

Marketed Surplus Function of Major Agricultural Commodities in Pakistan

by

MOHAMMAD RAQUIBUZZAMAN*

INTRODUCTION

The marketed surplus of agricultural commodities plays a significant role in the economic development of a low-income country where agriculture is the principal source of income. This surplus is the main source of capital accumulation, since it provides the basic wage goods to the urban sector. A rise in the marketed surplus makes the terms of trade favourable to the urban sector which enables it to enhance the size of its profits. This, in turn, helps the rapid growth of the economy. The marketed surplus not only provides the nonagricultural sector with food, but also enables it to get raw materials, liquid capital and foreign exchange. It reduces the need for importing food-stuffs and thus relieves pressures on the balance of payments. The role of marketed surplus in economic development is so well known that further elaboration is superfluous¹.

Given the present high rate of population growth of now estimated at 2.7 per cent [16] and the rate of increase in per capita income it is unlikely that the marketed surplus of agricultural commodities has kept pace with the growing demand. Attempts are being made to raise the productivity of agriculture. Productivity, though of prime importance, is not the only factor that determines the size of the surplus. The marketed surplus is determined by the interplay of different independent economic variables. Unless the pattern of behaviour of these variables is known any policy aimed at raising the size of the surplus may be ineffective. Therefore, the need for a study of the marketed surplus function becomes important. Despite the importance of this problem, few attempts have

* The author is a Staff Economist at the Pakistan Institute of Development Economics. He is deeply indebted to Professor Nurul Islam, Director of the Institute, without whose encouragement the work would not have been completed. He is grateful to Mr. Ghulam Mohammad, Senior Research Economist at the Institute, for his guidance and to Mr. Joseph J. Stern, Research Adviser at the Institute, for his helpful comments on an earlier draft. He wishes to thank Messrs. Abdur Rab, Abdur Rahman and Drs. Martin Sanders, all of the Institute, for their helpful suggestions as well as Dr. Bruce Glassburner, former Senior Research Adviser at the Institute and Mr. Carl Gotsch of the Harvard University for their comments on an earlier draft. The responsibility for any remaining errors, however, rests with the author.

¹ A good many articles are now available which deal with the role of marketed surplus in economic development. A few are [5; 6: 10 and 11].

been made to study it in Pakistan. Empirical work on this subject has been very limited in the past. Recently, some attempts have been made in India to study the problem there².

Kahlon and Dwivedi [8] studied the marketable surplus function of the major crops (wheat, gram, maize, groundnut and *desi* cotton) of the Ludhiana district of the East Punjab state in India. They found that the volume of production was the principal determinant of the marketed surplus. Domestic consumption affected adversely the marketed surplus of food crops but had no influence on the surplus of cash crops. Dharam Narain's study [3] related the aggregate marketable surplus and its response to the size of holding. He found that a part of the marketable surplus showed a direct relation to price changes, the other part showed an inverse relation. That latter part was the "distress surplus" which was necessitated by the cash obligation of the farmer. The Mathur-Ezekiel argument [12] was that farmers in an underdeveloped economy part with that portion of their output necessary to meet fixed cash requirements. From this it followed that higher prices would reduce the marketed surplus whereas lower prices would increase it. Dandekar [2] refuted the arguments of Mathur-Ezekiel and showed that their thesis did not apply in the case of large farmers whose contribution to the marketed surplus was of prime importance. The Mathur-Ezekiel thesis was only partially true in the case of small farmers. Raj Krishna attempted to find out the elasticity of the marketable surplus of a single subsistence crop, wheat, for the Indian economy. He found that "if elasticity of output is positive, albeit small, the likelihood of a perverse market supply behaviour is extremely small".

The only attempt to find out the "marketable surplus function" in Pakistan was made by A. R. Khan and A. H. M. N. Chowdhury [9]. Their study showed the marketable surplus function for agricultural goods in the Northern Zone of West Pakistan. The authors, in their study, dealt with such independent variables as: *i*) per capita food crop production, *ii*) per capita rent, *iii*) per capita cash-crop production, and *iv*) other per capita income. The study was based on the National Sample Survey (First Round) [13].

