Hierarchy of Agricultural Functions: A Study of Production and Marketed Output in Purnia (North Bihar, India)

Mahmood Ansari

Assam University

2010

Online at http://mpra.ub.uni-muenchen.de/52597/
MPRA Paper No. 52597, posted 5. January 2014 07:31 UTC
Hierarchy of Agricultural Functions:
A Study of Production and Marketed Output in Purnia (North Bihar, India)

Abstract

There may be a situation for classes of peasantry whereby a peasant-cultivator of a specific class location may not even make both ends meet. A peasant may be in debt. It may not be the net returns for a peasant of this class but the gross yield, which he/she may be seeking to maximize with the burden of debt allowed to be accumulating. In such circumstances, it is clearly futile to reduce all operators to the status of the profit maximizers. It is worth arguing that there cannot logically and realistically be a uniform technology adopted by the peasantry, who are differentiated on the basis of inequality in the resource endowments and land ownership base. In such a circumstance, the minimization of deviations from the average relation between inputs and output characterizing the least-square method of regression analysis to derive a production function is anti-thesis of the differentiation of peasantry. All the operators are not to be assumed to be uniformly profit-maximizers and a uniform technology may not posited to be accessible to all classes of peasantry. It is therefore posited that there are bound to be logically a hierarchy of production functions rather than a unique aggregate function in the agriculture. A unique production function is best suitable for a cross-section of uniformly controlled experimental farms, but not the diverse class of actual farms possessed by differentiated peasantry. What is true of an agricultural production function is equally true of a marketed surplus function. What must not be debatable is the assertion that there is logically a possibility of a hierarchy of marketed surplus functions on the divergent peasant farms of the differentiated peasantry in the district of Purnia in north Bihar, India.

Key Words: peasantry, price, labour, output, yield, acreage, regression coefficient, statistical test production function, marketed surplus function, class differentiation, rich peasant, small peasant, middle peasant, district

Introduction

In the standard model, it is invariably assumed that a peasant owns and controls a profit-seeking production enterprise in agriculture. The objective of agricultural production is profit maximization. The production unit utilizes the inputs in technically efficient manner. The state of knowledge about the various methods that might be used to transform the inputs into agricultural outputs, that is, production technology in agriculture used by the peasant is assumed to be given for a given period of time. It is further posited that the inputs are perfectly divisible. These assumptions are at the core of neoclassical thinking in the mainstream economics. Under such postulates of theorists of the neoclassical economic analysis persuasions, a vital tool and technique of input-output relations have been devised in the literature. This is called the agricultural production function. In the perspective of the present work, the conceptual doubt towards such a technique of production analysis is premised on the fact that it simplifies the complex realities of the production process in agriculture. The concept of production function abstracts from the concrete economic differentiation among the peasantry, which is the core of
Marxist perspective on the peasantry. It is worth arguing that there are no motivational forces, which are definable, a priori for any peasant household independently of the entire gamut of production and market relations in which it is involved. It may not be all the time the profit-seeking.

There may be a situation for classes of peasantry whereby a peasant-cultivator of a specific class location may not even make both ends meet. A peasant may be in debt. It may not be the net returns for a peasant of this class but the gross yield, which he/she may be seeking to maximize with the burden of debt allowed to be accumulating. In such circumstances, it is clearly futile to reduce all operators to the status of the profit maximizers (Bhardawaj, 1974, pp.61-2). A given qualitatively identical materials, equipment and machinery, and therefore, almost uniform technology used by each cross-section of farms of peasantry is the crucial assumption of production function in agriculture, which is far from reality. It is worth arguing that there cannot logically and realistically be a uniform technology adopted by the peasantry, who are differentiated on the basis of inequality in the resource endowments and land ownership base. In such a circumstance, the minimization of deviations from the average relation between inputs and output characterizing the least-square method of regression analysis to derive a production function is anti-thesis of the differentiation of peasantry.

In the present work, all the operators are not assumed to be uniformly profit-maximizers and a uniform technology is not posited to be accessible to all classes of peasantry. It is therefore posited that there are bound to be logically a hierarchy of production functions rather than a unique aggregate function in the agriculture. A unique production function is best suitable for a cross-section of uniformly controlled experimental farms, but not the diverse class of actual farms possessed by differentiated peasantry. What is true of an agricultural production function is equally true of a marketed surplus function. What must not be debatable is the assertion that there is logically a possibility of a hierarchy of marketed surplus functions on the divergent peasant farms of the differentiated peasantry. Such postulates are tested with empirical data obtained from a district of north Bihar called ‘Purnia’ in the present paper. While undertaking a regression analysis on heterogeneous farms in Purnia, the production technique efficiency index is also estimated.

1. Conceptual Foundation

Peasantries are actually economically differentiated groups in the countryside. Such groups differ with each other not only in matter of ownership, control and operation of land but also the use and exploitation of outside labour hired on the farms. The degree of use of hired-in labour vis-à-vis family labour differentiates the peasantries into at least five economic classes: petty/poor peasant, small peasant, middle peasant, rich peasant, and landlord/capitalist. In order to classify the peasantry, Utsa Patnaik (1987) has put forward a labour-exploitation index in the following form:

Agricultural Production is organized by combining a number of non-land inputs with the land. The output obtained and the inputs applied bear a definite relation of association. Such relation is usually captured by the conventional input-output analysis with the help of a theoretical concept called an agricultural production function. It shows the technical relationship between
the physical quantities of inputs used and output obtained on the agricultural farms. The
method commonly used for statistical fitting of an agricultural production function in the
literature is the least square method of the regression analysis. A production function in
agriculture describes the maximum output for each specified combination of agricultural inputs.
It refers to the physical relation between inputs and output. It represents the purely technical
relations between inputs and output on the peasant farm. It describes the laws of proportions of
inputs at any particular point of time. The basic theory of production then concentrates only on
the efficient methods or processes or activity. A rational entrepreneur in agriculture is not
assumed to be using any inefficient method of production. A production function can be
represented mathematically in the form of algebraic equations, and diagrammatically by a series
of isoquants (the negatively sloped curve in an input-output space). A production function
describes not only a single isoquant but the whole array of the isoquants on the map, whereby
each isoquant represents a method of economizing on the use of agricultural resources by the
peasant-producer.

In the neoclassical literature, the popular empirical measure of agricultural growth is the
statistical fitting of an aggregate production function for agriculture, and there are sophisticated
tools available for the statistical fitting of the function, for example, the multiple regression
analysis. The marketable and marketed output functions of individual crop as well aggregate
food crop are fitted and statistically estimated with the help of simple and multiple regression
analysis. There are debates surrounding the statistical estimates, and the associated measurement
methods. These controversies belong to the domain of the statistical theory. It is affirmed that
there may be a possibility of `specification bias' in fitting a production and marketed surplus
functions. The specification bias arise when the specification of the list of relevant factors in a
relation is either wrong or a particular factor is omitted. While fitting a production function in
agriculture, the omission of variables like human labor, draft power, etc. are very much likely
because of disregard of importance to measurement of the variable itself (Minhas, 1966, p. 176).
In a statistical fitting of a production function of Cobb Douglas type, there are further serious
problems of isolating the marginal productivity of human labor from that of other inputs like
livestock (Bardhan, 1973). On methodological grounds, the statistical procedures employed to
fit a function have been found to be unsatisfactory (Rudra, 1982; Bhardawaj, 1979; Jodha and
Anderson, 1973; Sen, 1975). It is therefore asserted that such functions are usually too simple to
capture adequately the complexities of the agricultural production processes (Booth and
Sundaram, 1984, p.248). It is not to say that the function is not at all an improved and rigorous
tool of analysis of the production activity of the peasantry on uniformly controlled experimental
farms. The statistical fitting of an agricultural production function however involves a departure
from the theoretical concept. The departure consists in the fact that the measurement of
variables (i.e. input and / or output) in the value terms is possible on the assumption of a
uniform “price regime. It is also the case that the statistical fitting affords only average or
“expected” estimate of the functional relation. Its deviation from the “maximum” or maximal
estimate (the theoretical concept of neoclassical vintage point) needs to be measured (Rudra,

2. Multiple Models of Regression Analysis
The most widely used and popular agricultural function is the Cobb-Douglas production function. It was a pioneering piece of economic work, which came up towards the close of the third decade of the present century (Cobb and Douglas, 1928, pp.139-65; Douglas, 1948, pp.1-41). It is a power production function. The function makes it possible to use the statistical data on the volume of labor and stock of fixed capital employed to plot the shape of the production map. The original Cobb-Douglas production function was represented symbolically as

\[ P = b \cdot L^k \cdot C^{1-k}, \]

where \( P \) refers to the volume of product, \( L \) to volume of labor supply, \( C \) to stock of fixed capital, and \( b \) and \( k \) to the constants. This function made the theoretical selection of the constant returns to scale of production - homogeneous linearity- possible. The exponents were later made deliberately free by Douglas (1948) to account for the increasing and diminishing returns (Mitra, 1980, p.18). What was further needed later was to incorporate the vital input of agriculture called the land resource in the function. The land is a crucial input which explains the variation in the agricultural output. There emerged the possibility of incorporation of other inputs, for example, the land in the agricultural production function. The function for a particular crop is finally represented as:

\[ Y = k \cdot A^n \cdot B^m \cdot C^l, \]

where \( Y \) refers to the amount of gross product, \( A \) to the amount of land, \( B \) to volume of labor, \( C \) to capital stock, and \( k \) to a constant. The letters \( n, m \) and \( l \) represent the production elasticities (Mellor, 1986, p.24). The Cobb-Douglas production function has yet been controversial enough to warrant occasional critical appreciation. It has been argued that there is a vital input called the raw material, which has not been taken care of in this function (Mitra, 1980, pp.19-21). There have thus been attempts to broaden the functional form in later years.

