also made to derive the estimating area supply functions for jute and rice. The primary purpose of the model is not to derive a consumption demand for the food crop as such, but to underline the implications of the role of a producer-consumer farmer in making area-allocation decisions under the constraint of subsistence farming. Part II attempts at empirical verification of the hypothesis that the farmer response to price declines (deteriorates) under the influence of the growing constraint of subsistence farming. Part III draws some policy implications.

I. THE BASIC THEORETICAL FRAMEWORK³

I.1

For simplicity and a close approximation to the situation in East Pakistan, the following assumptions are made for a single farming unit:

Assumption (i): There is fixed cultivable land to be allocated between the two competing crops: rice and jute.

Assumption (ii): The farmer derives his income from the cultivation of rice/jute.

²As a crude statement, subsistence farming means that farmers, while making land-allocation decision, set aside enough land to grow food for their families and only allocate the left-over land among competing crops on the basis of profitability.

³The detailed working of the theoretical model analyzing the area-allocation decisions under the constraint of subsistence farming can be seen in studies by Hussain [12; 13].

Assumption (iii): Income is spent on two consumption goods: food (*i.e.*, rice) and a nonfood good.

Assumption (iv): Constant Y_J/Y_F for the same farm,

where

Y_J = normal yield of jute per unit of land (*i.e.*, acre)

Y_F = normal yield of rice per unit of land (*i.e.*, acre)

Assumption (v): Heterogeneous land in the farm sector as a whole (*i.e.*, variation in Y_J/Y_F over the various farm units)

Assumption (vi): Farmer's utility function is of the form⁴:

$$U(F, N) = \theta \log (F_H + F_M - F_S) + (1 - \theta) \log N$$

where

F_H = food produced at the farm for consumption

F_M = food purchased from the market for consumption

F_S = minimum food required for farmer's household in order to survive

$F = F_H + F_M - F_S$

N = nonfood consumption good. This might be a single good like cloth, salt, kerosene oil, or a combination of all nonfood goods in the form of a composite commodity.

θ = weight assigned to the utility derived from food

There is a built-in survival constraint in the utility function implying that the farmer gets utility from two sources: *a*) food consumed ($F_H + F_M$) in excess of the minimum required for survival (F_S); and *b*) the quantity of nonfood goods indicated by an appropriate index, if they are more than one.

1.2

Under the above assumptions, farmer's income and expenditure become the following:

$$\text{Income} = P_F^* (A_F Y_F - F_H) + P_J^* (A - A_F) Y_J$$

$$\text{Expenditure} = P_F^* F_M + P_N^* N$$

⁴The utility function chosen is Stonsian in character. The sole reason for using it, rather than some other form, is the fact that utility functions of this type have been found to give satisfactory fits to observed demand behaviour in a variety of studies and the resulting demand functions are easily adapted to empirical analysis. See, Stone [27].

where

P_{F2}^* = expected sale (or harvest) price of rice per unit of weight (*i.e.*, maund)

P_{F1}^* = expected purchase price of food (rice) per unit of weight (*i.e.*, maund)

P_J^* = expected sale (or harvest) price of jute per unit of weight (*i.e.*, maund)

P_N = purchase price (index) of nonfood consumption goods

A = total land available for allocation

A_F = land allocated to produce food (*i.e.*, rice crop)

I.3

The farmer is assumed to be rational in the sense that his production and consumption decisions are dictated by the maximization of a well-ordered function, *i.e.*, utility function, subject to the constraints of fixed land (A) and the survival of the family ($F_H + F_M \geq F_S$), which are incorporated in the budget constraint and the utility function, respectively.

We add another constraint: $A_F Y_F \geq F_H$, to ensure that home consumption of rice cannot be larger than rice production or the marketable surplus of rice must be non-negative.

Since the problem is to maximize utility, subject to the above-mentioned constraints, the following Langrangian (L) is set up to study the production and consumption implications for the farmer.

$$L = \left[\theta \log (F_H + F_M - F_S) + (1 - \theta) \log N \right] \\ + \lambda \left[P_{F2}^* (A_F Y_F - F_H) + P_J^* (A - A_F) Y_J - (P_{F1}^* F_M + P_N N) \right] \\ + \mu \left[A_F Y_F - F_H \right]$$

Differentiating L with respect to N , F_M , F_H and A_F , we get:

$$\frac{\partial L}{\partial N} = \frac{1 - \theta}{N} - \lambda P_N = 0 \quad (1)$$

$$\frac{\partial L}{\partial F_M} = \frac{\theta}{F_M + F_H - F_S} - \lambda P_{F1}^* \begin{pmatrix} = 0 \\ \leq 0 \end{pmatrix} \text{ if } \begin{pmatrix} F_M > 0 \\ F_M = 0 \end{pmatrix} \quad (2)$$

$$\frac{\delta L}{\delta F_H} = \frac{\theta}{F_M + F_H - F_S} - \lambda P_{F2}^* - \mu \begin{pmatrix} = 0 \\ < 0 \end{pmatrix} \text{ if } \begin{pmatrix} F_H > 0 \\ F_H = 0 \end{pmatrix} \quad (3)$$

$$\frac{\delta L}{\delta A_F} = \lambda \left[P_{F2}^* Y_F - P_J^* Y_J \right] + \mu Y_F \begin{pmatrix} \leq \\ = \\ \geq \end{pmatrix} 0 \text{ for } \begin{pmatrix} A_F = 0 \\ 0 < A_F < A \\ A_F = A \end{pmatrix} \quad (4)$$

I.4 Production Possibilities

In the case of a single farm unit for which the Y_J and Y_F are given, three production possibilities exist depending on the prices and yields involved.

From equations (2), (3), and (4), the possibilities are:

1. $P_J^* Y_J > P_{F1}^* Y_F$ jute specialization (Case I)
2. $P_J^* Y_J < P_{F2}^* Y_F$ rice specialization (Case II)
3. $P_{F2}^* Y_F < P_J^* Y_J < P_{F1}^* Y_F$ rice production to meet F_H and jute cultivation on the remaining land (Case III)
4. $P_J^* Y_J = P_{F1}^* Y_F$ either Case I or Case II
5. $P_J^* Y_J = P_{F2}^* Y_F$ either Case II or Case III

Possibility 5 becomes a clear-cut Case III when we introduce risk (see Section I.15). Even if possibilities 4 and 5 retain their dual character, our model remains fully workable at the aggregate level since we lump Case I with Case III, and Case II with Case III; whereas Cases I and II are mutually exclusive.

It is to be emphasized that Case III emerges in place of Case I or Case II only because the expected purchase price of rice (P_{F1}^*) is higher than the expected sale price of rice (P_{F2}^*). Hence, $P_{F1}^* > P_{F2}^*$ is a sufficient condition for Case III (subsistence farming) to exist.

It should be noted that in our framework the so-called practice of subsistence farming in the underdeveloped countries is not without rationale and need not extend to the whole farm sector.

I.5 Consumption Demand Functions

In case the farmer finds jute specialization advantageous (Case I), the

consumption demand functions are derived as:

$$\left. \begin{aligned} F_H &= 0 \\ F_M &= \theta \frac{P_J^*}{P_{F1}^*} AY_J + (1 - \theta) F_S \\ N &= (1 - \theta) \left[\frac{P_J^*}{P_N} AY_J - \frac{P_{F1}^*}{P_N} F_S \right] \end{aligned} \right\} \quad (5)$$

Note: Subsistence requires $P_J^* AY_J \geq P_{F1}^* F_S$.

In the case of complete rice specialization (Case II), the demand functions become:

$$\left. \begin{aligned} F_H &= F_S + \theta (AY_F - F_S) \\ F_M &= 0 \\ N &= (1 - \theta) \frac{P_{F2}^*}{P_N} [AY_F - F_S] \end{aligned} \right\} \quad (6)$$

In Case III the demand functions are:

$$\left. \begin{aligned} F_H &= F_S + \theta (AY_F - F_S) \\ F_M &= 0 \\ N &= (1 - \theta) \frac{P_J^*}{P_N} \left[AY_J - \frac{Y_J}{Y_F} F_S \right] \end{aligned} \right\} \quad (7)$$

Note: Subsistence requires $AY_J > \frac{Y_J F_S}{Y_F}$ or $AY_F > F_S$.

1.6 Aggregation at the Farm Sector Level: Area Response Functions

When we consider a large number of farm units within a farm sector, we are bound to find variation in the crop yield of jute (Y_J) relative to the crop yield of rice (Y_F) per unit of land. This is inevitable as land is not homogeneous in productivity due to differences in soil and weather conditions and other factors that influence the crop yields. Some farm units will have higher productivity for rice cultivation, and others for jute cultivation.

Thus, given the level of P_J^* and P_{F1}^* (and P_{F2}^*), all the three production possibilities can be found for the farm sector as a whole, though they were mutually exclusive in the case of a single-farm unit due to the constant Y_J/Y_F .

For aggregation, all the farm units are classified into the above three possible cases. By assigning weights on the basis of land contained in each category relative to the total land in the farm sector, we will sum up the jute and rice acreage separately. The weights for each production mix category are:

α = proportion of total farm land under Category I (Case I): complete jute specialization. It includes farm units for which

$$P_J^* Y_J \geq P_{F1}^* Y_F$$

β = proportion of total farm land under Category II (Case II): complete rice specialization. It includes all farm units for which

$$P_J^* Y_J \leq P_{F2}^* Y_F$$

γ = proportion of total farm land under Category III (Case III): partial rice specialization to the extent of $F_H \geq F_S$ and jute cultivation on the left-over land. It consists of farm units for which

$$P_{F2}^* Y_F \leq P_J^* Y_J < P_{F1}^* Y_F$$

Since α , β , and γ are expressed in land in each category as a proportion of the total farm land (A), $\alpha + \beta + \gamma = 1$.