The aim of this paper is essentially to extend the work of Khan and Chowdhury in terms of both time period and area covered. The methodology followed in this study is slightly different from theirs. In our study we have used physical quantities rather than value magnitudes since we believe that in studying problem

²Mention may be made about the studies of A. S. Kahlon and H. N. Dwivedi [8]; Dharam Narain [3]; P. N. Mathur and H. Ezekiel [12]; S. N. Sinha, [18]; V. M. Dandekar, [2]; Raj Krishna [17]; and the discussions that were made about the problem of the marketed surplus at the Twentieth Conference of the Indian Society of Agricultural Economics [4].

of marketed surplus, the value figures are apt to be misleading, as variations of prices, due to a variety of reasons, will show spurious variations in the value of the marketed surplus in different regions, or within the same region at different time periods, *i.e.*, variations which do not correspond to physical changes. To get a more accurate picture of the marketed surplus, we believe that one should concentrate on physical quantities in order to abstract from demand effects which would enter our results if we used price data. We have, in addition, included some additional variables such as: *i*) tenurial status; *ii*) consumption of cash goods; *iii*) size of family, and *iv*) size of holdings³ and excluded the variable "other income". The exclusion of the latter is necessitated primarily because our sample does not contain the relevant data. Absence of this variable is likely to have little effect on our conclusions, however, as this variable was found to have a relatively small influence on the marketed surplus in the study by Khan and Chowdhury [9, p. 372].

Finally, we have relied primarily on the data as collected in the National Sample Survey (Second Rund) [14]. Not only do these data reflect a more recent time period but also there is some reason to believe that certain statistical problems encountered in the first round of the National Sample Survey were overcome in the later survey⁴.

I. DEFINITIONS OF THE CONCEPTS USED IN THIS STUDY

We use marketed surplus in two senses. Marketed surplus in the gross sense has been defined here as the total quantity of gross output produced by the farming household minus the part used for payments to labour and landlord and the part retained for home consumption and other uses⁵. Marketed surplus in the net sense has been defined as the gross marketed surplus minus the "buy back". For brevity, *net* marketed surplus will be written simply as "marketed surplus".

Data on family size from the National Sample Survey have been converted into adult units by following Coale and Hoover's conversion ratios [1, p. 88]. On this basis, "large family size" has been calculated as that which contains more than 4.7 adult units, while "small size family" refers to units which contain 1 to 4.7 adult units.

³ It is clear that inclusion of the variable "size of holdings" as well as the variable of "production" in any formal model will lead to a problem of multicollinearity. We have, therefore, included "size of holdings" only in our tables, as distinct from our regression model, since we nevertheless feel that is useful and interesting to see how the percentage of marketed surplus varies among different size of holdings.

⁴ For the sources of data, see Appendix A.

⁵ All measures about commodities are in terms of *maunds* (roughly 82.3 pounds). As harvest prices of all commodities in all areas were not available, and if available not adequate, no attempt was made to convert the quantities into value terms in this paper.

TABLE I
VOLUME OF PRODUCTION AND MARKETED SURPLUS OF FOODGRAINS IN EAST AND WEST PAKISTAN

| Volume of production (maunds) | Number of farms | | Quantity produced (maunds) | | Quantity sold (maunds) | | Sales as percentage of quantity produced | |
|----------------------------------|------------------|------------------|-------------------------------|------------------|---------------------------|------------------|---|------------------|
| | East Pakistan | West Pakistan | East Pakistan | West Pakistan | East Pakistan | West Pakistan | East Pakistan | West Pakistan |
| | Below 20 | 39 | 18 | 329.40 | 196.00 | 14.34 | 15.83 | 4.4 |
| 20—40 | 30 | 47 | 792.31 | 1374.50 | 57.88 | 141.02 | 7.3 | 10.3 |
| 41—60 | 3 | 27 | 143.33 | 1370.66 | 11.25 | 170.32 | 7.8 | 12.4 |
| 61—80 | 4 | 21 | 287.99 | 1474.00 | 53.33 | 249.66 | 18.5 | 17.0 |
| 81 and above | 5 | 21 | 560.00 | 2655.32 | 82.82 | 625.16 | 14.8 | 23.5 |
| Total | 81 | 134 | 2113.03 | 7070.48 | 219.62 | 1201.99 | 10.39 | 17.0 |

Source: NSS Schedules.