There exists today a general mathematical form also, which can be represented as:

\[ Y = f (L, K, R, S, \delta, \gamma), \]

where \( L \) refers to the amount of labour, \( K \) to capital, \( R \) to the raw materials, \( S \) to land amount, \( \delta \) to the returns to scale, and \( \gamma \) to the efficiency parameter. All the variables are flows, and measured per unit of time. The raw materials bear a constant relation to output for all levels of production and land can be assumed to be fixed for the economy, and thus may be lumped together with capital for individual firm. The abbreviated form of the function is

\[ Y = f (L, K, \delta, \gamma) \]

The variable \( \delta \) is relevant only in the long run. If land and capital are constant, then the output is simply a function of the efficiency parameter only. The parameter refers to the entrepreneurial organizational aspects of the production (Koutsoyiannis, 1985, pp.67-70). According to Yujiro Hayami (1975), there may be residuals, which may remain unexplained by the growth in inputs. This residual may be explained by the changes in the rate of growth in total factor productivity. The changes in the rate of growth in total factor productivity may be explained by including non-conventional factors such as education of farmers, public expenditure on agricultural research and extension, and improvement in land infrastructures in a production function. The growth rate of agricultural output on the peasant farms across the historical junctures shows
distinct growth phases – distinct regions of total factor productivity growth. It is influenced by the technology.

In the present analysis of cross-section of agricultural farms, the general linear production function is conceived as follows:

$$X_c = f (A, c, L, B, M, C, P_L) g + D + F$$

A departure from the theoretical concept is made while statistically fitting an agricultural production regression function. The departure consists in the fact that the measurement of variables (i.e. input and / or output) in the value terms is possible on the assumption of a uniform “price regime. It is also the case that the statistical fitting affords only average or “expected” estimate of the functional relation. Its deviation from the “maximum” or maximal estimate (the theoretical concept of neoclassical vintage point) needs to be measured (Rudra, 1982, pp. 273-5). In the present work, the linear equation form is:

$$X_c = \alpha_0 + \alpha_1 A + \alpha_2 e + \alpha_3 L + \alpha_4 B + \alpha_5 M + \alpha_6 C + \alpha_7 P_L + D + F,$$

where the notations $X_c$ refers to the volume of output of a crop per acre, $A$ to the amount of cultivated land area in acres, $e$ to the percentage of cultivated area under artificial irrigation, $L$ to the number of man days of human labor input per acre, $B$ to the number of man days of bullock labor (or plough labor) per acre, $M$ to the aggregate monetary value of material inputs of the seeds, manure, fertilizers, irrigation water, and pesticides per acre, $C$ to the monetary value of expenses on the machinery like pump-sets, tractors, threshers, etc running on farms per acre, $P_L$ to the annual money cost of hiring-in the permanent labor per acre, $g$ to the random multiplicative error term, $D$ to the dummy representing village effect, and $F$ to the dummy capturing the land fertility effect. The letter ‘$f$’ refers to the functional notation. The notations $\alpha_0$ refer to the intercept value, and notations $\alpha_1$ to $\alpha_7$ to the respective regression coefficients with respect to relevant inputs. It is to be noted that the letter ‘$g$’ stands for an error term that arises from two sources: a stochastic-error-component, resulting from the effects on $X_c$ of many omitted variables operating in different directions and each with a relatively small effect, and a measurement-error-component. All the variables are expressed in ‘per-acre’ terms to ensure homoskedasticity. The general linear model entails the restriction that the structure of the relationships is linear in the $\alpha_i$s. Furthermore, it is assumed that the independent variables are measured without error.

The production technique efficiency index on a farm is defined to be the ratio of field enumerated actual annual amount of gross output of crop per acre to the predicted amount of output of crop per acre. The predicted amount of output of crop per acre is obtained by reconstituting the set of statistically significant agricultural inputs in running a production regression analysis. The farms that attain the production technique efficiency index value, which is the ratio of field enumerated actual annual amount of output of crop per acre to the predicted amount of output of crop per acre on each peasant farm, greater than 1.00 are classified as the highly efficient farms, the farms with index value equal to 1.00 as just efficient farms, and those with index value lower than 1.00 as the production inefficient farms.
A simple linear cross-section marketed output function is likewise statistically fitted based on least-square method of multiple regression analysis in case of a crop in the following form:

\[ S_i = f(\chi_p, \chi_i, P_{mi}, I) + M, \]

where \( S_i \) refers to the proportion of net marketed output to net output of a crop over a year, \( \chi_p \) to the annual volume of output of food crop per adult in quintals, \( \chi_i \) to the current market price-based value of output of a commercial crop per adult in rupees, and \( P_{mi} \) to the weighted average market price of a crop per quintal received by a household across season in the year, \( I \) to the average income of a peasant householding from non-crop production, and \( M \) to the dummy variable called the market-type chosen by a household in disposing the surplus of a food crop. The goodness of fit is estimated based on the significance of \( R^2 \) value of estimates, t-value of a pair of determinant variable and the value of standard error of estimate. The diagnosis of multi-collinearity is particularly taken care of.

3. Agricultural Functions: Generalized Results

In the case of paddy crop, the regression analysis is run over the aggregate sample of farms, and the statistical estimate of coefficients obtained. The linear production function fitted is found to be of the following reduced form:

\[ P_p = \alpha_o - \alpha_2 e' + \alpha_5 M + V \]

The least-square criterion of linear regression analysis gives statistically non-significant values of slope coefficients for other input variables of the original regression model; these independent input variables are thus eliminated, and a trimmed model is run. The input variables are therefore reconstituted to consider only those explanatory variables, whose t-value was respectively statistically significant. It is revealed that even the slope coefficient value for dummy variable of land fertility index show insignificant t-value. Putting the estimated values of intercept and slopes or the regression coefficients of the considered inputs, we get

\[ P_p = 8.75 + 0.001 M - 0.02e' + 3.64V \]

The linear regression analysis has a ‘goodness of fit’. The estimated F-value of the analysis of variance stands at 33.828, which is higher than the table value and therefore meaningful at 1 percent level of significance. What is more significant is the reading that the test of Durbin-Watson gives the value of 1.796, which is of course closer to two ─ a desirable trait. The collinearity statistics referred to as variance inflation factor (VIF) for all independent variables in the multiple regression equation is much less than 10, establishing that there is no concern for the multi-collinearity in the backward stepwise regression. In other words, there is no need of reconstituting the set of determining variables under consideration.
Table – 1
Linear Regression Analysis of the Determinants of Annual Volume of Paddy Output per Acre on a Farm in Rural Purnia, 1991-92

Mean Value: 10.37 quintals per acre
Standard Deviation: 3.65 quintals per acre

<table>
<thead>
<tr>
<th>Regressors/Explanatory Variables</th>
<th>Regression coefficient statistics</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>8.748</td>
<td>0.380</td>
<td>23.007</td>
<td>0.000</td>
</tr>
<tr>
<td>Total cost incurred on seeds, manure, fertilizers and irrigation per acre of operational land (rupees)</td>
<td>0.0007</td>
<td>0.000</td>
<td>5.082</td>
<td>0.000</td>
</tr>
<tr>
<td>Net area under irrigation as percentage of operated area</td>
<td>(-)0.018</td>
<td>0.006</td>
<td>(-)3.312</td>
<td>0.001</td>
</tr>
<tr>
<td>Paddy village dummy variable</td>
<td>3.641</td>
<td>0.399</td>
<td>9.131</td>
<td>0.000</td>
</tr>
</tbody>
</table>

In this regression analysis, the number of observations is 268 paddy farms of the sample peasantry in Purnia. The estimated R-value is 0.527. The $R^2$ value is the square of the correlation coefficient. The value of $R^2$ stands at 0.278. This $R^2$ value is important because it reveals how well the straight-line model fits the scatter of points in the regression plain. It is evident that it fits rather less well in the exercise under consideration. The statistical fitting of the cross-sectional paddy-crop production function is rather a poor one because it explains only 27.80 percent of the variation in the annual volume of the paddy output per acre. The intercept value is positive one; which is a high numerical figure closer to the mean value of output variable. In statistical theory, the adjusted $R^2$ reduces the $R^2$ by taking into account the sample size and the number of parameters estimated. In the present exercise, the adjusted $R^2$ is at the numerical figure of 0.269. Be that as it may. The F-value of the analysis of variance signals however that null hypothesis of no linear relationship is to be rejected. The contribution of the total cost incurred on seeds, manure, fertilizers and irrigation per acre of operational land to the paddy output per acre is positive. The contribution of the irrigation input in explaining the change in the paddy output is however negative one. This is expected in a rain fed farming area. The most important part is nonetheless played by the area and village specificity clubbed under the dummy of so-called ‘paddy-producing village’. Theoretically, the standard error of the estimate is a measure of the accuracy of the estimates of the regression equation. It is analogous to the standard error of the mean but based on residuals i.e. the difference between the predicted and actual value of paddy output per acreage under the crop. It is of course found to be low presently. The standard error of the estimate is found to be equivalent to 3.117.