1.7

Before proceeding further, we redefine the following notations and make an additional assumption:

F_{III} = food produced at the farm for consumption in Category III

Y_{II} = normal yield of jute per acre in Category I

Y_{III} = normal yield of jute per acre in Category III

Y_{FI} = normal yield of rice per acre in Category II

Y_{FIII} = normal yield of rice per acre in Category III

F_S = minimum food required for farmers' household in order to survive in the farm sector as a whole

P = farm population

Assumption (vii): The population in the farm sector is evenly distributed over the area under cultivation. Thus, weights α , β , and γ also reflect the relative distribution of population in Categories I, II, and III, respectively⁵.

⁵This assumption is made for simplification only. Its removal does not upset the model or the results obtained from it.

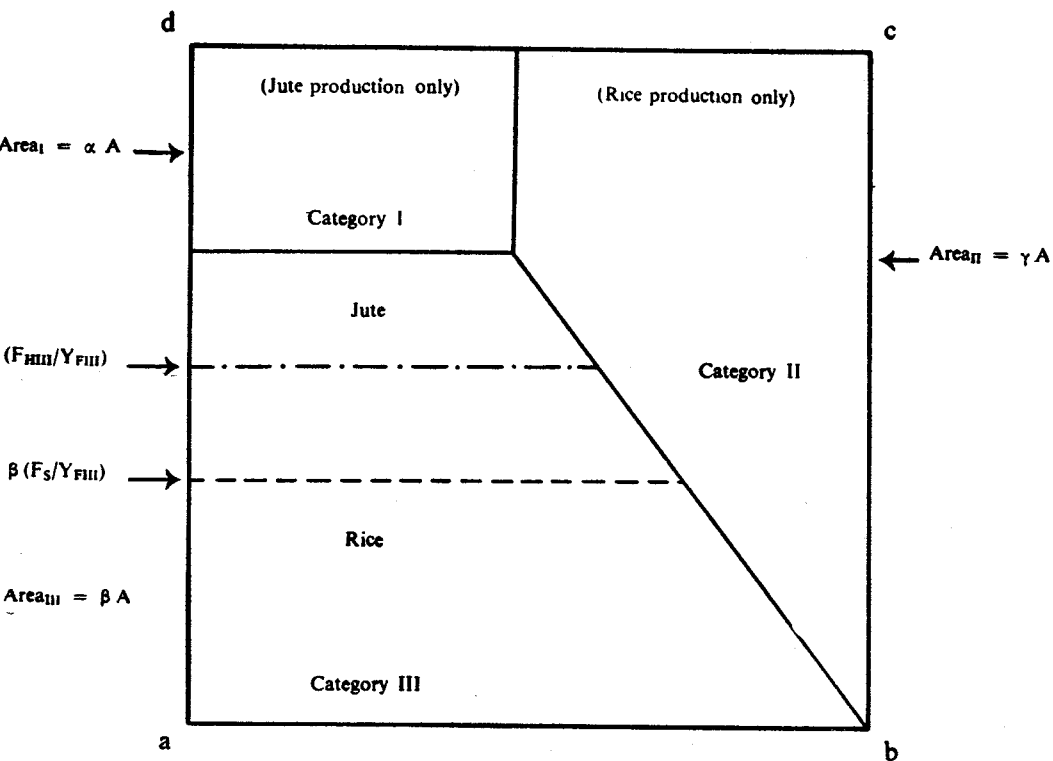


Figure 1

Figure 1 provides a view of what is involved in aggregation at the conceptual level. The total farm land in the farm sector is $a b c d = A$. Given the relevant prices and crop yields, the land in each category is: Category I = αA , Category II = βA , and Category III = γA . Only Category III is a common source for jute as well as for rice acreage. Now we proceed to derive area response (supply) functions, assuming that the relative weights assigned to each category remain as given. This is reasonable to assume at a point of time, though, of course, the weights will change in response to the variations in the relevant prices, crop yields, and the minimum food needed for the survival of the farm population.

1.8 Area Supply Functions for Jute

Given the relative weights, we can derive jute area supply functions by summing up the two basic sources of jute supply, namely Category I and Category III, as shown in Equation (8):

$$\text{Area under jute}^6 = A_J = \alpha A + \gamma \left(A - \frac{F_S}{Y_{FIII}} \right) (1 - \theta) \quad (8)$$

Given the relative weights assigned to Categories I and III, the basic determinants of the area supply of jute are the size of the farm sector (A), the magnitude of α and γ and the consumption demand for food in Category III in terms of area units (*i.e.*, Equation (7) divided by Y_{FIII}).

1.9 Implications for the Cross-Section Analysis

In analysing the area sown/jute produced over the various farm units, we must distinguish between farms on which it is advantageous to grow jute only (Category I), and those which allocate area to both jute and rice (Category III). The analysis should take place for each category separately, and it is obvious that the cross-section analysis for Category I would not be very interesting.

Within Category III, however, in view of Equation (8), we should observe that the area allocated to jute as a proportion of the total area on each farm unit will vary directly with the yield of rice (Y_F) and inversely with the family size measured in standard adult units⁷.

In case the farm units of Category III are scattered over space and sell their jute in a common market centre, then any crop-wise (jute versus rice) cost of transportation differential should be taken into account also.

⁶The jute area in Category III is equal to the total area in it (γA) minus the area needed to produce rice for meeting the consumption demand: F_{HIII} (*i.e.*, Equation (7) divided by Y_{FIII}).

⁷It is worth noting that the area sown to jute in Category III is closely tied with the food problem (*i.e.*, family size and Y_F).

I.10 Area Supply Response to Price for Jute in the Course of Time

We can rewrite Equation (8) as:

$$A_J = \alpha A + \gamma (1 - \theta) (A - A_{\text{subs}}) \quad (9)$$

where

A_{subs} = area required to produce the minimum food needed for the survival of the farm population dependent on land in *Category III*.

In case $\frac{\dot{P}}{P} > \dot{Y}_{\text{FIII}}/Y_{\text{FIII}}$ (when land is fixed), A_{subs} is positively related with time⁸.

Assuming that under impact of $\frac{\dot{P}}{P} > \dot{Y}_{\text{FIII}}/Y_{\text{FIII}}$, A_{subs} in addition to being positive is also linear in time variable T , we have:

$$A_{\text{subs}} = d_0 + d_1 T \quad (10)$$

As noted earlier, given the relevant prices and crop yields, weights α , β , and γ are determined. But in the course of time, the prices relative to each other change and cause the weights to change in response when the following assumption is made.

Assumption (viii): The net average revenue obtained from the cultivation of jute relative to the cultivation of rice varies roughly in direct proportion to the expected sale price of jute (P_J^*) relative to the expected sale price of rice (P_{F2}^*). The same holds for rice.

From the conditions laid out earlier, jute specialization takes on farms where $\frac{Y_J}{Y_F} \geq \frac{P_{F1}}{P_J^*}$, rice specialization where $\frac{Y_J}{Y_F} \leq \frac{P_{F2}^*}{P_J^*}$ and a combination of rice and jute cultivation otherwise. Assuming further that the crop yields remain constant in time, we make α , β , and γ a function of prices alone. Using a linear functional relationship⁹:

$$\left. \begin{aligned} \alpha &= b_0 + b_1 (P_J^*/P_{F1}^*), \text{ and} \\ \alpha + \gamma &= 1 - \beta = a_0 + a_1' (P_J^*/P_{F2}^*) \\ \text{or } \alpha + \gamma &= a_0 + a_1 (P_J^*/P_{F1}^*) \\ \text{or } \gamma &= a_0 - b_0 + (a_1 - b_1) (P_J^*/P_{F1}^*) \end{aligned} \right\} \quad (11)$$

The functional relationships of (11) are based on the assumption that P_{F2}^* is a constant proportion of P_{F1}^* and this holds in time also.

⁸It is assumed that the rate of population growth in Category III is the same as in the farm sector as a whole.

⁹We have used a linear functional form, but it does not mean to exclude other forms.

Putting values for α , γ , and A_{subs} in Equation (9): $A_J = \alpha A + \gamma (1 - \theta) (A - A_{\text{subs}})$, we get:

$$\begin{aligned} A_J &= b_0 A + b_1 (P_J^*/P_{F1}^*) A + (a_0 - b_0) (1 - \theta) (A - d_0 - d_1 T) \\ &\quad + (a_1 - b_1) (P_J^*/P_{F1}^*) (1 - \theta) (A - d_0 - d_1 T) \\ A_J &= e_0 + e_1 (P_J^*/P_{F1}^*) - e_2 T (P_J^*/P_{F1}^*) - e_3 T \end{aligned} \quad (12)$$

where

$$\begin{aligned} e_0 &= b_0 A + (a_0 - b_0) (1 - \theta) (A - d_0) \\ e_1 &= b_1 A + (a_1 - b_1) (1 - \theta) (A - d_0) \\ e_2 &= d_1 (a_1 - b_1) (1 - \theta) \\ e_3 &= d_1 (a_0 - b_0) (1 - \theta) \end{aligned}$$

It can be seen from the functional relationships listed in (11) that as long as Categories I and III respond to P_J^*/P_{F1}^* positively, the following inequalities hold:

$a_1 > 0$, $b_1 > 0$ and $a_1 > b_1$ (since a_1 reflects the response of Category I, and of Category III as well).