Holding Size, Tenurial Status and Marketed Surplus

Tables II through IV show the marketed surplus of foodgrains and cash crops in relation to holding size and tenurial status.

Percentage sales of foodgrains show a direct relationship with the size of holdings. In Table II we find that the surplus of foodgrains in East Pakistan increases from about 6 per cent to 13 per cent as the size of holding increases from less than 2.5 acres to more than 12.5 acres. In Table III we find that in West Pakistan also the percentage of sales is positively associated with holding size.

Table III also shows that the marketed surplus is larger in the case of owner farmers, less in the case of owner-tenant farmers and the least in tenant farmers. The percentages are 29.4, 10.8 and 9.7 respectively. Since a part of the rent payments may flow back to the market after passing through the renter, nothing can be said directly about the proportion of the final marketed surplus generated by the farmers belonging to each of these three tenurial groups. However, one observation can safely be made—owner farmers contribute relatively more to the monetisation of the economy than either of the other two groups.

Cash crops, as the very name suggests, are mainly produced for markets. The marketed surplus for these crops depends primarily on the tenurial status. The marketed surplus of cash crops is generally very large in the case of owner farmers. This is evident from the case of cotton and jute where the average percentages of sale are respectively 96.6 and 95.1. Sugarcane is both a food and a cash crop and as such the surplus is lower in case of owner farmers (58.5 per cent) compared to other cash crops. Tenant farmers pay half of their produce to landlords and most of the remainder is sold by them on the market. The tenant farmers sell 50 per cent and 45 per cent of their cotton and sugarcane produce in the market.

Consumption, Family Size and Marketed Surplus

From Table V it can be seen that the higher the average consumption, the lower the percentage of sales. The marketed surplus is lower in the case of small size families, since we find that their average consumption is higher than for large size families (cf. Table V). Another reason for this may be that farmers having large families sell a larger proportion of their output because they have a greater need for cash.

As regards Table VI, we should note that small size families do not apparently have any land holdings above 4.9 acres⁹. We can therefore only look at the sales by large size families in relation to different size of holdings. Here again, the larger the average consumption, the larger is the size of the surplus.

⁹ It is not clear whether this represents the actual situation correctly or whether this result reflects on sampling error on the part of the National Sample Survey.

TABLE II
MARKETED SURPLUS IN RELATION TO HOLDING SIZE OF OWNER FARMS FOR FOODGRAINS AND CASH CROP
EAST PAKISTAN

| Holding size (acres) | Number of farms | | Quantity produced (maunds) | | Quantity sold (maunds) | | Sales as percentage of quantity produced | |
|-------------------------|-----------------|-----------|-------------------------------|---------------|---------------------------|---------------|--|-------------|
| | Foodgrain | Jute | Foodgrains | Jute | Foodgrains | Jute | Foodgrains | Jute |
| Below 2.5 | 42 | 11 | 420.08 | 53.33 | 26.00 | 50.00 | 6.2 | 93.8 |
| 2.5—4.9 | 24 | 12 | 276.12 | 61.00 | 47.16 | 58.50 | 8.2 | 95.9 |
| 5.0—7.4 | 7 | 6 | 190.00 | 26.50 | 20.00 | 26.00 | 10.5 | 98.1 |
| 7.5—12.5 | 4 | 2 | 308.00 | 29.00 | 35.00 | 27.50 | 11.4 | 94.8 |
| Above 12.5 | 3 | 3 | 433.33 | 81.00 | 55.00 | 76.50 | 12.7 | 94.4 |
| Total | 80 | 34 | 1927.53 | 250.83 | 183.16 | 248.50 | 9.5 | 95.1 |

Source: NSS Schedules.