In the case of jute crop, a trimmed linear model of the regression analysis is statistically fitted on the aggregate sample of 268 peasant farms under consideration. This is again obtained by reconstituting the explanatory variables of the original regression model under consideration. The linear production function, which is statistically fitted, is found to be of the following reduced form:
The other input variables of the original model were dropped from the analysis to improve the “goodness of fit”. The regression coefficients of the dropped variables have t-value, which was significant not even on 10 percent level of statistical significance. The estimated fit of the linear jute production function, obtained by least square method of multiple regression analysis with the statistical estimate of coefficients obtained, is as follows:

\[ P_j = \alpha_0 + \alpha_1 L + \alpha_6 C + \alpha_7 P_I + V \]

The goodness of fit of the regression analysis of the annual volume of jute output per acre is established by the high numerical estimated and statistically significant F-value of analysis of variance. The estimated F-value, which stands at 45.098, is significant at 1 percent level of significance. The Durbin-Watson value is also closer to two; the estimated value is 1.772. The collinearity statistics referred to as variance inflation factor (VIF) for all independent variables in the multiple regression equation is much less than 10, which does unfailingly establish that there is no need of any concern about the multi-collinearity in the backward stepwise regression. In other words, there is no need of further reconstituting the set of determining variables under consideration.

Table – 2

Linear Regression Analysis of Determinants of Annual Volume of Jute Output per Acre on a Farm of a Peasant Household in Rural Purnia: 1991-92

Mean value = 4.85 quintals per acre
Standard deviation = 3.30 quintals per acre

<table>
<thead>
<tr>
<th>Explanatory variables (Regressors)</th>
<th>Regression coefficient</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.498</td>
<td>0.248</td>
<td>10.080</td>
<td>0.000</td>
</tr>
<tr>
<td>Total mandays of family, casual and contract labor employed per acre of jute production</td>
<td>0.009</td>
<td>0.001</td>
<td>9.294</td>
<td>0.000</td>
</tr>
<tr>
<td>Total cost incurred on seeds, manure, fertilizers and irrigation per acre of operational land (rupees)</td>
<td>(-)0.0003</td>
<td>0.000</td>
<td>(-)1.995</td>
<td>0.047</td>
</tr>
<tr>
<td>Cost incurred in employing the permanent labor per acre of operated land (rupees per acre)</td>
<td>0.0017</td>
<td>0.000</td>
<td>1.024</td>
<td>0.000</td>
</tr>
<tr>
<td>Jute village dummy variable</td>
<td>2.034</td>
<td>0.361</td>
<td>5.638</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The number of observation is 268 peasant farms of jute crop. The estimated R coefficient is high at the figure of 0.638. The significant coefficient is however the R² which is 0.407. It means...
that 40.70 percent of the variation in the jute output per acre on the sample farms is explained by the input variables considered in the model. This is still high in a situation of a highly heterogeneous cross-section of farms of the sample. The adjusted R\textsuperscript{2} value of course reduces to stand at 0.398. In other words, it is justifiable to use a straight-line relationship to model the selected variables. The contribution of the mandays of family, casual and contract labor per acre, and the monetary cost incurred on employing the permanent labor per acre on the jute farms are positive, along with the positive intercept value in the model. The role played by the annual cost incurred on seeds, manure, fertilizers and irrigation per acre of operational land in the change in the output of jute per acre is however negative. The village specific dummy variable is having a positive contribution in the changes in jute output on the farms. Be that as it may. The standard error of estimate is low at 2.561. It is worth a note that the regression equation of jute output can not be strictly compared with the regression equation of paddy output in terms of the goodness of fit, because the R\textsuperscript{2} value in each case pertains to two different trimmed model altogether. This is despite it that the linearity characteristics of the models are common. Nonetheless, it is understood that the variation in the jute yield is robustly explained by the inputs under consideration.

In the case of paddy crop marketed by the cross-sections of aggregate sample farms, a rather trimmed model is run, because the variables relating to the income and dummy are dropped due to these being found statistically not significant. The marketed output function of paddy crop on the basis of reconstituted independent variables is of the following linear equation form:

$$S_p = A + \alpha_1 \chi_p + \alpha_2 \chi_i + \alpha_3 P_{mp},$$

where \(A\) refer to the intercept value, the subscript \(p\) for the paddy crop, and \(\alpha_1\) to \(\alpha_3\) to the respective regression coefficients with respect to relevant independent variables. In the multiple regression analysis, the estimated values of intercept and regression coefficients give the following marketed output function for paddy crop:

$$S_p = -16.60 + 1.28 \chi_p - 0.001 \chi_i + 0.17 P_{mp}$$

### Table – 3

**Linear Regression Analysis of the Determinants of the Proportion of Net Marketed Output to Net Output of Paddy Crop on a Farm in Rural Purnia, 1991-92**

<table>
<thead>
<tr>
<th>Explanatory Variables (Regressors)</th>
<th>Regression coefficients</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>(-)16.603</td>
<td>2.700</td>
<td>(-)6.149</td>
<td>0.000</td>
</tr>
<tr>
<td>Annual volume of paddy output per adult (quintals)</td>
<td>1.284</td>
<td>0.160</td>
<td>8.038</td>
<td>0.000</td>
</tr>
<tr>
<td>Annual market value of jute output per adult (rupees)</td>
<td>(-)0.0013</td>
<td>0.000</td>
<td>(-)3.472</td>
<td>0.001</td>
</tr>
</tbody>
</table>
Average market price of paddy per quintal (rupees)  |  0.165  |  0.011  |  15.033  |  0.000

The linearity assumption and the set of explanatory variables chosen gives a statistical ‘goodness of fit’ with a high and significant value of $R^2$ and F-value of analysis of variance. The standard error of the estimate is nonetheless high. The model has goodness of fit on the cross-section of farms under consideration. The number of observation is 268 paddy farms. The F-value of analysis of variance is pretty high at 170.064, which is significant at 1 percent level of significance. The Durbin-Watson value is 1.645. The estimated R-value is 0.812. The $R^2$ value is 0.659. In other words, the present linear model and the determining variables considered therein do explain 65.90 percent of the variation in the proportion of the net-marketed surplus of paddy. The adjusted $R^2$ value is of course a reduced value, that is, 0.655. The standard error of the estimate is high at 21.666. The intercept value is negative, which is of course expected. We get the negative intercept, which captures the fact that there is phenomenon of positive sales of marketed surplus along with negative phenomenon of repurchases. In case of a few peasant houses holding farm, the net-marketed surplus of paddy is a negative figure due to high repurchases and zero marketed surplus.

The contributions of the paddy output on the farm and paddy price in the market are positive to the variation in the proportion of the net-marketed surplus of paddy. It is but the role played by the market value earned by selling a commercial crop is negative. The annual jute output value per adult has otherwise weak significance in explaining the proportion of net marketed surplus to net output of the food crop of the sample farm. The three determining variables considered in the model, given the t-values estimated, are statistically significant. There is no need to reconstitute the set of variables considered, because the collinearity statistics referred to as variance inflation factor (VIF) for all independent variables in the multiple regression equation is much less than 10, establishing that there is no concern for the multicollinearity in the backward stepwise regression.