Thus, $a_1 > 0$, $b_1 > 0$, and $(a_1 - b_1) > 0$ leaves a positive sign for e_1 and a negative sign for e_2 ¹⁰. A negative e_2 in Equation (12) shows the adverse effect of the growing constraint of subsistence farming (i.e., $\dot{P}/P > \dot{Y}_{FIII}/Y_{FIII}$ on the jute area response to price in the economic opportunity set of area allocation between competing crops. *In other words, the declining farmers' response to price is the result of a growing constraint on their ability to exploit the area-allocation opportunity set.*

I.11 Area Supply Functions for Rice

Categories II and III are the sources of rice acreage. We can derive area supply response function when relative weights β , γ are given by just summing up the relevant rice acreage originating from each category:

$$\begin{aligned} \text{Area under rice}^{11} &= A_R = \beta A + \gamma \left[\frac{F_S}{Y_{FIII}} + \theta \left(A - \frac{F_S}{Y_{FIII}} \right) \right] \\ \text{or} \\ A_R &= \beta A + \gamma \left[A_{\text{subs}} + \theta (A - A_{\text{subs}}) \right] \end{aligned} \quad (13)$$

Thus, with given β and γ , the basic determinants of the area supply function of rice are the size of the farm sector (A), the magnitude of β and γ , and the consumption demand for food in Category III in area units.

¹⁰It should be noted that nothing can be said on *a priori* grounds about the magnitude of a_0 and b_0 . If $a_0 > 0$, $b_0 > 0$, then the sign of e_3 will be positive when $a_0 > b_0$, and negative when $a_0 < b_0$. The effect of time on A_J will be zero if $a_0 = b_0$. Thus, nothing can be predicted about the impact of time alone on jute acreage.

¹¹The rice area in Category II = βA , and in Category III = $\gamma [F_S/Y_{FIII} + \theta (A - F_S/Y_{FIII})]$ (Equation (7) divided by Y_{FIII} and adjusted for aggregation).

I.12 Implications for the Cross-Section Analysis

In the context of cross-section analysis, Equation (13) can be rewritten by excluding the farm units in Category II which completely specialize in the cultivation of rice. The area function for the i -th farm unit is as follows:

$$A_{Ri} = A_{\text{subsi}} + \theta(A_i - A_{\text{subsi}}) \quad (14)$$

It is obvious from Equation (14) that over the various farm units, the area under rice will vary positively with the size of the farm and the yield of rice, and inversely with the family size in standard adult units.

I.13 Rice Area Response to Price in the Course of Time

From the conditions laid out earlier for the various production possibilities, and by assuming linear relationships, we find:

$$\left. \begin{aligned} \beta &= g_0 + g_1' \frac{P_{F2}^*}{P_j^*} & \text{or} &= g_0 + g_1 \frac{P_{F1}^*}{P_j^*} \\ \gamma &= l_0 - l_1' \frac{P_{F2}^*}{P_j^*} & \text{or} &= l_0 - l_1 \frac{P_{F1}^*}{P_j^*} \end{aligned} \right\} \quad (15)^{12}$$

Putting the values of β , γ , and A_{subs} in Equation (13), we get:

$$A_R = \left(g_0 + g_1 \frac{P_{F1}^*}{P_j^*} \right) A + \left(l_0 - l_1 \frac{P_{F1}^*}{P_j^*} \right) (c_0 + c_1 T + \theta A)$$

where

$$c_0 = d_0 - \theta d_0$$

$$c_1 = d_1 T - \theta d_1 T$$

$$\text{or } A_R = \pi_0 + \pi_1 \frac{P_{F1}^*}{P_j^*} - \pi_2 T \frac{P_{F1}^*}{P_j^*} + \pi_3 T \quad (16)$$

where

$$\pi_0 = g_0 A + l_0 c_0 + l_0 \theta A$$

$$\pi_1 = g_1 A - c_0 l_1 - \theta A l_1$$

$$\pi_2 = c_1 l_1$$

$$\pi_3 = l_0 c_1$$

It may be pointed out that $c_1 = d_1 T - \theta d_1 T$ and θ being less than unity makes c_1 positive. Further, farm units practising subsistence farming (Category III) respond negatively to changes in the relative price of rice, *i.e.*, P_{F2}^*/P_j^* or (P_{F1}^*/P_j^*) . This happens because the farm units in Category III

¹² P_{F2}^* assumed to be a constant proportion of P_{F1} in time.

with the highest Y_F/Y_I find it advantageous to move into Category II as the relative price of rice becomes more favourable.

Thus, with a positive c_1 and a negative response of Category III to changes in the relative price of rice, the growing constraint of subsistence farming (*i.e.*, $\dot{A}_{\text{subs}} > 0$) adversely affects the area under rice. It is indicated by the negative sign of π_2 in Equation (16).

Hence, the adverse effects of the growing constraint of subsistence farming are felt in the case of all the crops competing for land (*i.e.*, jute and rice).

I.14 Relaxing Some of the Assumptions of the Model

We made seven important assumptions in setting up the model. They were as follows:

- i) Fixed land in the farm sector (A).
- ii) Only source of income is the cultivation of jute/rice.
- iii) All the income is spent on two goods: food (F) and nonfood (N). No provision for saving.
- iv) Constant Y_I/Y_F for each farm unit.
- v) Variations in Y_I/Y_F over farm units.
- vi) Utility function: $\theta \log (F_H + F_M - F_S) + (1 - \theta) \log (N)$.
- vii) The net average revenue changes directly in relation to prices in the relative sense.

If Assumption (i) is relaxed then the constraint of subsistence farming is growing when the condition $\dot{P}/P > \dot{Y}_{FIII}/Y_{FIII}$ is replaced by $\dot{P}/P > (1 + \dot{A}/A) \dot{Y}_{FIII}/Y_{FIII}$. But so long as the rate of population growth exceeds the growth in food production made possible by the growth in total land and rice yields, we will retain a negative e_2 (Equation 12) and a negative π_2 (Equation 16) which are the coefficients indicating the adverse effects of a growing constraint on farmers' area response to price.

If Assumption (ii) is relaxed, we have to recognize sources of income other than the cultivation of jute and rice (*e.g.*, cultivation of other crops and non-farm income). This will, of course, affect the total income and expenditure of the farmer, and hence the consumption demand functions for food and non-food goods, but the effect of the growing constraint of subsistence farming on farmers' supply response to price will remain intact.

Under Assumption (iii), saving is excluded. Introduction of saving, however, will not affect our results on farmers' area response to price because saving affects the total expenditure rather than how much area be allocated to the competing crops.

Assumptions (iv) and (v) imply an average Y_J/Y_F which we assumed to be constant. This enabled us to make relative weights α , β , and γ a function of prices only. If Y_J/Y_F is changing in time, then we have to recognize an additional variable that determines relative weights. This can be achieved by introducing Y_J/Y_F as an explicit variable in Equations (12) and (16). A_J will have a positive response to, and A_R a negative response to, a growing Y_J/Y_F . It will not change our result that farmers' response to price declines when the constraint of subsistence farming is growing.

Assumption (vi) about utility function is reasonable as it implies that consumer derives a positive utility from the quantities of food and nonfood goods, with given weights θ and $(1 - \theta)$, respectively. The feature of utility function that is crucial to our model is that there should exist some nonfood goods competing with food in consumption (*i.e.*, $\theta < 1$).

It should be noted that rice consumption in Equations (6) and (7) is found independent of the prices due to the form of the utility function used. The basic conclusions of the model, however, would remain the same with many other similar utility functions without this one property.

Assumption (vii) makes the role of prices all prevailing. If this is not the case, then we will have to adjust the relative prices of jute and rice by the changing cost of production differential, or alternatively after knowing its time pattern, separate its possible effects on the area response to price.

After this brief discussion on the nature of the assumptions of the model, it can be said that the results obtained in Equations (12) and (16) clearly show that the declining farmers' response to price (*i.e.*, economic performance within the area-allocation set) is the result of the growing constraint of subsistence farming.

I.15 The Effect of Risk and Uncertainty About Prices and Crop Yields

The postulate that the purchase price of rice (P_{F1}^*) is higher than the sale price of rice at the harvest time (P_{F2}^*) served as a sufficient condition for the emergence of Category III in our model. Other reasons or conditions can be added for the existence of this phenomenon.

Falcon and others have given additional reasons for the existence of the so-called practice of subsistence farming (*i.e.*, Category III). The most important reason given by Falcon is to the effect that if farmers buy rice from the market instead of producing it at the farm, then they face additional risk and uncertainty on the future purchase price of rice. Similarly risk and uncertainty is involved in the expectations about crop yields [6].

Although our model did not include risk and uncertainty, yet the risk and uncertainty on the relevant prices and yields can be introduced by saying that the relative size of Category III will be much larger than it would be implied by P_{F1}^* being higher than P_{F2}^* alone.

It should be noted that in order to get our results of Equations (12) and (16), the relative size of Category III need not be known so long as it exists (*i.e.*, $\gamma > 0$).

In the context of time, the existence of risk and uncertainty does not upset our results so long as the degree of risk and uncertainty does not change systematically with time. The declining degree of risk and uncertainty, for example, may prevent the results obtained from the model from being observed in reality. A systematic increase in the degree of risk and uncertainty on the other hand will reinforce our results, since it strengthens the extent of the growing constraint of subsistence farming.