TABLE III

MARKETED SURPLUS IN RELATION TO HOLDING SIZE AND TENURIAL STATUS FOR FOODGRAINS: WEST PAKISTAN

| Holding size (acres) | Number of farms | | | Quantity produced (maunds) | | | Quantity sold (maunds) | | | Sales as percentage of quantity produced | | |
|-------------------------|-----------------|-----------------|--------------------------|----------------------------|-----------------|--------------------------|------------------------|-----------------|--------------------------|---|-----------------|--------------------------|
| | Owner farms | Tenant farms | Owner tenant farms | Owner farms | Tenant farms | Owner tenant farms | Owner farms | Tenant farms | Owner tenant farms | Owner farms | Tenant farms | Owner tenant farms |
| | Below 5 | 27 | 13 | 5 | 641.50 | 292.50 | 222.50 | 107.43 | 8.00 | 12.25 | 16.7 | 2.7 |
| 5.0—7.49 | 9 | 18 | 5 | 416.00 | 706.33 | 102.00 | 117.00 | 53.82 | 11.66 | 28.1 | 7.6 | 11.4 |
| 7.5—12.49 | 11 | 19 | 3 | 636.00 | 1111.49 | 189.00 | 188.50 | 74.91 | 22.50 | 29.6 | 6.7 | 11.9 |
| 12.5—24.99 | 8 | 12 | 4 | 926.00 | 961.00 | 362.00 | 357.00 | 129.50 | 48.00 | 38.6 | 13.5 | 13.3 |
| 25.00—50.99 | 0 | 3 | 0 | 0 | 530.00 | 0 | 0 | 84.00 | 0 | 0 | 15.8 | 0 |
| Total | 55 | 65 | 17 | 2619.50 | 3601.32 | 875.50 | 769.93 | 350.23 | 94.41 | 29.4 | 9.7 | 10.8 |

Source: NSS Schedules.

TABLE IV
MARKETED SURPLUS IN RELATION TO HOLDING SIZE AND TENURIAL STATUS OF CASH CROPS: WEST PAKISTAN

| Holding size (acres) | Number of farms | | | | Quantity produced (maunds) | | | | Quantity sold (maunds) | | | | Sales as percentage of produced quantity | | | |
|-------------------------|-----------------|-----------|------------|----------|----------------------------|---------------|---------------|---------------|------------------------|---------------|--------------|---------------|--|-------------|-------------|-------------|
| | Cotton | | Sugar-cane | | Cotton | | Sugar-cane | | Cotton | | Sugar-cane | | Cotton | | Sugar-cane | |
| | (OW) | (T) | (OW) | (T) | (OW) | (T) | (OW) | (T) | (OW) | (T) | (OW) | (T) | (OW) | (T) | (OW) | (T) |
| Below 5 | 4 | 3 | 1 | 0 | 49.50 | 24.00 | 8.00 | 0 | 47.75 | 12.35 | 6.00 | 0 | 96.0 | 51.0 | 75.0 | 0 |
| 5.0—7.49 | 4 | 10 | 0 | 1 | 58.00 | 184.00 | 0 | 4.50 | 54.50 | 77.13 | 0 | 2.25 | 94.0 | 42.0 | 0 | 50.0 |
| 7.5—12.49 | 3 | 13 | 2 | 5 | 64.00 | 367.00 | 18.00 | 150.00 | 60.00 | 132.80 | 8.00 | 55.50 | 94.0 | 36.0 | 44.00 | 37.0 |
| 12.5—24.9 | 5 | 6 | 1 | 1 | 230.00 | 272.00 | 80.00 | 246.00 | 225.50 | 130.00 | 48.00 | 123.00 | 98.0 | 48.0 | 60.00 | 50.0 |
| 25.00—50.00 | 0 | 2 | 0 | 0 | 0 | 41.00 | 0 | 0 | 0 | 20.00 | 0 | 0 | 0 | 49.0 | 0 | 0 |
| Total | 16 | 34 | 4 | 7 | 401.50 | 888.00 | 106.00 | 400.50 | 387.75 | 372.28 | 62.00 | 180.75 | 96.6 | 50.0 | 58.5 | 45.0 |

OW = Owner farmers.
T = Tenant farmers.