In case of commercial crop of jute, there is again the need to reconstitute the explanatory variables in the marketed surplus function. The income and dummy variables are statistically not significant. The trimmed model was therefore run. The statistically fitted marketed output function over the cross section of farms is of the following linear form:

$$S_j = A + \alpha_1 X_j + \alpha_2 P_{mj},$$

where $S_j$ refers to the proportion of net marketed output to net out put of jute in the year, $X_j$ to annual volume of jute output per adult in quintals in the year and $P_{mj}$ to the average current market price of jute per quintal in rupees received by a household. The least square method of the multiple regression analysis on the cross section of all sample farms gives the following marketed output function for jute crop estimate:

$$S_j = 1.85 + 0.181 P_{mj}$$


The number of observation is 268 jute-producing farms. The model has a highly satisfactory goodness of fit. The Durbin-Watson value is highly close to the desirable value, it stands at 1.927. It is almost close to 2.0. The F-value is pretty high numerical figure; it is 3192.160. This estimated value is of course significant at 1 percent level of significance. The estimated R value is 0.961. The value of the $R^2$ is 0.923. In other words, almost 92 percent of the variation in the proportion of the jute-marketed surplus is explained by the trimmed linear model. The adjusted $R^2$ is 0.923. The standard error of the estimate is quite low at 10.791. There is no concern for the multi-collinearity phenomenon. The market price of the jute crop received by the farmers is the sole explanatory variable worth consideration. This is highly expected in case of a commercial crop. The intercept value is quite low but positive. The jute marketed surplus function is a comparatively better statistical fit with linearity assumptions of regression analysis than the paddy marketed surplus function of the overall sample peasant farms.

### 3.1. "Class Differentiated” Results

**Petty/Poor Peasant**

It is worth the memory that the present cross-section agricultural food-crop production function captures the input-output relation as one moves from farm to farm. This is irrespective of the size and qualitative features of the farms. The peasant farms are however operationally quite different and diverse rather qualitatively due to the differing economic class-locations of the owner-peasantry. The linear paddy regression equations are estimated therefore for each cross sub-section of the paddy farms pertaining to the diverse agrarian locations of peasant classes. The linear production functions of paddy crop for the cross-sections of each peasant class farms, which are fitted and estimated, are all different. In the case of petty and poor peasant class farms, the statistical fitting gives the following linear form of regression equation:

\[
P_{pmg} = 7.50 + 0.014 M - 0.04 er + 1.21V
\]
Table – 5

Linear Regression Analysis of the Determinants of Annual Volume of Paddy Output per Acre on a Farm of the Marginal Class of Peasant Household in Rural Purnia, 1991-92

Mean Value=10.26 quintals per acre
Standard Deviation =3.23 quintals per acre

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Regression coefficient</th>
<th>Standard Error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>7.498</td>
<td>1.875</td>
<td>4.000</td>
<td>0.004</td>
</tr>
<tr>
<td>Total cost incurred on seeds, manure, fertilizers and irrigation per acre of operational land (rupees)</td>
<td>0.0144</td>
<td>0.008</td>
<td>1.886</td>
<td>0.096</td>
</tr>
<tr>
<td>Net area under irrigation as percentage of operated area</td>
<td>(-)0.043</td>
<td>0.029</td>
<td>(-)1.493</td>
<td>0.174</td>
</tr>
<tr>
<td>Paddy village dummy variable</td>
<td>1.207</td>
<td>1.877</td>
<td>0.643</td>
<td>0.536</td>
</tr>
</tbody>
</table>

The number of observation is only 12 farms. The estimated R-value of the regression analysis is 0.703. The R\(^2\) coefficient is standing at 0.495. The adjusted R\(^2\) is 0.305. The standard error of estimate is 2.699. The value of the Durbin-Watson value is 2.095. The F-value is 2.611, which is significant at 12.4 percent level of significance. The intercept value is positive. The monetary expenditures on the seeds, manures, fertilizers, and irrigation do contribute positively to the variation in paddy yield. The village dummy is also contributing to the variation in the paddy output per acre rather positively. The area under irrigation contributes rather negatively in the variation of paddy yield on the marginal farms of the peasantry.

An attempt is made to estimate the statistical fitting of jute-crop production function for the cross sub-sections of farms belonging to the diverse peasant economic class separately. The regression analysis is run in each case by dropping the input variables to improve the “goodness of fit” – trimming the model. In the case of petty and poor peasant class jute-farms, the statistical fitting gives the following linear form of regression equation:

\[ P_{jmg} = 0.11 + 0.01L - 0.91V \]

Table – 6

Linear Regression Analysis of the Determinants of Annual Volume of Jute Output per Acre on a Farm of Petty and Poor Class of Peasant Household in Rural Purnia, 1991-92

Mean Value = 1.19 quintals per acre
Standard Deviation = 2.79 quintals per acre
Hierarchy of Agricultural Functions

<table>
<thead>
<tr>
<th>Explanatory variables (regressors)</th>
<th>Regression coefficient</th>
<th>Standard Error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.112</td>
<td>0.168</td>
<td>0.668</td>
<td>0.521</td>
</tr>
<tr>
<td>Total mandays of family, casual and contract labor employed per acre of jute production</td>
<td>0.098</td>
<td>0.006</td>
<td>16.481</td>
<td>0.000</td>
</tr>
<tr>
<td>Jute village dummy variable</td>
<td>(-)0.906</td>
<td>0.451</td>
<td>(-)0.126</td>
<td>0.076</td>
</tr>
</tbody>
</table>

The number of observation is 12 jute farms. The estimated R is 0.986. The estimated $R^2$ is 0.972. In other words, almost 97 percent variation in the jute yield on the petty and poor peasant class farms is explained by the inputs under consideration in the model. The adjusted $R^2$ value reduces to stand numerically at 0.966. The standard error of estimate is 0.515. The Durbin-Watson value is found to be 2.118. it is of course closer to the desirable value of two. The F-value of the estimate is 156.580. This is significant at 1 percent level of significance. The intercept value is positive. The contribution of the jute specific village dummy is however negative. It is the mandays of human labor, which has a positive contribution to the jute yield on such farms.

The marketed surplus function of the paddy food crop across the cross-section of widely heterogeneous householding farms and its linear statistical fit does however serve merely as an approximation at best. It is not a true representation of farms belonging to diverse and divergent peasant class locations in the countryside. The linear paddy regression equations are estimated therefore for each cross sub-section of the paddy farms pertaining to the diverse agrarian locations of peasant classes. The linear marketed surplus functions of paddy crop for the cross-sections of each peasant class farms, which are fitted and estimated, are all different.

In the case of petty and poor peasant class farms, the statistical fitting gives the following linear form of regression equation:

$$S_{ppp} = -22.70 + 0.16 P_{mp}$$

Table – 7

Linear Regression Analysis of the Determinants of the Proportion of Net Marketed Output to Net Output of Paddy on a Farm of Petty and Poor Class of Peasant Household in Rural Purnia, 1991-92

Mean Value = 6.30
Standard Deviation = 35.60

<table>
<thead>
<tr>
<th>Explanatory Variables (regressors)</th>
<th>Regression coefficients</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>(-)22.696</td>
<td>11.515</td>
<td>(-)1.971</td>
<td>0.077</td>
</tr>
<tr>
<td>Average market price of paddy per quintal (rupees)</td>
<td>0.161</td>
<td>0.049</td>
<td>3.304</td>
<td>0.008</td>
</tr>
</tbody>
</table>
The number of observation is only 12 paddy farms. The estimated R-value of the regression analysis of marketed surplus proportion of paddy is 0.722. The crucial $R^2$ value is 0.522. The adjusted $R^2$ value is 0.474. The standard error of estimate is 25.817. The Durbin-Watson value is highly close to the desirable value and stands at 2.152. The F-value of variance is 10.918. It is significant at 1 percent level. The intercept value is negative, which is of course expected. There is positive contribution of the paddy price received by the farmers in explaining the variation in the proportion of the paddy-marketed surplus.

The statistical fitting of linear marketed surplus function of jute crop across the cross subsection of householding farms belonging to different peasant economic classes gives the following form, based on estimates of intercept and coefficient values obtained from the least square method of multiple regression analysis. In the case of petty and poor peasant class jute farms, the statistical fitting gives the following linear form of regression equation:

$$S_{jPP} = 0.009 + 0.21 P_{mj}$$

Table – 8

<table>
<thead>
<tr>
<th>Explanatory Variables (regressors)</th>
<th>Regression coefficients</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.0092</td>
<td>0.267</td>
<td>0.034</td>
<td>0.973</td>
</tr>
<tr>
<td>Average jute market price per quintal (rupees)</td>
<td>0.214</td>
<td>0.002</td>
<td>134.022</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The number of observation in this cross sub-section of paddy farms is in total 12. The estimated R-value is 1.000. The coefficient of determination, represented by the $R^2$ stands at 0.999. This is certainly a high numerical figure. The adjusted $R^2$ reduces to the value of 0.999. The standard error of estimate is 0.846. The crucial test of the goodness of fit of the regression analysis is nonetheless performed by checking the value of the Durbin-Watson. It stands at the value of 1.471. The F-value is higher than the table value for the degree of freedom under consideration. It is 17961.795, which is significant at 1 percent level of significance. There is no concern for the multi-collinearity phenomenon. The market price of the jute crop received by the farmers is the sole explanatory variable worth consideration. The intercept value is quite low but positive.
Small Peasant

In the case of small peasant class farms, the statistical fitting gives the following linear form of regression equation for paddy crop:

\[
P_{p}^{sp} = 7.71 + 0.02 P_{LM} + 2.48V
\]