I.16 The Usefulness of Our Model

Most of the discussions on the practice of subsistence farming have lacked theoretical rigour. The model, though simple, attempts to handle this phenomenon by giving a proper role of a producer and a consumer to the farmer.

The practice of subsistence farming does not have to prevail over the whole farm sector as many economists give the impression through their writings. Only farm units in Category III practise subsistence farming and it is due to purely economic reasons.

Within the model, the implications of the subsistence farming constraint for farmers' area response to price both at the cross-sectional level and in the time dimension can-be easily seen.

To the best of our knowledge, no theoretical treatment has been given to the implications of the constraint of subsistence farming in the time dimension. Some economists, though, have suggested that population pressure (density and growth) may have important influence on farmers' area response to price. An examination of Equations (12) and (16) will show that these statements have some truth in them, but they are vague in their theoretical precision and empirical content [2].

II. EMPIRICAL VERIFICATION OF THE HYPOTHESIS GENERATED BY THE MODEL: THE CASE OF JUTE IN EAST PAKISTAN

II.1

In this section, we will examine the empirical evidence to test the hypothesis of the model: farmers' area response to price declines in time as a result of the growing constraint of subsistence farming (Equation 12).

Before the relevant empirical support for the hypothesis is discussed it is important to make sure that the area chosen for building the empirical evidence stands close to the abstractions of the theoretical model. To this effect, East Pakistan (one of the two provinces of Pakistan) is chosen for analysis due to its closeness to the model and the availability of suitable data. We will discuss the various features of the farm sector and the nature of data in the following sections.

II.2 Features of the East Pakistan Farm Sector and its Closeness to the Model

Empirical analysis is restricted to the case of jute only as area statistics for this crop are available since 1931. The other crop available for analysis is rice, but it has to be ignored because of the nonavailability of area statistics for a large time sample.

Rice and jute are the major crops of East Pakistan. Rice is grown as the staple food crop, while jute is the principal cash crop in the area. Rice and jute cultivation are not only the major sources of income for farmers, but also compete with each other for land being the alternative crops in production during the Spring-Summer-Autumn farming season [11 ; 21].

The sowing (plantation) and harvesting periods are such that the cultivation of jute on any given piece of land will completely exclude the cultivation of *aus* (summer) rice [11 ; 21]. Although the possibility of combining an early jute crop with a later *aman* (winter) rice crop exists for the same land, it is held that the yields of both crops are adversely affected and the hazards from the uncertain weather and flooding conditions make such a decision even more costly [21]. The Jute Committee Survey observed that the double cropping of jute and *aman* (winter) rice was only 3.3 per cent of the total land for the jute growers [19, p. 57].

Thus, the cultivation of jute almost excludes the cultivation of two rice crops of the same season. It is not only the sowing (planting) and harvesting time constraints, however, that make jute and rice as alternative crops, but also the nature of other inputs, e.g., labour, weather, that go into their cultivation. Both jute and the type of rice grown in East Pakistan need hot humid climate, abundant water and, above all, cheap labour. In Rabbani's words:

It is now clear that over most of the jute belt of India and Pakistan rice is practically the only alternative to jute cultivation. Cultural practices of the two crops are such that land, labour and equipment are readily interchangeable between their cultivation [21, p. 198].

Our discussion so far has emphasized three main points about East Pakistan:

- a) Farmers' main source of income is the cultivation of jute and rice (Assumption (ii) of the model).
- b) On the land suitable for jute cultivation, rice is practically the only competing crop, and the various inputs, *e.g.*, land, labour equipment, *etc.*, are easily interchangeable in cultivation. Thus for the land suitable for jute, the opportunity for economic gain exists through area allocation between jute and rice in response to relative profitability (Part of Assumption (i)).
- c) Rice is the staple food crop of East Pakistan. Thus, some farmers are consumers of one crop that is being produced by them (Assumption (iii)).

II.3

The hypothesis that the farmers' area response to price declines as a result of the growing constraint of subsistence farming has been developed in the context of time. Thus, we must make sure that the assumptions of our model hold in the course of time also.

The time period to be covered in the empirical analysis begins from 1931. We have reasons to believe that the above mentioned a) to c) features of the East Pakistani farm sector hold in time also since they are conditioned by the climatic and agronomic conditions which have not changed to the exclusion of rice or jute from being production alternatives.

One of the important assumptions of the model is that the net revenue obtained from producing jute relative to that of producing rice changes in proportion to the relative price of jute. Since the relative net revenue of producing jute is equal to $(P_J^*/P_R^* - C_J/C_F)$, we could use P_J^*/P_R^* (the relative expected price of jute) as a proxy for the relative net revenue of jute if C_J/C_F does not change in time in an irregular fashion.

It is widely believed that C_J/C_F remained more or less constant in time during the period to be covered [12, pp. 104-107]¹³. On this point we also quote Ralph Clark:

Within the limits discussed above, land, labour and equipment are readily interchangeable between paddy cultivation and jute cultivation. Moreover, during the last 50 years, there have not been in Bengal important changes in agricultural practices which would have seriously affected

¹³It could be argued that jute is relatively more labour intensive and with a population growth rate higher than the growth rate of land, the labour should become relatively abundant and cheaper in the course of time, and other things being equal, will lower the cost of producing jute. This is a possibility, but it will not complicate our empirical analysis as a trend variable can be introduced to capture its effect on jute acreage.

ted the relative cost of growing rice or jute. Improvements in planting methods, seed selection, and equipment are of comparatively recent origin and have not as yet, had a general effect on costs or yields. In other words, the relative yields of paddy or jute that the *ryot* may expect from a specific piece of land and the relative costs of producing paddy or jute may be considered to have been constant factors [3, p. 2].

II.4 The Existence of the Growing Constraint of Subsistence

$$\text{Farming : } \dot{P}/P > (1 + \dot{A}/A) \dot{Y}_{FIII}/Y_{FIII}$$

Our hypothesis makes the decline in the farmer response to price conditional to the growing constraint of subsistence farming. Thus, in order to observe the decline in farmer response to price, it must be made sure that the constraint of farming is growing.

A wide range of Y_J/Y_F exists in East Pakistan. Therefore, we can expect all the three categories of farming (*i.e.*, complete jute specialization, complete rice specialization and production of rice to meet home consumption demand for food, and the allocation of the left-over land to jute production). It is Category III in which the constraint of subsistence farming arises basically from the minimum food required to survive and the economic advantage of producing food at the farm rather than buying it from the market. The minimum food requirements are a function of the farm population. If the farm population is growing : $\dot{P}/P > 0$, then the F_S (minimum food needed for survival) is growing, but this does not necessarily imply that the constraint on the area-allocation set is growing, unless $\dot{P}/P > \dot{Y}_{FIII}/Y_{FIII}$ when land is fixed, and $\dot{P}/P > (1 + \dot{A}/A) \dot{Y}_{FIII}/Y_{FIII}$ when both land and Y_F are changing. To the best of anybody's knowledge the \dot{Y}_{FIII}/Y_{FIII} and \dot{A}/A in itself or in its combined effect has not been keeping up with the population growth in East Pakistan since 1930's at least. We quote this general view as stated by Rabbani :

Rice production has lagged behind population growth in East Pakistan with only a small increase in rice acreage and with no perceptible increase in yield rate up to 1959/60 [21, p. 224].

Contrary to many African, Latin American, and some Asian countries, East Pakistan as a region does not have sufficient land that can be brought under cultivation. This is an area of a very old agricultural settlement and the population density and growth have been high for a long time. Most of the cultivable area, under the given technology and facilities, is already under the plough. In more recent times the area has shown some tendency to increase in response to the extension in irrigation facilities that helped the farmers to grow rice in the off-Monsoon season. But it has been very small. The growth in rice yields (\dot{Y}_F/Y_F) has been almost non-existent over time.

The data on rice area and yields are not available in sufficient detail and reliability. Whatever the data is available, no (perceptible) trend in rice yields is noticeable. The history of the region shows serious famines at times and near-famine conditions in general.

When we look at the population growth, we find an increase of 18.0 per cent during 1931-41, and an increase of 21.2 per cent during 1951-61 [20]. The population increase for the decade 1941-51 was very small (0.02 per cent). The reason for the small decade increase during 1941-51 was the fact that population migrated to India from this region in 1947.

The population in the nine main jute-growing areas showed a higher increase than the province during 1951-61: 24.1 per cent compared to 21.2 per cent. There are some studies which indicate that the actual rate of population growth is higher than what the censuses imply [23].

The information about area and rice yields does not indicate that food production matched the population growth in this region. Even in recent times, despite the benefit of having a national government, rice production remained stagnant in the 1950's. Only since 1958/59 rice production has shown growth [8, p. 31]. Hence, in the light of the known and plausible facts, one can characterize East Pakistan as an area where $\dot{P}/P > \dot{Y}_{FIII}/Y_{FIII}$, and also where $\dot{P}/P > (1 + \dot{A}/A)\dot{Y}_{FIII}/Y_{FIII}$ till 1958/59, thus forcing the minimum food requirements for the survival of the farm population to rise. The constraint of subsistence farming has been growing and Equation (12) seems relevant for the region.

II.5

All the assumptions made for the theoretical model are met for East Pakistan during the period from 1930's till very recently (say 1958/59), and this makes our model an abstraction close to reality. Hence, we expect to observe the results of the growing constraint of subsistence farming as implied by Equation (12).

We propose to use Equation (12) as the estimating equation (by adding an error term) and see if an empirical evidence consistent with the hypothesis can be found. Before we do so, the nature and sources of the data used are examined.