Source: NSS Schedules.

TABLE V
MARKETED SURPLUS OF FOODGRAINS IN RELATION TO FAMILY SIZE : WEST PAKISTAN

| Holding size (acres) | Number of farms | | Number of adult units | | Quantity produce (maund) | | Quantity consumed (maund) | | Average consumption (maund) | | Quantity sold (maund) | | Sales as percentage of quantity produced | |
|-------------------------|-----------------|-----------|-----------------------|--------------|--------------------------|----------------|---------------------------|----------------|-----------------------------|------------|-----------------------|---------------|--|-------------|
| | S.S.F. | L.S.F. | S.S.F. | L.S.F. | S.S.F. | L.S.F. | S.S.F. | L.S.F. | S.S.F. | L.S.F. | S.S.F. | L.S.F. | S.S.F. | L.S.F. |
| Below 5 | 40 | 9 | 118.9 | 62.9 | 907.50 | 278.00 | 809.96 | 305.20 | 6.8 | 4.9 | 97.88 | 42.30 | 10.8 | 15.2 |
| 5.00—7.49 | 14 | 18 | 37.8 | 113.5 | 475.00 | 758.33 | 249.28 | 598.45 | 6.6 | 5.3 | 58.66 | 117.16 | 12.3 | 15.4 |
| 7.5—12.49 | 15 | 19 | 43.2 | 124.7 | 832.00 | 1115.98 | 374.41 | 766.75 | 8.7 | 6.1 | 108.00 | 188.00 | 13.0 | 16.8 |
| 12.5—25.00 | 11 | 12 | 34.7 | 99.9 | 907.00 | 1408.00 | 292.00 | 691.00 | 8.4 | 6.9 | 220.00 | 324.50 | 24.3 | 23.0 |
| Total | 80 | 58 | 234.6 | 401.0 | 3121.50 | 3560.32 | 1725.65 | 2361.40 | 7.4 | 5.9 | 484.54 | 671.96 | 15.5 | 18.9 |

S.S.F. = Small size family.
L.S.F. = Large size family.

Source: NSS Schedule.

TABLE VI
MARKETED SURPLUS OF FOODGRAINS IN RELATION TO FAMILY SIZE : EAST PAKISTAN

| Holding size (acres) | Number of farms | | Number of adult units | | Quantity produced (maunds) | | Quantity consumed (maunds) | | Quantity sold (maunds) | | Sales as percentage of quantity produced | | | |
|-------------------------|-----------------|-----------|-----------------------|--------------|----------------------------|----------------|----------------------------|----------------|------------------------|-------------|--|---------------|------------------------|------------------------|
| | S.S.F. | L.S.F. | S.S.F. | L.S.F. | S.S.F. | L.S.F. | S.S.F. | L.S.F. | S.S.F. | L.S.F. | S.S.F. | L.S.F. | | |
| Below 2.5 | 42 | 8 | 120.7 | 49.2 | 342.24 | 147.32 | 728.29 | 251.98 | 6.3 | 5.8 | 12.07 | 0 | 3.5 | 0 |
| 2.5—4.9 | 19 | 8 | 68.4 | 51.4 | 464.96 | 205.15 | 488.63 | 316.66 | 7.3 | 6.2 | 35.85 | 11.31 | 7.7 | 5.5 |
| 5.0—7.4 | 0 | 8 | 0 | 52.4 | 0 | 170.00 | 0 | 322.66 | 0 | 6.5 | 0 | 14.32 | 0 | 8.4 |
| 7.5—12.5 | 0 | 7 | 0 | 52.7 | 0 | 543.32 | 0 | 418.33 | 0 | 8.9 | 0 | 58.32 | 0 | 10.7 |
| Above 12.5 | 0 | 4 | 0 | 49.5 | 0 | 433.00 | 0 | 350.65 | 0 | 7.1 | 0 | 47.32 | 0 | 10.8 |
| Total | 61 | 35 | 189.1 | 255.2 | 807.20 | 1498.79 | 1216.92 | 1660.28 | 6.44 | 6.51 | 47.92 | 131.27 | 5.9^b | 8.8^b |

S.S.F. = Small size family.