Table – 9

Linear Regression Analysis of the Determinants of Annual Volume of Paddy Output per Acre on a Farm of Small Class of Peasant Household in Rural Purnia, 1991-92

Mean Value=9.43 quintals per acre
Standard Deviation =2.93 quintals per acre

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>Regression coefficient</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>7.714</td>
<td>0.542</td>
<td>14.229</td>
<td>0.000</td>
</tr>
<tr>
<td>Cost incurred in employing the permanent labor per acre of operated land (rupees per acre)</td>
<td>0.018</td>
<td>0.005</td>
<td>3.611</td>
<td>0.001</td>
</tr>
<tr>
<td>Paddy village dummy variable</td>
<td>2.482</td>
<td>0.724</td>
<td>3.427</td>
<td>0.001</td>
</tr>
</tbody>
</table>

The number of observation is 42 farms. The estimated R-value is 0.631. The R² is 0.398. In other words, close to 40 percent of the variation in the yield of paddy on small class farms are explained by the inputs considered in the trimmed linear model. The adjusted R² is 0.368. The standard error of estimate is found to be at 2.335. The Durbin- Watson value is closer to two at 2.250. It is found that the null hypothesis of no relation is to be rejected because the F-value is 12.911, and it is significant at 1 percent level. The intercept value is positive. The cost incurred in employing the permanent labor per acre of operated land contributes positively to the variation in the paddy yield on the small farms. The village dummy is also contributing to the variation in the paddy output per acre rather positively.

In the case of small peasant class jute-farms, the statistical fitting gives the following linear form of regression equation:

\[
P_{j}^{sp} = 0.64 + 0.02L + 2.97V
\]

Table – 10

Linear Regression Analysis of the Determinants of Annual Volume of Jute Output per Acre on a Farm of Small Class of Peasant Household
Hierarchy of Agricultural Functions

in Rural Purnia: 1991-92

Mean Value = 2.82 quintals per acre
Standard Deviation = 3.21 quintals per acre

<table>
<thead>
<tr>
<th>Explanatory variables (regressors)</th>
<th>Regression coefficient</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.642</td>
<td>0.350</td>
<td>1.836</td>
<td>0.074</td>
</tr>
<tr>
<td>Total mandays of family, casual and contract labor employed per acre of jute production</td>
<td>0.0199</td>
<td>0.002</td>
<td>8.940</td>
<td>0.000</td>
</tr>
<tr>
<td>Jute village dummy variable</td>
<td>2.974</td>
<td>0.777</td>
<td>3.828</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The number of observation in the present regression exercise is a cross sub-section of 42 jute producing farms. The estimated R-value is found to be 0.846. The estimated R² value is standing at 0.715. In other words, almost 71.5 percent variation in the jute yield on the small peasant class farms is explained by the inputs under consideration in the model. The adjusted R² value is a reduced one at 0.700. The standard error of estimate is pretty low at 1.759. The Durbin-Watson value is 1.823, which is close to two. The F-value of the analysis of variance is certainly positive. It is considerably high value at 48.938, which is significant at 1 percent level of significance. The intercept value is positive. The contribution of the jute specific village dummy is also positive. It is otherwise the mandays of human labor alone which has a positive contribution to the jute yield on the farms of the small class peasantry.

In the case of small peasant class paddy-farms, the statistical fitting gives the following linear form of regression equation:

\[ S_{p}^{sp} = -20.22 + 0.18 P_{mp} \]

Table – 11

Linear Regression Analysis of the Determinants of the Proportion of Net Marketed Output to Net Output of Paddy on a Farm of Small Class of Peasant Household in Rural Purnia, 1991-92

Mean Value = 5.46
Standard Deviation = 33.70

<table>
<thead>
<tr>
<th>Explanatory Variables (regressors)</th>
<th>Regression coefficients</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>(-)20.215</td>
<td>4.506</td>
<td>(-)4.486</td>
<td>0.00</td>
</tr>
<tr>
<td>Average paddy price per quintal (rupees)</td>
<td>0.181</td>
<td>0.022</td>
<td>8.200</td>
<td>0.000</td>
</tr>
</tbody>
</table>
The number of observation in this cross sub-section of paddy farms is in total 42 farms. The estimated R-value is 0.792. The coefficient of determination, represented by the $R^2$ stands at 0.627. This is certainly a high numerical figure. The adjusted $R^2$ reduces to the value of 0.618. The standard error of estimate is 20.778. The crucial test of the goodness of fit of the regression analysis is nonetheless performed by checking the value of the Durbin-Watson. It stands at the value of 2.021. The F-value of the analysis of variance is higher than the table value for the degree of freedom under consideration. It is 67.238, which is significant at 1 percent level of significance. The intercept value is negative, which is of course expected. There is positive contribution of the paddy price received by the farmers in explaining the variation in the proportion of the paddy-marketed surplus. It is evident that the farms, which do belong to the petty and small farmers, are influenced principally by the market price of the crop while taking a decision to market the food crop.

In the case of **small peasant** class jute-farms, the statistical fitting gives the following linear form of regression equation:

$$S_{j}^{sp} = 1.18 + 0.18 \ P_{mj}$$

<table>
<thead>
<tr>
<th>Explanatory Variables (regressors)</th>
<th>Regression coefficients</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>1.182</td>
<td>2.550</td>
<td>0.464</td>
<td>0.645</td>
</tr>
<tr>
<td>Average jute market price per quintal (rupees)</td>
<td>0.182</td>
<td>0.009</td>
<td>20.749</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The number of observation in this cross sub-section of paddy farms is in total 42. The estimated R value is 0.957. The coefficient of determination, represented by the $R^2$ stands at 0.915. This is certainly a high numerical figure. The adjusted $R^2$ reduces to the value of 0.913. The standard error of estimate is 12.288. The crucial test of the goodness of fit of the regression analysis is nonetheless performed by checking the value of the Durbin-Watson. It stands at the value of 2.079. The F-value of the analysis of variance is higher than the table value for the degree of freedom under consideration. It is 430.501, which is significant at 0.1 percent level of significance. There is no concern for the multi-collinearity phenomenon. The market price of the jute crop received by the farmers is the sole explanatory variable worth consideration. The intercept value is quite low but positive.

**Middle Peasant**
In the case of middle-peasant class farms, the statistical fitting gives the following linear form of regression equation:

\[ p_{mp} = 9.26 - 0.03e^r + 3.44V \]

Table – 13
Linear Regression Analysis of the Determinants of Annual Volume of Paddy Output per Acre on a Farm of Middle Class of Peasant Household in Rural Purnia, 1991-92

Mean Value = 9.69 quintals per acre
Standard Deviation = 2.90 quintals per acre

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>Regression coefficient</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>9.256</td>
<td>0.570</td>
<td>16.238</td>
<td>0.000</td>
</tr>
<tr>
<td>Net area under irrigation as percentage of operated area</td>
<td>(-)0.027</td>
<td>0.120</td>
<td>(-)2.293</td>
<td>0.026</td>
</tr>
<tr>
<td>Paddy village dummy variable</td>
<td>3.436</td>
<td>0.746</td>
<td>4.605</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The number of observation is 51 farms. The estimated R stands at 0.558. The estimated \( R^2 \) value is 0.311. Accordingly, the adjusted \( R^2 \) value is 0.282. The standard error of estimate is 2.460. The Durbin-Watson value is little far off from the desirable value of two at 1.341. The \( F \)-value is 10.830, which is significant at 1 percent level of significance. The intercept value is positive. The village dummy is also contributing to the variation in the paddy output per acre rather positively. The contribution of the net area under irrigation as percentage of operated area to the paddy yield on the middle class farms is negative.

In the case of middle-peasant class jute-farms, the statistical fitting gives the following linear form of regression equation:

\[ p_{mp} = 1.24 + 1.29A + 1.57V \]

Table – 14
Linear Regression Analysis of the Determinants of Annual Volume of Jute Output per Acre on a Farm of Middle Class of Peasant Household in Rural Purnia, 1991-92

Mean Value = 4.12 quintals per acre
Standard Deviation = 3.63 quintals per acre

<table>
<thead>
<tr>
<th>Explanatory variables (regressors)</th>
<th>Regression coefficient</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
</table>

Mahmood Ansari
The number of observation is 51 sample jute farms. The estimated R-value of the present regression analysis is 0.795. The estimated $R^2$ value is 0.633. It is clear that the form of the trimmed models is changing across the divergent peasant class jute-farms, and the coefficient of determination value is subsequently decreasing. The adjusted $R^2$ value is 0.617. The standard error of estimate is found to be at 2.244. The Durbin-Watson value is a little far off from the desirable value; it is at the numerical figure of 1.629. The F-value of the analysis of variance is high enough at 41.341. It is significant at 1 percent level of significance. The intercept value is positive. The contribution of the jute specific village dummy is also positive. In the case of the middle peasant farms, there is a positive contribution of the acreage under jute to the jute yield.