II.6 The Nature and Sources of Data

Statistical analysis to fit Equation (12) requires series on area under jute, price of jute and the price of rice.

Appendix Table A-1 presents the data on jute acreage (A_j), actual harvest price of jute and the actual retail price of rice for the period 1931/32 to 1954/55.

The data was compiled by the F.A.O. from the official Indian and Pakistani sources and was published in the *F. A. O. Commodity Series (Bulletin No. 28)* on jute. This data has been used for statistical analysis by the F.A.O. and by Ralph Clark [3 ; 28].

The official estimates of jute and other crop acreage are based on complete enumeration since 1940. Before that they were based on traditional methods. Many research scholars have tried to check the degree of reliability of the acreage data before and after 1940 [22 ; 24]. They find by comparing the official jute-production estimates with those derived from the flow estimates, that yields tend to be underestimated in the case of a good crop, and vice versa. However, by comparing the growth rates implied under both series, Rabbani concludes that acreage data is sufficiently reliable to disclose the direction of true variability on a year-to-year basis. He finds no reason for a bias in the acreage figures and uses them for a statistical treatment such as regression analysis.

Price data are compiled by taking an average of the recorded prices at various important market centres. The records at market centres are written on a regular basis and are compiled and published by the various government agencies. The recorded prices are quite reliable, but still the question remains that what these prices mean to the farmers. If we assume that the prices to the farmers differ by a margin covering the cost of transportation, middlemen's margins, *etc.*, and these margins in relative sense have not changed in time, then the recorded prices are quite meaningful in indicating the level and changes in prices that the farmers experience.

II.7

In order to extend the F.A.O. data beyond 1954/55, we will depend on Hussain's data on jute acreage, harvest price of jute and harvest price of rice (Appendix Table A-2). The original sources are official and whatever is true of the quality of the F.A.O. data also holds in this case. Jute acreage and harvest price of jute are comparable to that of F.A.O. data. The F.A.O. data has the retail price of rice, whereas Hussain has harvest price of *aus* (summer) and *aman* (winter) rice.

We will use the harvest price of *aus* (summer) rice as an approximation to the retail price of rice throughout the year, and combine F.A.O. data with Hussain data, and call it FAO-Hussain Data I.

Alternately, we will add a 10-per-cent margin (to cover marketing and other margins) to the average harvest price of the *aus* (summer) and *aman* (winter) rice in order to get an approximation to the retail price of rice. The 10-per-cent margin was almost the differential found between the F.A.O. and Hussain series for seven common years. Thus, using this adjusted average harvest price of rice, we will combine F.A.O. and Hussain series to get FAO-Hussain Data II.

It should be emphasized that the annual retail price of rice (P_{F1}) is closely tied with the harvest price of *aus* (summer) and *aman* (winter) rice since they supply 1/3 and 2/3 of the total production, respectively. A bad harvest leading to a high harvest price is bound to result in a high retail price of rice throughout the year. This is why it makes little difference for the analysis of farmers' area response to price whether we use harvest price or retail price of rice [22 ; 28].

We now move to the statistical analysis estimating the jute area supply response to price using F.A.O. data, FAO-Hussain Data I and FAO-Hussain Data II.

II.8 Estimation of the Jute Area Supply Response to Price: Time Series Data

We wish to estimate farmers' jute area (A_J) response to price and the effect of the growing constraint of subsistence farming on it. For this purpose, Equation (12) is fitted to the relevant data (Appendix Tables A-1 and A-2) by adding an error term :

$$(A_J)_t = e_0 + e_1 (P_J/P_{F1})_t^* - e_2 T(P_J/P_{F1})_t^* - e_3 T + E \quad (17)$$

where

A_J = jute acreage (in 000' acres)

e_0 = constant term

e_1 = coefficient of jute area response to the expected harvest price of jute relative to the purchase price of rice: $(P_J/P_{F1})^*$

e_2 = coefficient indicating the adverse effect of the constraint of subsistence farming growing in time

e_3 = coefficient indicating the effect of time on A_J

T = time

E = the error term

It should be noted that the prices involved (P_J and P_{F1}) are prices that are expected at the time when area-allocation decisions are made. This is necessary as there is a time lag between the time the area-allocation decisions are made and the time the economic returns for the produced crops are obtained and spent.

Various hypotheses can be put forward about the formation of the price expectations on the part of farmers. The relevance of such hypotheses, however, will depend on the nature of markets and the information on which the farmers sell their jute and buy their rice.

The most obvious basis of forming expectations about prices from farmers' point of view is their own experience about prices. Prices that farmers actually experience are of great relevance for the formation of expectations about the future prices in market situations where prices during a year and between years show wide fluctuations. Farmers' experience is as good, or as bad, as any other basis for price expectations.

The next important question is which experience is crucial, a recent one or a farther past one. It is obvious that the most recent experience is of utmost importance since it indicates the latest market situation on prices. But to what extent the past experience will influence the expectations about future prices cannot be answered on *a priori* ground. Essentially, it is an empirical question.

We will, in most cases, make the expected relative price of jute, $(P_J/P_{F1})_t^*$, a function of farmers' most recent experience about the relevant prices, namely the experience in the previous year, $(P_J/P_{F1})_{t-1}$.

We will, however, also try farmers' experience in times previous to $t-1$, by introducing $(P_J/P_{F1})_{t-2}$, $(P_J/P_{F1})_{t-3}$, and so on, as additional explanatory variables, explicitly.

While using Equation (17) as the estimating equation, we expect the trend variable (*i.e.*, time = T) to take care of *i*) any systematic change in total land fit for jute and rice cultivation, *ii*) any change in other factors affecting the area under jute. The net effect of the trend variable on A_J is not clear on *a priori* ground, since many diverse and opposite forces are at work in the course of time.

II.9 The Results of the Regression Analysis and their Interpretation

The data discussed above were put to regression analysis using the Time Series Processor (TSP) computer programme designed by Mr. Robert E. Hall at the Department of Economics, University of California, Berkeley.

In most cases, we fitted the estimating Equation (17) with the trend variable (T) to the F.A.O. (1932-54), FAO-Hussain Data I (1932-58 and 1932-62) and FAO-Hussain Data II (1932-58 and 1932-62) data. The estimates of the various regression coefficients are summarized in Table I.

II.9 : (i)

Section A of Table I presents the results for the period 1932 to 1958 during which the subsistence-food needs of the farm population as a whole, and of the main jute-growing districts in particular, were growing. In other words, the constraint on the ability of farmers to allocate land among the competing crops

TABLE I
JUTE AREA (A) RESPONSE FUNCTIONS: EAST PAKISTAN

Row No.	Constant term	Estimated coefficients of:					Number of observation	R ²	Durbin-Watson statistics
		$(P_j/P_{F1})_{t-1}$	$T(P_j/P_{F1})_{t-1}$	$(P_j/P_{F1})_{t-2}$	T	(NSD) _t			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Section A :									
(i) F.A.O. Data (1932-1954):									
1.	-1035.2	27.62 (6.4266)	-0.9733 (0.4541)	—	91.16 ^a (51.00)	—	23	.73	1.6826
2.	-1263.1	26.84 (6.1643)	-0.9106 (0.4359)	2.99 ^b (1.7990)	83.58 ^b (48.99)	—	23	.77	1.7845
(ii) FAO-Hussain Data I: (1932-1958):									
3.	-1099.1	28.49 (5.3327)	-1.0683 (0.3357)	—	97.34 (39.92)	—	27	.74	1.7411
4.	-1273.7	27.87 (5.2183)	-1.0214 (0.3291)	2.38 ^b (1.6200)	90.60 (39.21)	—	27	.76	1.8223
(iii) FAO-Hussain Data II: (1932-1958):									
5.	-1030.8	27.72 (5.4457)	-0.9996 (0.3564)	—	92.45 (38.41)	—	27	.74	1.8583
6.	-1316.5	27.67 (5.2569)	-0.9977 (0.3441)	2.63 ^b (1.6084)	93.16 (37.08)	—	27	.77	1.9284

(contd.)

TABLE I—(Contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Section B :									
(i) F.A.O. Data (1934-1954) :									
7.	—1715.4	33.63 (6.5580)	—1.3954 (0.4567)	—	143.82 (54.75)	—186.30 (84.84)	21	.81	1.9503
(ii) FAO-Hussain Data I : (1934-1958) :									
8.	—1568.7	33.32 (5.9275)	—1.4393 (0.3904)	—	136.58 (47.28)	—140.00 ^a (75.69)	25	.80	1.8772
(iii) FAO-Hussain Data II : (1934-1962) :									
9.	—1159.7	30.10 (5.4435)	—1.2008 (0.3596)	—	106.34 (38.63)	—96.30 ^b (59.28)	25	.79	1.8469
Section C : Period extended to 1962 :									
(i) FAO-Hussain Data I : (1932-1962) :									
10.	—665.9	24.16 (4.0088)	—0.6949 (0.1954)	—	63.09 (23.90)	—	31	.73	1.9941
11.	—995.9	24.59 (3.9224)	—0.7314 (0.1922)	2.20 ^b (1.4391)	67.67 (23.51)	—	31	.76	2.0510
(ii) FAO-Hussain Data II : (1932-1962) :									
12.	—667.7	24.32 (4.4479)	—0.7256 (0.2395)	—	63.24 (29.34)	—	31	.71	1.6950
13.	—876.1	24.23 (4.3785)	—0.7194 (0.2358)	2.10 ^b (1.5367)	61.65 (28.90)	—	31	.73	1.7593

Source : Computed from the data shown in Appendix Tables A-1 and A-2.