L.S.F. = Large size family.

^a Consumption figures may be higher than production figures as consumption includes production as well as purchases from the market. Quantity sold refers to gross surplus. Otherwise it could be negative.

^b Since this table includes owner, tenant and owner-tenant farms, the average percentage of sale is lower (i.e., 7.8) as compared to Table I, where we only include owner farmers.

Source: NSS Schedules.

This section does not make any attempt to rigorously specify the actual relationship between family size and marketed surplus. This will be explained in Section II where we derive the marketed surplus function.

II. MARKETED SURPLUS FUNCTIONS

The discussion and results presented in Section I are clear indications of the fact that the marketed surplus is not the function of any one single variable. The interplay of the different variables determine the size of the surplus. In this section, therefore, attempts will be made to determine the surplus function of foodgrains with the help of two separate models. Model I applies only to owner farmers while model II is formulated for tenant farmers.

Model I: Owner Farmers

In this model, the “marketed surplus” per farmer family has been considered a function of production and family size. We have not introduced holding size in this model as we found a high correlation between production and the size of holding. These two variables cannot be considered together to determine the surplus function without raising the problem of multicollinearity¹⁰. Our model I, therefore, can be written as:

$$S = f(X_2 ; X_3).....(1)$$

Where: S = “marketed surplus” of foodgrains per farmer family,
 X₂ = production per farmer family, and
 X₃ = family size.

By applying multiple regression analysis, the surplus functions of foodgrains have been derived. The regression equation for East Pakistan is as follows¹¹:

$$S = 1.07 + 0.67X_2 - 5.76X_3.....(2)$$

(0.02) (0.23)

The bracketed figures are the standard errors. The adjusted coefficient of determination $\bar{R}^2 = 0.93$. The regression equation for West Pakistan is:

$$S = 5.27 + 0.51 X_2 - 4.34 X_3.....(3)$$

(0.04) (0.56)

The $\bar{R}^2 = 0.71$.

The regression coefficients are significantly different from zero at the 1 per cent level of significance. Ninety-three per cent of the variations in the “marketed surplus” of foodgrains in East Pakistan is explained by the interplay of the two

¹⁰ For an exposition of the problem of multicollinearity, see [7, pp. 201-207].

¹¹ The coefficients in a regression equation show the marginal change in the dependent variable, because of this, the regression coefficient of family size is not equal to average consumption of the families. In interpreting equations where we write “on the average” we mean marginal change on the average and not the simple average change.

variables, *i.e.*, production and the size of family. They explain 71 per cent of the variations in the surplus in the case of West Pakistan¹².

The interpretation of the equation for East Pakistan is as follows: for the East Pakistani farmers a change in one unit of production is, on the average, associated with a direct change of 0.67 unit in the "marketed surplus", while a change of one unit in the family size appears to bring about, on the average, a negative change of -5.76 units in the "marketed surplus".

The partial elasticity¹³ of the surplus with respect to production at the mean is 1.9 and for family size -2.9. The output elasticity of the "surplus" shows that a percentage change in production is associated with a change of about 2 per cent in the "marketed surplus"; and the family size elasticity of the "surplus" shows that the percentage change in the surplus in response to a percentage change in family size is approximately minus 3 per cent. Thus, the "marketed surplus" is quite responsive to both the changes in production and family size.

The interpretation of the regression equation for West Pakistan is as follows: for West Pakistani farmers a change of one unit in production is associated, on the average, with a direct change of 0.51 unit in the "marketed surplus", while a change by one unit in the family size leads, on the average, to a change in the "marketed quantity" of -4.34 units.

¹² As our study is based on cross-section data, it is implied that the results we obtained are subject to the given set of prices which prevailed at the time of the survey. Presumably the effect of changed prices would be to shift the whole regression line (surface). This has been pointed out to us by Professor Falcon of Harvard University.