In the case of middle-peasant class paddy-farms, the statistical fitting gives the following linear form of regression equation:

$$S_{p}^{MP} = -11.14 + 1.05 X_p + 0.15 P_{mp}$$

Table – 15

Linear Regression Analysis of the Determinants of the Proportion of Net Marketed Output to Net Output of Paddy on a Farm of Middle Class of Peasant Household in Rural Purnia, 1991-92

<table>
<thead>
<tr>
<th>Mean Value</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>33.46</td>
<td>26.09</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Explanatory Variables (regressors)</th>
<th>Regression coefficients</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>(-) 11.141</td>
<td>4.304</td>
<td>(-)2.588</td>
<td>0.013</td>
</tr>
<tr>
<td>Annual volume of paddy output per adult (quintal)</td>
<td>1.054</td>
<td>0.306</td>
<td>3.440</td>
<td>0.001</td>
</tr>
<tr>
<td>Average market paddy price per quintal (rupees)</td>
<td>0.147</td>
<td>0.017</td>
<td>8.865</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The number of observation in this cross sub-section of paddy farms is in total 51 farms. The estimated R value is 0.860. The coefficient of determination, represented by the $R^2$ stands at 0.739. This is certainly a high numerical figure. In other words, almost 74 percent of the variation in the proportion of marketed surplus of paddy on the middle class farms is explained by the paddy output and its price being considered in the trimmed linear model. There is positive contribution of both the paddy volume produced on the farms as well as the price received by the farmers in explaining the variation in the proportion of the paddy-marketed surplus. The adjusted $R^2$ reduces to the value of 0.728. The standard error of estimate is 13.600. The crucial test of the goodness of fit of the regression analysis is nonetheless performed by...
checking the value of the Durbin-Watson. It stands at the value of 1.795. The F-value of analysis of variance is higher than the table value for the degree of freedom under consideration. It is 67.992, which is significant at 1 percent level of significance. The intercept value is negative, which is of course expected.

In the case of middle-peasant class jute-farms, the statistical fitting gives the following linear form of regression equation:

\[ S_j^{MP} = 1.61 + 0.19 P_{mj} \]

Table – 16

Linear Regression Analysis of the Determinants of the Proportion of Net Marketed Output to Net Output of Jute Crop on a Farm of Middle Class of Peasant Household in Rural Purnia, 1991-92

<table>
<thead>
<tr>
<th>Explanatory Variables (regressors)</th>
<th>Regression coefficients</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>1.604</td>
<td>2.218</td>
<td>0.723</td>
<td>0.473</td>
</tr>
<tr>
<td>Average jute market price per quintal (rupees)</td>
<td>0.190</td>
<td>0.007</td>
<td>29.133</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The number of observation in this cross sub-section of paddy farms is in total 51. The estimated R-value is 0.972. The coefficient of determination, represented by the R^2 stands at 0.945. In other words, almost 94 percent of the variation in the proportion of marketed surplus of jute on the middle class farms is explained by its price being considered in the trimmed linear model. This is certainly a high numerical figure. The adjusted R^2 reduces to the value of 0.944. The standard error of estimate is 9.999. The crucial test of the goodness of fit of the regression analysis is nonetheless performed by checking the value of the Durbin-Watson. It stands at the value of 1.468. The F-value is higher than the table value for the degree of freedom under consideration. It is 848.712, which is significant at 1 percent level of significance. There is no concern for the multi-collinearity phenomenon. The market price of the jute crop received by the farmers is the sole explanatory variable worth consideration. The intercept value is quite low but positive.

**Rich Peasant**

In the case of rich peasant class farms, the statistical fitting gives the following linear form of regression equation:

\[ P_p^{rp} = 9.64 - 0.02e^r + 0.04P_L + 4.03V \]
Table – 17

Linear Regression Analysis of the Determinants of Annual Volume of Paddy Output per Acre on a Farm of Rich Class of Peasant Household in Rural Purnia, 1991-92

Mean Value = 10.47 quintals per acre
Standard Deviation = 3.49 quintals per acre

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Regression coefficient</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>9.639</td>
<td>0.452</td>
<td>21.429</td>
<td>0.000</td>
</tr>
<tr>
<td>Net area under irrigation as percentage of operated area</td>
<td>(-)0.017</td>
<td>0.007</td>
<td>(-)2.351</td>
<td>0.021</td>
</tr>
<tr>
<td>Annual number of mandays of plough labor hired-in per acre of operated land</td>
<td>0.044</td>
<td>0.020</td>
<td>2.198</td>
<td>0.030</td>
</tr>
<tr>
<td>Paddy village dummy variable</td>
<td>4.027</td>
<td>0.658</td>
<td>6.116</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The number of observation in this cross sub sectional regression analysis is 108 farms. It is estimated that the R-value is 0.585. The estimated $R^2$ is 0.343. In other words, almost 34 percent of the variation in the yield of paddy on rich class farms are explained by the inputs considered in the trimmed linear model. The adjusted $R^2$ value is 0.324. The standard error of estimate is pretty low at 2.872. The Durbin-Watson value is 2.042. Of course, it is closer to the desirable figure of two. The F-value stands at 18.066. This establishes that the regression estimate is meaningful at 0.1 percent level of significance. The intercept value is positive. The mandays of plough labor hired-in contributes positively but the area under irrigation rather negatively to the variation in the paddy yield on the rich class farms. The village dummy is also contributing to the variation in the paddy output per acre rather positively.

In the case of rich peasant class jute-farms, the statistical fitting gives the following linear form of regression equation:

$$P_{jr} = 4.53 + 0.003L + 0.03 P_L + 1.81V$$

Table – 18

Linear Regression Analysis of the Determinants of Annual Volume of Jute Output per Acre on a Farm of Rich Class of Peasant Household in Purnia, 1991-92

Mean Value = 6.18 quintals per acre
Standard Deviation = 2.28 quintals per acre

<table>
<thead>
<tr>
<th>Explanatory variables (regressors)</th>
<th>Regression coefficient</th>
<th>Standard Error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The number of observation in this regression analysis is 108 jute farms belonging to the rich class peasantry. The estimated R-value is 0.501. The estimated R² value is 0.251. In other words, merely 25 percent of the variation in the yield of jute on the rich class farms is explained by the inputs considered in the trimmed linear model. A non-linear model would be probably a better fit. The adjusted R² value is 0.229. The standard error of estimate is 2.001. The Durbin-Watson value is 1.998, which is very close to the value of two. The F-value of the analysis of variance is comparatively low at 11.605. This is however significant even at even 1 percent level of significance. The intercept value is positive. The contribution of the jute specific village dummy is also positive. There is definite contribution of the mandays of human and plough labor to the yield of jute on the farms of the rich peasantry. The t-values of the regression coefficients of these agricultural inputs are of course are statistically significant at 5 percent level of significance.

In the case of rich-peasant class paddy-farms, the statistical fitting gives the following linear form of regression equation:

\[ S_p^{RP} = -10.71 + 1.14 X_p - 0.002 X_{j} + 0.16 P_{mp} \]

Table – 19

Linear Regression Analysis of the Determinants of the Proportion of Net Marketed Output to Net Output of Paddy on a Farm of Rich Class of Peasant Household in Rural Purnia, 1991 - 92

Mean Value = 35.63  
Standard Deviation = 36.17
The number of observation is 108 paddy farms. The value of estimated $R$ is 0.770. The value of the coefficient of determination, $R^2$ is 0.592. The adjusted $R^2$ is 0.580. The standard error of estimate is 23.429. The Durbin-Watson value is 1.677. The ANOVA F-value is 50.355. It is significant at 0.1 percent level of significance. There is positive contribution of the paddy price received by the farmers in explaining the variation in the proportion of the paddy-marketed surplus. The contribution of the market value realized by selling the commercial crop is of course negative.

In the case of rich-peasant class jute-farms, the statistical fitting gives the following linear form of regression equation:

$$ S_{j}^{BP} = 6.30 + 0.17 P_{MJ} $$

Table – 20

Linear Regression Analysis of the Determinants of the Proportion of Net Marketed Output to Net Output of Jute Crop on a Farm of Rich Class of Peasant Household in Rural Purnia, 1991-92

<table>
<thead>
<tr>
<th>Mean Value = 79.14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Deviation = 24.13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Explanatory Variables (regressors)</th>
<th>Regression coefficients</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>6.299</td>
<td>4.332</td>
<td>1.454</td>
<td>0.149</td>
</tr>
<tr>
<td>Average jute market price per quintal (rupees)</td>
<td>0.170</td>
<td>0.010</td>
<td>17.478</td>
<td>0.000</td>
</tr>
</tbody>
</table>

The number of observation is in total 108 paddy farms. The estimated $R$ value is 0.862. The coefficient of determination, represented by the $R^2$ stands at 0.742. This is certainly a high numerical figure. The adjusted $R^2$ reduces to the value of 0.740. The standard error of estimate is 12.302. The crucial test of the goodness of fit of the regression analysis is nonetheless performed by checking the value of the Durbin-Watson. It stands at the value of 2.138. The F-value of analysis of variance is higher than the table value for the degree of freedom under consideration. It is 305.498, which is significant at 1 percent level of significance. There is no concern for the multi-collinearity phenomenon. The market price of the jute crop received by the farmers is the sole explanatory variable worth consideration. The intercept value is quite low but positive.