^aSignificant at 10-per-cent level.

^bSignificant at 30-per-cent (or less, but more than 10-per-cent) level.

Notes : All coefficients other than e_0 are statistically significant at, or less than, 5-per-cent level, unless they are noted.

$(NSD)_t = \sigma^2$ for $P_{F1} (t-1, t-2, t-3)$

minus σ^2 for $P_j (t-1, t-2, t-3)$, where σ^2 = standard deviation.

in response to price (or profitability) considerations was tightening (growing). As a result, we expect farmers' area response to price in the case of jute to decline the coefficient e_2 to be statistically significant and to show an adverse effect on the allocated jute acreage in response to price.

Results of rows 1 to 6 clearly show that the estimated coefficient e_2 is statistically significant and consistent with our hypothesis spelled out in Equation (12).

It is worth noting that making $(P_J/P_{F1})_t^*$ as the function of $(P_J/P_{F1})_{t-2}$ in addition to $(P_J/P_{F1})_{t-1}$ does not improve the fit or the price coefficient very much. This can be seen by comparing rows 2, 4, 6, with 1, 3, and 5, respectively.

It may also be noted that the various regression coefficients show a remarkable stability within a narrow range when the results from F.A.O. data are compared with the FAO-Hussain Data I and II. This shows that the move to combine F.A.O. data with Hussain's data is a step towards forming a closely consistent series.

II.9 : (ii)

Section B of Table I presents some special results by introducing a measure of risk attached to the expected prices of jute and rice. The measure is designed to indicate the *extra degree of risk* attached to P_J^* compared to P_{F1}^* , and is computed by taking 3-year standard deviation for P_{F1} and deducting it from the standard deviation for P_J for the same three years. The extra degree of risk computed in this way is called NSD_J , and indicates the risk differential attached to the expected price of jute on the assumptions that risk expectations are formed on the basis of the past 3 years' experience about price fluctuations¹⁴.

Since NSD_J is the extra risk attached to P_J^* , we expect A_J to be adversely affected by it. Row 7 shows that the NSD_J is statistically significant and has a negative (adverse) estimated influence on the area allocation to jute during the period 1934 to 1954. The results are consistent with the theoretical expectations.

For the period 1934 to 1958 and 1934 to 1962, however, the risk variable NSD_J does not come out to be statistically significant at the 5-per-cent level, though the sign is right and the level of significance is 10-per-cent or more (see rows 8 and 9).

It can be said on the basis of this evidence that farmers are conscious of the

¹⁴The idea of using 3-year (or any other time horizon in the past) standard deviation of prices is borrowed from Behrman, though we have made a slightly different use of it. See Behrman [2].

price risks and they respond to the risk differential for individual crops in a rational manner¹⁵.

II.9 : (iii)

We extended the regression analysis from the 1932-58 period to 1932-62 period in order to see if the addition of years 1959 to 1962 makes any difference for farmers' jute area response to price. It is generally believed that since 1959 the rice production has been reported to show a distinct growth. If this is correct then the constraint of subsistence farming should relax somewhat and the negative effect of this constraint on A_j should be reduced [8].

Section C (rows 10 to 13) of Table I shows that with the addition of the 1959-62 period to the 1932-58 period leads to a reduction in the coefficient for $T(P_j/P_{F1})^*$. The e_2 falls from a range of -0.90 to -1.43 to a range of -0.69 to -0.73 , implying that the estimated adverse effects of the constraint of subsistence farming on A_j are reduced¹⁶. In our framework, this can only happen if more area is available and/or the rice yields increase. But to indicate the extent of growth in rice production is not possible from our results.

II.9 : (iv) Concluding Remarks

The significance of any statistical analysis depends on the question (or hypotheses) posed and the suitability and meaningfulness of the analysis designed to answer the questions posed or the hypotheses to be tested.

In the context of our hypothesis that farmers' jute-area response declines in a time sample when the constraint (of subsistence farming) on farmers' ability to exploit the area-allocation opportunity set tightens in time. The null hypothesis is that the coefficient e_2 in Equation (17) is zero.

The results of the statistical analysis show through rows 1 to 13 of Table I that we can reject the null hypothesis, since e_2 is found to be significantly different from zero at the 5-per-cent level of significance in all cases.

The rejection of the null hypothesis and the negative sign of the estimated coefficient are consistent with the hypothesis that the level of farmers' economic performance within the given economic opportunity set, declines when the constraint on farmers' ability to exploit that set tightens.

II.10 The Nature of Our Statistical Analysis Compared to Other Studies

We have used a single-equation model to estimate farmers' area supply

¹⁵Results to this effect were also found for Thailand by Behrman [2].

¹⁶Although the change is in the expected direction, it seems that it cannot be regarded as statistically significant.

response to price. This is also the case in most of the studies on supply response conducted on India, Pakistan, Thailand, Philippines, *etc.*¹⁷.

Contrary to most studies, however, the estimating equation (17) has been explicitly derived from a simple but more comprehensive model by incorporating the realities of farmers' economic environment as much as possible.

In order to estimate the area-supply response to price, we have used the expected price like all studies. However, we found that the expected price is almost based on actual price experience in the previous year, *i.e.*, $(P_J/P_{F1})^* = f(P_J/P_{F1})_{t-1}$. In other words the coefficient of price expectation (K) is close to unity. Some research scholars have been hasty in rejecting the postulate that $K = 1$, as they found serial correlation in the so-called naive model in which $K = 1$. As a solution they usually shift to Nerlove type price-expectation models in which $0 < K < 1$, or to the adjustment models in which the actual output/area falls short of the planned one [15; 21].

The possibility that serial correlation and poor fit may be due to misspecification is likely when a variable is left out that may have a peculiar time pattern (*e.g.*, the constraint of subsistence farming). The solution in such a case is to identify and introduce such a variable. The choice of the variable, however, should not be based on the goodness of fit, but it should have foundations in economic theory developed in the light of the facts of a particular situation.

In fact, the latest fashion in the statistical analysis of farmers' supply responses for underdeveloped areas is to use Nerlove type output/area adjustment models. The basic idea to the adjustment models is that the actual output/area falls short of the planned one due to the various constraints, *e.g.*, lack of credit, water shortage and subsistence farming. Thus, the supply response will be higher in the long-run as some of these constraints will disappear or relax themselves. This is very relevant in developed and probably in some underdeveloped countries where farmers' ability to remove various bottlenecks and constraints is relatively high.

In the case of East Pakistan, however, we are not so sure that the alleged constraints will be relaxed in time. Hence it is doubtful if the long-run farmers' area response will exceed the short-run response, thus rendering the usefulness of the coefficient of adjustments to be hopelessly low since the adjustment is not being realized.

In fact, as noted, some of the constraints (*e.g.*, subsistence farming) may grow in time. It is much more useful to identify constraints that are system-

¹⁷Single-equation estimation of supply responses ignores the demand side and takes price as an exogenous variable rather than determined within a system. Such a procedure is satisfactory in our case as the shifts in supply of and demand for jute are more or less independent. See, Rabbani [21 ; 22].

atically changing in time and estimate their effect on the area response to price. Thus, our model not only recognizes the adjustment problem arising from the divergence of actual and planned area, but also tries to identify one of the major constraints on farmers' ability to allocate land in response to price and attempts to estimate its effects. In this way, the understanding about farmers' response to price over time is enhanced.

II.11 Some Other Implications of the Growing Constraint of Subsistence Farming

In the theoretical model, farmers never reach a point where they cannot meet food subsistence needs (*i.e.*, $A_i Y_{Fi} < F_{Si}$ or $P_i^* A_i Y_{Fi} < P_{Fi}^* F_{Si}$).

But this is a possibility that we cannot ignore. In case $A_i Y_{Fi} < F_{Si}$ or $P_i^* A_i Y_{Fi} < P_{Fi}^* F_{Si}$, the farming family has two choices: *i*) some members of the family can leave the farm and sell their labour in the urban-industrial areas or even in the farm sector itself, and *ii*) the family sells their land and chooses *i*). The direct consequence of these forced choices is that the movement of population from the farm sector to the urban-industrial areas of East Pakistan, West Pakistan or to foreign countries will increase; and the number of landless labourers within the farm sector will increase also.

As a matter of fact both of these consequences can be observed in East Pakistan. The Population Census of 1961 showed a rapid growth of urban areas¹⁸ not because of any substantial industrial progress in the region between 1951 and 1961, but probably that some families cannot grow sufficient food to meet their family needs.

The number of landless labourers is believed to be increasing also in the farm sector of East Pakistan.

II.12 Summary and Conclusions

Confining ourselves to a given geographical and socio-economic unit (*i.e.*, East Pakistan) we tried to learn and derive the effects of a growing constraint on the ability of farmers to allocate land among competing crops in response to price. East Pakistan was chosen for the theoretical and statistical analysis because of the dominance of two competing crops in farming, stability of the cropping pattern and the techniques of production, absence of any complicating factors, and above all the availability of the fairly reliable acreage and price data.

The analysis is conducted within the economic opportunity set of land allocation among competing crops in response to price because it is reasonable to assume that the opportunities in this set are within the mental horizon of the farmers. The constraint of subsistence farming was chosen since we could

¹⁸The population in the urban areas increased by 45.1 per cent over the decade 1951-1961. See, Census of Pakistan Population [20, Part II, p. 16].

verify if it was growing or not from the information on the growth of population and food production.

The theoretical model appropriately recognized the farmer as a producer and a consumer of rice, which is a food crop. After making some simplifying assumptions, the utility-maximization model is employed to work out the implications of the growing constraint of subsistence farming for farmers' response to price in the case of all the competing crops. It was noted that the growing constraint of subsistence farming adversely affects the area response to price both in the time dimension and at the cross-sectional level. If the degree of farmer response to price is regarded as the level of farmers' economic performance in the given opportunity set, then the hypothesis generated says that the economic performance of farmers varies *directly* with the ability of farmers to exploit some given opportunities. The constraint of subsistence farming is singled out to reduce the ability of farmers to exploit the area-opportunity set, and hence farmers' area response to price.

The hypothesis was put to statistical test in East Pakistan. We found that the results obtained, and reported in Table I, are consistent with our hypothesis in the time dimension.

One of the benefits of deriving the hypothesis from theoretical framework is that it is consistent with rationality on the part of farmers.

Theoretically expected and empirically observed poor economic performance in the area-allocation set in response to price cannot be attributed to farmers' irrationality or lack of incentives on their part. On the contrary, it is the result of a growing constraint on their ability to exploit this opportunity set.

In order to put reasonable faith in the hypothesis that farmers' economic performance deteriorates when constraint on their ability to exploit a given and well-understood opportunity set tightens, and vice versa, one must make sure that the empirical support noted in this section is not the result of any cultural, economic or social peculiarities of East Pakistan.

In other words, empirical facts in other areas/countries need also be examined wherever it is feasible to do so. In fact, empirical analysis was conducted for rice and cotton in West Pakistan and for corn in Thailand by the author [12, chapters 4 and 5]. It may be mentioned that evidence consistent to the hypothesis was obtained. Some indirect evidence consistent to the hypothesis was also discussed for East Pakistan, West Bengal (India) and Philippines [12, pp. 165-172].

III. SOME POLICY IMPLICATIONS

In the above analysis it was pointed out that the practice of subsistence farming is rational and justified on economic reasons so long as the purchase

price of rice is higher than the sale price of rice and/or risk and uncertainty exist about the prices and crop yields. Over time, the adverse impact of the practice of subsistence farming is felt when population is growing faster than food production.

III.1

From the previous discussion and analysis it is clear that the intensity of the constraint of subsistence farming can be relaxed in the following ways:

i) Through the extension of transport and communication facilities, storage facilities, and market information and marketing reforms with the effect of making the various agricultural markets more competitive. In these ways the excess of the purchase price (P_{F1}^*) over the sale price of rice (P_{F2}^*) can be minimized. An ideal situation would be to bring the price differential to the level that would prevail in a competitive market.

The reduction in the present purchase-sale price differential will help to reduce the need for the practice of subsistence farming and hence help to relax the intensity of the constraint.

ii) Another, and perhaps the most important, step that will reduce the need (rationale) for the practice of subsistence farming is to minimize the risk and uncertainties attached with the purchase price of rice (P_{F1}^*). The high degree of risk and uncertainty arises from the fact that the food prices relevant to the farmers fluctuate much during a given year as well as between years. The P_{F1}^* can be stabilised somewhat through the measures suggested under i). But for an effective policy, government participation (sale and purchase operations) is necessary to stabilize the P_{F1} within a certain well-considered range. An ideal situation would be to stabilize P_{F1}^* for short periods (one or two years) with frequent reconsiderations about its level. But in considering any price stabilization policy one must compare the resource cost of such a policy and the benefits of such a policy.

iii) It was noted in Subsection II.9 (ii) that any extra risk attached to the expected sale price of jute (P_J^*) relative to the expected sale price of rice (P_{F2}^*) adversely affects the area allocated to jute.

First of all it should be said that the minimization of the risk attached to both jute and rice prices is desirable. But the most important moral of our analysis is that so far as possible, any risk differential for jute or rice price must be avoided. This point is very important in situations where government policies and measures, unconscious of the allocation problems, may favour the stabilization of the sale price of jute or rice. Unless the purpose of encouraging one crop at the expense of the other crop is well considered, creating any risk differential on prices will have an effect on land allocation that might be undesirable.

iv) Another important factor that reinforces the need and the extent of the practice of subsistence farming is the risk and uncertainty about crop yields. To a great extent the risk and uncertainty about crop yields is due to the unpredictable and uncontrollable weather conditions which change a lot from one farming season to another. Nevertheless, it can be suggested that the adverse impact of weather conditions and natural calamities (e.g., floods, storms, pest attacks) can be minimized through the extension of irrigation, flood control, pest control, etc. In addition to the direct benefit of such measures and efforts arising from the prevention of a loss in production, an indirect benefit will accrue through the reduction of the constraint of subsistence farming leading to a better land allocation between food and nonfood crops, as a result of the reduction in the present risk and uncertainty attached to the crop yields.

III.2

Measures i) to iv) of Subsection III.1 above are proposed to remove/relax the rationale for the existence of the constraint of subsistence farming. We also discussed that the initial intensity of the constraint will grow in time if the population grows faster than food production. Thus, in order to avoid any tightening of the constraint of subsistence farming, the potential growth in the food production (through the growth in productivity and land) must *at least* match the growth of the rural population dependent on land for food supply. This can be achieved by raising cultivable land, food productivity or a reduction in the rural population dependent on land for food through movement of rural population to urban areas and encouraging nonfarming occupations in the farm sector to a level where the growth in the food production is sufficient to sustain the growth of rural population dependent on land.

All the above-suggested measures will help to relax the intensity of the constraint or at least prevent it from tightening further in the course of time.

III.3 A Word of Caution

Subsections III.1 and III.2 propose certain measures and policies that will help to relax the constraint of subsistence farming. The removal of the constraint of subsistence farming is thought to be desirable since it adversely affects the land allocated to the cultivation of nonfood crops.

We must emphasize, however, that our discussion should not be taken to imply that we favour an increase in the land and hence production of nonfood crops. To be clear, the question as to whether the production of nonfood crops should be encouraged or not (e.g., jute in East Pakistan and cotton in West Pakistan) is completely a different question. For that an independent and comprehensive study should be undertaken.

Our discussion assumed that no policy decision either to favour food crops or the competing nonfood crops existed on *a priori* ground.

III.4 Making Farmers' Price Expectations More Efficient

The idea basic to this and other studies on farmers' behaviour is that farmers in the underdeveloped countries have been found to be rationally responding to the expected price (or profitability). In most studies the expected price is based on the actual price in the previous year or at the most a few more years in the past added to the previous year's experience. In other words the coefficient of price expectation (K) is found to be either unity or less than unity but greater than zero.

The question arises, however, whether the actual prices in the future come close to the expectations or not. This question is very important because inefficient price expectations can cause substantial losses or gains to the farmers, and to the extent the whole game provides windfall profits (losses), it will adversely affect the resource allocation among the competing crops.

It was mentioned in Section II that in most cases the farmers base their expectations about future prices on the actual price experience in time $t - 1$, or $t - 1, t - 2, \dots$, so on. This is not because it is the most logical or the most efficient basis for the formation of price expectations, but because no other basis is available to farmers that could be better.

In fact it was found that in East Pakistan, the actual price of jute relative to rice in period $t - 1$ could not explain the price in t to any great extent, although the farmers made $(P_J/P_R)_t$ a function of the $(P_J/P_R)_{t-1}$. This clearly shows that although the use of $(P_J/P_R)_{t-1}$ as a basis for the $(P_J/P_R)_t$ is common, the usefulness of such basis is very low.

The government can provide a useful service to farmers through improving the efficiency of their expectations about the future prices. This can be done by supplementing farmers' price experience in time $t - 1$ with efficient predictions about the future demand and supply conditions wherever it may be possible. More information on market conditions and the addition of future markets can help farmers a great deal provided their ability to form price expectations is improved in the operational sense.

In addition, measures that could be helpful are the stabilization of prices within a narrow range or to set a floor price and let the farmers know about it. Such a policy can be very helpful to farmers' decision-making, though this type of approach is not easy to handle properly.

Whatever the measures are adopted to improve the operational efficiency of price expectations on the part of the farmers, it will be useful to make agriculture a less hazardous business and hence improve resource allocation, and reduce farmers' miseries when price expectations are underfulfilled.

III.5 The Use of Price as a Policy Instrument for Handling the Agricultural Problems¹⁹

Almost all the studies on farmer response to price have made the important point that farmer response to price is positive and statistically significant. This point is very important in considering the decision about a choice between the direct interference (i.e., forcing farmers to allocate land to the production of certain crops, surrender some portion of production to the nonfarm sector), and the use of price incentives as policy instruments. Direct interference may not be very effective or feasible in the case of agriculture where millions of farm households exist and are scattered over space. Problems of implementation are enormous. Given the fact that farmers have economic incentives, price policies can be designed to encourage or discourage the production of agricultural production and in many cases, to influence the marketed surplus of agricultural products. ✓

Our study has enabled us to go a step beyond the above conclusion. We can say that although price policy should be effective due to the existence of economic incentives on the part of farmers, farmers' response to a given level of price incentives can be enhanced by removing the various physical, technological and institutional constraints on their ability to exploit the understood economic opportunities. The need to remove these constraints becomes very essential when we realize that farmer response to price in the economic opportunity set of area allocation (though significantly positive) is low, and in the context of the economic opportunity set of crop yields is almost nonexistent both in the case of individual as well as for all the crops. This is due to the low ability of farmers to exploit the area-opportunity and yield-opportunity sets. ✓

It will be necessary to remove the various physical, technological and institutional constraints to enhance the efficiency and effectiveness of a certain given price policy. Removal of the various constraints will result into increased agricultural production so long as the marginal return from it exceeds the marginal cost involved, and the composition of agricultural production will shift in favour of those products for which the profitability is the highest. ✓

The latest word in the context of agricultural policy-making is the use of price incentives. We propose that the price incentives must be matched by a side-by-side removal of the various constraints on farmers' ability to exploit the given economic-opportunity sets. In the context of those opportunity sets for which farmers' supply response to price is positive and for which farmers' ability to exploit is constrained, there are more than one policy choices open to achieve some given increase in production/marketed surplus. The choices arise from the use of price alone, or the removal of the various constraints only, and the various possible combinations of price policies matched by a removal

¹⁹For a discussion on the relevance and usefulness of agricultural price policy, see [14 a].

of constraints. It is worthwhile to conduct an analysis for the available choices on policy instruments and design an optimal policy on its basis.