Landlord/Capitalist Class
In the case of landlord class farms, the statistical fitting gives the following linear form of regression equation:

\[ P_p^{cp} = 10.68 - 0.02B + 2.90V \]

**Table – 21**

Linear Regression Analysis of Determinants of Annual Volume of Paddy Output per Acre on a Farm of Landlord and Capitalist Class of Peasant Household in Rural Purnia, 1991-92

Mean Value = 11.57 quintals per acre  
Standard Deviation = 4.74 quintals per acre

<table>
<thead>
<tr>
<th>Explanatory Variables</th>
<th>Regression coefficient</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>10.676</td>
<td>0.883</td>
<td>12.096</td>
<td>0.000</td>
</tr>
<tr>
<td>Annual number of mandays of plough labor hired-in per acre of operated land</td>
<td>(-)0.0185</td>
<td>0.009</td>
<td>(-)2.144</td>
<td>0.037</td>
</tr>
<tr>
<td>Paddy village dummy variable</td>
<td>2.899</td>
<td>1.183</td>
<td>2.450</td>
<td>0.018</td>
</tr>
</tbody>
</table>

The number of observation is 55 paddy farms belonging to the well to do peasantry. The estimated R value is 0.437. The estimated \( R^2 \) value is 0.191. In other words, merely 19 percent of the variation in the yield of paddy on landlord class farms is explained by the inputs considered in the trimmed linear model. A non-linear model would be a better fit. Be that as it may. In the present linear model, the adjusted \( R^2 \) value is 0.160. The standard error of estimate is found to be at the numerical figure of 4.346. The value of the Durbin-Watson value is 1.917. Undoubtedly, it is closer to two. The F-value is at 6.126, this is lower than the table value. This is significant only at 5.0 percent level. The intercept value is positive. The contribution of annual number of mandays of plough labor hired-in per acre of operated land to the yield of paddy on the landlord farms is negative. The village dummy is however contributing to the variation in the paddy output per acre rather positively.

In the case of landlord and capitalist class jute farms, the statistical fitting gives the following linear form of regression equation:

\[ P_j^{cp} = 2.96 + 0.01L - 0.0004C + 0.003P_l \]

**Table – 22**

Linear Regression Analysis of Determinants of Annual Volume of Jute Output per Acre on a Farm of Landlord and Capitalist Class of Peasant Household in Rural Purnia, 1991-92

Mean Value = 5.24 quintals per acre
Hierarchy of Agricultural Functions

Standard Deviation = 3.40 quintals per acre

<table>
<thead>
<tr>
<th>Explanatory variables (regressors)</th>
<th>Regression coefficient</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.959</td>
<td>0.645</td>
<td>4.587</td>
<td>0.000</td>
</tr>
<tr>
<td>Total mandays of family, casual and contract labor employed per acre of jute production</td>
<td>0.0073</td>
<td>0.002</td>
<td>4.137</td>
<td>0.000</td>
</tr>
<tr>
<td>All modern powered equipment and machinery value per unit of area operated (rupees)</td>
<td>(-)0.00035</td>
<td>0.000</td>
<td>(-)2.430</td>
<td>0.019</td>
</tr>
<tr>
<td>Cost incurred in employing the permanent labor per acre of operated land (rupees per acre)</td>
<td>0.0030</td>
<td>0.001</td>
<td>3.342</td>
<td>0.002</td>
</tr>
</tbody>
</table>

The number of observation is 55 jute farms. The estimated R-value is 0.555. The estimated \( R^2 \) value is 0.308. The adjusted \( R^2 \) value is 0.268. The standard error of estimate is 2.909. The Durbin-Watson value is 1.620. The F-value of the analysis of variance is 7.580, which is significant at 1 percent level of significance. The intercept value is positive. The contribution of the jute specific village dummy is nil, that is, statistically not significant at all. The human labor mandays used per acre and the cost incurred on hiring-in the permanent labor do have statistically significant contributions to the jute yield on the landlord farms. It is surprising to note that the expenditures incurred on the tools and machinery do contribute to the jute yield on the farms of this peasant class only, and that too rather negatively.

In the case of **landlord and capitalist peasant** class paddy farms, the statistical fitting gives the following linear form of regression equation:

\[
S_{p LP} = -1.26 + 1.15 \times P - 0.002 \times X_j + 0.15 \times P_{mp}
\]

Table 23

Linear Regression Analysis of the Determinants of the Proportion of Net Marketed Output to Net Output of Paddy on a Farm of Landlord and Capitalist Class of Peasant Household in Rural Purnia, 1991-92

Mean Value = 56.02
Standard Deviation = 33.73

<table>
<thead>
<tr>
<th>Explanatory Variables (regressors)</th>
<th>Regression coefficients</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>(-)1.262</td>
<td>8.769</td>
<td>(-)0.144</td>
<td>0.886</td>
</tr>
<tr>
<td>Annual paddy output per adult (quintal)</td>
<td>1.114</td>
<td>0.248</td>
<td>4.486</td>
<td>0.000</td>
</tr>
<tr>
<td>Annual value of jute output per adult (rupees)</td>
<td>(-)0.0016</td>
<td>0.001</td>
<td>(-)2.476</td>
<td>0.017</td>
</tr>
</tbody>
</table>

Mahmood Ansari
Hierarchy of Agricultural Functions

| Average paddy price per quintal (rupees) | 0.147 | 0.031 | 4.751 | 0.000 |

The number of observation is 55 farms. The estimated R is 0.758. The value of $R^2$ is 0.575. The adjusted $R^2$ value is 0.550. The standard error of the estimate is 22.062. The Durbin-Watson value stands at 1.165. The F-value of analysis of variance is 23.017, which is of course significant at 1 percent level. The intercept value is negative, which is of course expected. There is positive contribution of the paddy price received by the farmers in explaining the variation in the proportion of the paddy-marketed surplus. The contribution of the market value realized by selling the commercial crop is of course negative.

In the case of landlord and capitalist class jute farms, the statistical fitting gives the following linear form of regression equation:

$$S_j^{LP} = 1.43 + 0.18 P_{mj}$$

Table – 24

Linear Regression Analysis of the Determinants of the Proportion of Net Marketed Output to Net Output of Jute Crop on a Farm of the Landlord and Capitalist Class of Peasant Household in Rural Purnia, 1991 – 92

| Mean Value = 62.55 |
| Standard Deviation = 37.46 |

<table>
<thead>
<tr>
<th>Explanatory Variables (regressors)</th>
<th>Regression coefficients</th>
<th>Standard error</th>
<th>t-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>1.430</td>
<td>1.957</td>
<td>0.731</td>
<td>0.468</td>
</tr>
<tr>
<td>Average market price of jute per quintal (rupees)</td>
<td>0.179</td>
<td>0.005</td>
<td>36.354</td>
<td>0.000</td>
</tr>
</tbody>
</table>

There are 52 paddy farms in this cross sub-section of observations. The estimated R-value of the regression analysis is 0.981. The coefficient of determination, represented by the $R^2$ stands at 0.961. This is certainly a high numerical figure. The adjusted $R^2$ reduces to the value of 0.961. The standard error of estimate is 7.425. The crucial test of the goodness of fit of the regression analysis is nonetheless performed by checking the value of the Durbin-Watson. It stands at the value of 1.536. The ANOVA F-value is higher than the table value for the degree of freedom under consideration. It is 1321.642, which is significant at 0.1 percent level of significance. There is no concern for the multi-collinearity phenomenon. The market price of the jute crop received by the farmers is the sole explanatory variable worth consideration. The intercept value is quite low but positive.

4. Economic Class Differentiated Technique Efficiency on Farms
In the case of paddy crop, the regression analysis is run over the aggregate sample of farms, and the statistical estimate of coefficients obtained. The linear regression function fitted is found to be of the following reduced form:

\[ P_p = \alpha_o - \alpha_2 e^r + \alpha_5 M + V \]

The least-square criterion of linear regression analysis gives statistically non-significant values of slope coefficients for other input variables of the original regression model; these independent input variables are thus eliminated, and a trimmed model is run. The input variables are therefore reconstituted to consider only those explanatory variables, whose t-value was respectively statistically significant. It is revealed that even the slope coefficient value for dummy variable of land fertility index show insignificant t-value. Putting the estimated values of intercept and slopes or the regression coefficients of the considered inputs, we get

\[ P_p = 8.75 + 0.001 M - 0.02 e^r + 3.64V \]

The linear regression analysis has a ‘goodness of fit’. The estimated F-value of the analysis of variance stands at 33.828, which is higher than the table value and therefore meaningful at 1 percent level of significance. What is more significant is the reading that the test of Durbin-Watson gives the value of 1.796, which is of course closer to two — a desirable trait. The collinearity statistics referred to as variance inflation factor (VIF) for all independent variables in the multiple regression equation is much less than 10, establishing that there is no concern for the multicollinearity in the backward stepwise regression. In other words, there is no need of further reconstituting the set of determining variables under consideration.