In cases where farmers' response to price is very poor or nonexistent, the removal of the various constraints is the only effective policy to raise agricultural production.

Hence, it is suggested that before agricultural policies giving economic incentives are designed, their nature and level must be examined in the light of farmers' ability to exploit the various economic opportunities within the horizon. In some cases agricultural price policy is useful and can be made even more useful and effective by enhancing the constrained ability of farmers to understand and exploit given economic opportunities. In other cases, price policy could be little effective and the removal of the various constraints may be the only hope for raising agricultural production.

REFERENCES

1. Bauer, P. T., and B. S. Yamey, "A Case Study of Response to Price in an Underdeveloped Country", *Economic Journal*, Vol. 69, December 1959.
2. Behrman, J. R., *Supply Response in Underdeveloped Agriculture: A Case Study of Four Major Annual Crops in Thailand, 1937-1963*. Unpublished Ph. D. thesis, M. I. T., September 1966.
3. Clark, Ralph, "The Economic Determinants of Jute Production", *Monthly Bulletin of Agricultural Economics and Statistics*, Vol. 6, September 1957.
4. Dean, Edwin, *The Supply Response of African Farmers: Theory and Measurement in Malawi*. (Amsterdam: North-Holland Publishing Company, 1966).
5. Eicher, C. K., "The Dynamics of Long-run Agricultural Development in Nigeria", *Journal of Farm Economics*, Vol. 49, December 1967.
6. Falcon, W. P., *Farmer Response to Price in an Underdeveloped Area: A Case Study of West Pakistan*. Unpublished Ph. D. thesis, Harvard University, 1962.
7. Falcon, W. P., "Farmer Response to Price in a Subsistence Economy: The Case of West Pakistan", *American Economic Review*, Vol. 54, (Proceedings), May 1964.

8. Falcon, W. P. and C. H. Gotsch, *Agricultural Development in Pakistan: Lessons From the Second Plan Period*. Mimeographed. (Cambridge: Harvard University Center for International Affairs, June 1966).
9. Freire, R., *Price Incentives in Argentine Agriculture*. Mimeographed. (Cambridge: Harvard University Center for International Affairs, July 1966).
10. Hopper, W. D., "Allocative Efficiency in a Traditional Indian Agriculture", *Journal of Farm Economics*, Vol. 47, August 1965.
11. Hussain, S. M., "A Note on Farmer Response to Price in East Pakistan", *Pakistan Development Review*, Vol. IV, No. 1, Spring 1964.
12. Hussain, S. M., *Economic Development of the Agricultural Sector of An Underdeveloped Country with Special Reference to Pakistan*. Unpublished Ph.D. dissertation, University of California-Berkeley, December 1968.
13. Hussain, S. M., *Price Response of Marketable Surplus in a Developing Economy : A Theoretical Framework*. Mimeographed Research Report No. 81. (Karachi: Pakistan Institute of Development Economics, April 1969).
14. Kaul, J. L., "A Study of Supply Response to Price of Punjab Crop", *Indian Journal of Economics*, Vol. 48, July 1967.
- 14a. Krishna, R., "Agricultural Price Policy and Development" in [25].
15. Krishna, R., "Farm Supply Response in India-Pakistan: A Case Study of the Punjab Region", *Economic Journal*, Vol. 73, September 1963.
16. Krishna, R., *Farm Supply in the Punjab (India-Pakistan): A Case Study of Cotton*. Unpublished dissertation, University of Chicago, August 1961.
17. Mangahas, M., Recto, A. E., and V. W. Ruttan, "Price and Market Relationships for Rice and Corn in the Philippines", *Journal of Farm Economics*, Vol. 48, August 1966.
18. Mubyarto, *The Elasticity of the Marketable Surplus of Rice in Indonesia : A Study in Java Madura*. Unpublished Ph. D. dissertation, Iowa State University, 1965.
19. Pakistan Central Jute Committee, *Report on Survey of Cost of Production of Jute in East Pakistan, 1958 & 1959*. (Dacca : Pakistan Central Jute Committee, 1962).

20. Pakistan, Ministry of Home and Kashmir Affairs (Home Division), *Census of Pakistan Population, Vol. I*. (Karachi: Manager of Publications, 1961).
21. Rabbani, Ghulam, A. K. M., "Economic Determinants of Jute Production in India and Pakistan", *Pakistan Development Review*, Vol. V, No. 2, Summer 1965.
22. Rabbani, Ghulam, A. K. M., *Jute in the World Economy — A Statistical Study*. Unpublished Ph. D. thesis, University of London, 1964.
23. Seltzer, William, *Benchmark Demographic Data for Pakistan: A Review of Summary Estimates Derived from the PGE*. Mimeographed Research Report No. 66. (Karachi: Pakistan Institute of Development Economics, March 1968).
24. Sinha, A. R., "A Study of the Indian Jute Forecast", *Sankhya*, Vol. 3, 1938.
25. Southworth, H. M. and B. F. Johnston, (eds.), *Agricultural Development and Growth*. (Ithaca, N. Y.: Cornell University Press, 1967).
26. Stern, R. M., "The Price Responsiveness of Primary Products", *Review of Economics and Statistics*, Vol. 44, May 1962.
27. Stone, Richard, *The Measurement of Consumers' Expenditure and Behaviour in the United Kingdom, 1920-1938. Vol. 1*. (Cambridge: Cambridge University Press, 1954).
28. United Nations, F. A. O., *Commodity Series — Bulletin No. 28: Jute — A Survey of Markets, Manufacturing and Production*. (Rome: F. A. O., 1957).
29. Welsch, D. E., "Response to Economic Incentives by Abakaliki Rice Farmers in Eastern Nigeria", *Journal of Farm Economics*, Vol. 47, November 1965.
30. Venkateramananan, L. R., *A Statistical Study of Indian Jute Production and Marketing with Special Reference to Foreign Demand*. Unpublished Ph. D. dissertation, University of Chicago, 1958.

Appendix A

TABLE A-1

JUTE AREA, PRICE AND RELATED SERIES: EAST BENGAL/PAKISTAN

Year	Jute area	Jute harvest price	Rice retail price
(1)	(2)	(3)	(4)
	(000' hectares)	(rupees per maund)	
1931/32	586	4.3	3.8
1932/33	670	3.6	3.2
1933/34	788	3.5	3.4
1934/35	852	3.6	3.5
1935/36	696	4.7	3.7
1936/37	823	5.1	3.9
1937/38	791	5.2	3.9
1938/39	920	5.5	4.0
1939/40	943	9.1	4.4
1940/41	1,768	4.3	5.1
1941/42	548	7.2	5.3
1942/43	982	8.8	14.0
1943/44	773	12.4	15.0
1944/45	609	12.7	12.5
1945/46	736	13.3	13.0
1946/47	556	25.9	16.3
1947/48	833	23.3	24.2
1948/49	760	31.4	30.1
1949/50	632	19.9	24.4
1950/51	692	28.4	19.5
1951/52	720	27.5	22.0
1952/53	772	10.6	21.1
1953/54	391	15.9	15.9
1954/55	503	17.7	10.3

Hectare = 2.47 acres.

Source: [28, Appendix J-K, pp. 63-66].

TABLE A-2

JUTE AREA, PRICE AND RELATED SERIES: EAST PAKISTAN

Year	Jute area	Jute harvest price	Price of <i>aus</i> ^a and <i>aman</i> rice	Price of <i>aus</i> rice ^b
(1)	(2)	(3)	(4)	(5)
	(000 ⁰ acres)		(.....in rupees per maund.....)	
1948/49	1,877	32.31	27.31	29.01
1949/50	1,561	22.12	24.16	31.13
1950/51	1,701	28.69	16.61	19.37
1951/52	1,779	27.37	20.08	21.87
1952/53	1,907	10.69	19.78	23.62
1953/54	965	15.44	16.07	21.50
1954/55	1,243	16.02	9.00	14.37
1955/56	1,634	18.84	15.40	17.94
1956/57	1,230	26.36	20.25	33.62
1957/58	1,563	27.48	21.50	30.56
1958/59	1,528	21.70	23.00	28.37
1959/60	1,375	20.72	22.56	26.03
1960/61	1,518	41.00	23.40	23.00
1961/62	2,061	37.44	23.12	22.75
1962/63	1,723	—	—	—

Source: [11, Appendix Tables A-II & A-III, pp. 105-106].

^aIt is the average harvest price of *aus* and *aman* rice at Dacca and Mymensingh.^bIt is the average harvest price of *aus* rice (medium quality) in Dacca.