In the case of jute crop, a trimmed linear model of the regression analysis is again statistically fitted by reconstituting the explanatory variables of the original regression model under consideration. The linear regression function, which is statistically fitted, is found to be of the following reduced form:

\[ P_j = \alpha_0 + \alpha_3 L + \alpha_6 C + \alpha_7 P + V \]

The other input variables of the original model are dropped from the analysis to improve the “goodness of fit”. The regression coefficients of the dropped variables have t-value, which is significant not even on 10 percent level of statistical significance. The estimated fit of the linear jute production function, obtained by least square method of multiple regression analysis with the statistical estimate of coefficients obtained, is as follows:

\[ P_j = 2.50 + 0.01L - 0.0003M + 0.002P + 2.03V \]

The goodness of fit of the regression analysis of the annual volume of jute output per acre is established by the high numerical estimated and statistically significant F-value of analysis of variance. The estimated F-value, which stands at 45.098, is significant at 1 percent level of significance. The Durbin-Watson value is also closer to two; the estimated value is 1.772. The collinearity statistics referred to as variance inflation factor (VIF) for all independent variables in the multiple regression equation is much less than 10, which does unfailingly establish that there
is no need of any concern about the multi-collinearity in the backward stepwise regression. In other words, there is again no need of further reconstituting the set of determining variables under consideration.

Table – 25


<table>
<thead>
<tr>
<th>Economic Classes of Peasantry</th>
<th>Technique Efficiency Groups of Paddy Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inefficient Farm</td>
</tr>
<tr>
<td>Petty and Poor class</td>
<td>6</td>
</tr>
<tr>
<td>Small class</td>
<td>30</td>
</tr>
<tr>
<td>Middle class</td>
<td>32</td>
</tr>
<tr>
<td>Rich class</td>
<td>58</td>
</tr>
<tr>
<td>Landlord and Capitalist class</td>
<td>24</td>
</tr>
<tr>
<td>All Classes of Peasantry</td>
<td>150</td>
</tr>
</tbody>
</table>

Source: Field Survey, 1991-92

It is found that the numerical value of the production efficiency index for paddy producing farms ranges from 0.38 to 2.02. There are in total 150 paddy producing farms, which are inefficient, 7 just efficient and 111 highly efficient ones. It is also of interest to see whether the distribution of farms based on technique efficiency index has any non-monotonic statistical relations with the distribution of farms based on the labour-exploitation index. The row–column table is reduced to the 3 x 3 contingency table by combining the petty and small peasant class farms on the one hand and rich and landlord and capitalist class farms on the other. The estimated Chi-square value is 14.807 with the degree of freedom at 4 and the contingency coefficient value is 0.229, which is not significant at 1 percent level. The insignificant chi-square value and contingency coefficient value in case of paddy crop farms rules out any non-monotonic relation between peasant class groupings and technique-efficiency index based farms grouping. In other words, the efficient and inefficient farms are scattered across all peasant classes.

Table – 26


<table>
<thead>
<tr>
<th>Economic Classes of Peasantry</th>
<th>Technique Efficiency Groups of Jute Farms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inefficient Farm</td>
</tr>
<tr>
<td>Petty and Poor class</td>
<td>10</td>
</tr>
<tr>
<td>Small class</td>
<td>26</td>
</tr>
<tr>
<td>Middle class</td>
<td>26</td>
</tr>
</tbody>
</table>
It is the same exercise, which is repeated for the jute producing farms. In this case, the technique efficiency index ranges from 0.30 to 3.36. In the case of jute producing farms, the number of inefficient farms is equally 131, just efficient merely 2, and highly efficient farms 135 in total. In the arrangement of the 3 x 3 contingency table, the estimated Chi-square value is 10.582 with the degree of freedom standing at 4 and the contingency coefficient value is 0.195, which is statistically significant. In case of jute producing farms, there exists a relation between the two groupings. The highly efficient jute farms are mostly owned and operated by the dominant peasant classes, whereas the inefficient jute farms are mostly operated by the exploited peasant classes.

### Conclusion

There are heterogeneous agricultural farms in Purnia. These heterogeneous farms belong to the economically differentiated peasant households in the countryside. Such farms differ in matter of production efficiency. The farms are quite different in matter of both the production technology adopted as well as the behavior with regard to the crop sales on the market. There are therefore different trimmed linear models applicable to the cross sub-section of the sample peasant farms in Purnia. The marginal productivity of inputs are also dissimilar across the farms of different peasant classes, and therefore shows variations in the technical-organizational complex of farms.

The significance level of linear regression analysis of the determinants of annual volume of paddy output per acre under cultivation of the petty and poor peasant class farms as well as the landlord and capitalist class farms are quite low. A single linear production function for all 268 farms in the sample is not at all warranted. The only commonality is the linearity characteristics of the production function, and the positive role-played the village-specific dummy variable in explaining the variation in the paddy output per acre in all exercises, except the farms belonging to the landlord class. It is otherwise human labor alone which has a positive contribution to the jute yield on the farms of the marginal and small class peasantry. In the case of the middle peasant farms, there is a positive contribution of the acreage under operated land to the jute yield. The intercept value of the regression analysis of the jute yield on the rich class farms is positive. The contribution of the jute specific village dummy is also positive. There is definite contribution of the mandays of human and plough labor to the yield of jute on the farms of the rich peasantry. In the case of the landlord jute farms, the intercept value is positive. The contribution of the jute specific village dummy is nil, that is, statistically not significant at all. The human labor mandays used per acre and the cost incurred on hiring-in the permanent labor do have statistically significant contributions to the jute yield on the landlord farms. It is surprising to note that the expenditures incurred on the tools and machinery do contribute to the jute yield on the jute farms of this peasant class only and that too rather negatively. In other words, the conclusion of analysis on statistical fitting of production functions of subsistence and

<table>
<thead>
<tr>
<th>Rich class</th>
<th>41</th>
<th>65</th>
<th>2</th>
<th>108</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landlord and Capitalist class</td>
<td>28</td>
<td>27</td>
<td>Nil</td>
<td>55</td>
</tr>
<tr>
<td>All Classes of Peasantry</td>
<td>131</td>
<td>135</td>
<td>2</td>
<td>268</td>
</tr>
</tbody>
</table>

Source: Field Survey, 1991-92
commercial crops on a sample of farms in Purnia is sharp: the two functions do differ. In case of both paddy as well as jute farms, the statistical fitting of production functions on farms belonging to different economic class of peasantry are different. A homogeneous peasantry in terms of input–output relations of crop farms is again merely a misnomer.

The behavior of divergent classes of peasantries with regard to the marketing a proportion of the net output is equally interesting in Purnia. In case of petty as well as small class farms, the proportion of paddy surplus marketed is explained by merely the paddy price factor. In case of middle class farms, the marketed surplus volume is however explained by both price as well as paddy output variables. In case of rich and landlord class farms, almost three variables explain the marketed surplus: price of paddy, output of paddy and jute output value. The current value of jute output per adult does contribute of course in the negative way. What is not to be missed is the implication brought about by these regression exercises is that the economic classes of peasantry are significant principal factor in the hierarchy of marketed surplus function of paddy. In the case of farms of the peasantry of the marginal and petty class and landlord class, the regression models have comparatively much better ‘goodness of fit’. The linearity of the model and its fitness on these two sub sections of farms are as good as the statistical fitness on the aggregate cross section of 268 jute farms under consideration. On the jute farms of the peasants of middle class, the degree of goodness of statistical fit of the marketed surplus functions is equally satisfactory. The same in case of rich peasant class jute farms is however not as good. The number of observations, that is, the size of sample of cross section of farms of each peasant class is different, and therefore, the sampling error of estimates cannot be ruled out. Be that as it may. On the farms of the commercial crop, the price is the most significant explanatory variable of marketed output for all classes of peasantry; the output volume of food and commercial crops is however explanatory variable on the farms of the rich and landlord classes of peasantry in case of marketed output of the paddy. The intercept and the coefficient value of the jute price variable are quite different to further establish that the degree of commercialization are quite different among the farms of peasant households across the diverse class positions in the agrarian countryside of Purnia. In short, there exist a hierarchy of marketed output functions of both food as well as commercial crop across the farms of different peasant sectional clusters, and the best fit for the rich peasant class is probably a non-linear marketed output function. In such a situation, it is highly plausible to argue that the commercial and distress sales exist coexist and affect upon the diverse factions of peasantry differently.
References


Patnaik, Utsa (1987), *Peasant Class Differentiation: A Study in Method with Reference to Haryana*, Oxford University Press, Delhi