¹³ Elasticity of the "surplus" with respect to production at the mean is

$$b_2 \left[\frac{\bar{X}_2}{\bar{S}} \right]$$

where: \bar{X}_2 = mean food production,
 \bar{S} = mean "marketed surplus" and

$$b_2 = \frac{ds}{dx_2} = \text{incremental marketing ratio}$$

Elasticity of the "surplus" with respect to family size at the mean is

$$b_3 \left[\frac{\bar{X}_3}{\bar{S}} \right]$$

where \bar{X}_3 = mean size of family

$$b_3 = \frac{ds}{dx_3} = \text{incremental marketing ratio.}$$

The production elasticity and family size elasticity of the “marketed surplus” at the mean are 3.4 and —3.2 respectively. Thus , we see that marketed surplus is more responsive to changes in both production and family size in case of West Pakistan than in East Pakistan. Looking at the regression equations above, we find that the intercept is much larger in the case of West Pakistan than in East Pakistan. West Pakistan appears to be both absolutely and marginally more “monetized”.

The above analysis shows that: *i*) a change in production is associated with a less than proportionate change in the marketed surplus, albeit in the same direction; and *ii*) family size, production being given, is negatively related to the marketed surplus.

Model II: Tenant and Owner-cum-Tenant Farmers

In this model, per capita “marketed surplus” of a farmer family has been considered to be a function of per capita production and per capita rent paid (in kind) to the landlord¹⁴.

The function can be written thus:

$$S^P = f (X_2^P ; X_4^P) \dots\dots\dots(4)$$

Where S^P = “marketed surplus” per capita,

X_2^P = production of foodgrains per capita, and

X_4^P = rent payment to landlord in kind per capita.

The model is applied to tenant and owner-tenant farmers. It was found that owner-tenant farmers, both in East and West Pakistan, yield statistically insignificant results. The model is, therefore, applicable only to tenant farmers¹⁵. The regression equation for foodgrains “surplus” in West Pakistan for tenant farmers is as follows:

$$S^P = - 4.07 + 0.60 X_2^P - 0.62 X_4^P \dots\dots\dots(5)$$

(0.11) (0.19)

where the bracketed figures are the standard errors. The adjusted coefficient of determination (\bar{R}^2) is 0.60. This shows that 60 per cent of the variations in the “marketed surplus” is explained by these two variables in the case of tenant farmers. Both the coefficients of per capita production and per capita rent paid are significantly different from zero at the 1 per cent level of significance.

¹⁴ In order to reduce the number of explanatory variables in the function we divided all the magnitudes by family size. This procedure reduced the computational work involved.

¹⁵ We could not study the tenant farmers in East Pakistan as the number of observations available were less than ten.

The interpretation of the above equation is as follows: for tenant farmers in West Pakistan a change in per capita production by one unit is associated, on the average, with a direct change of 0.60 units in the marketed quantity, while a unit change in the per capita rent payment is inversely related, on the average, with the "marketed surplus" by 0.62 units.

The above analysis shows that the size of the surplus decreases with rent payment obligations in kind. We should also point out that for owner-tenant farmers the sign of the coefficient for rent payments is negative. This suggests that rent payment in kind reduces the "marketed surplus". However, as the value of the coefficient is found to be statistically insignificant we cannot say more than that our hypothesis has received a modicum of support.

III. CONCLUSIONS

The major findings of the paper may be summed up as follows:

a) Ninety-three per cent of the variation in the "marketed surplus" of foodgrains in East Pakistan is explained by production and family size. In the case of foodgrains in West Pakistan these variables explain 71 per cent of the variation in the "marketed surplus".

b) Sixty per cent of the variation in the "marketed surplus" for tenant farmers is explained by per capita production and rent payment. For owner-tenant farmers, rent payments do not explain the variance in the "marketed surplus".

c) Almost all the quantities produced are marketed in the case of cash crops. The marketed surplus of jute is about 95 per cent and that of cotton about 96 per cent. Tenant and owner-tenant farmers sell in the market whatever is left after paying rent in kind to landlords.

d) Consumption of cash goods has little relationship with the "marketed surplus" of foodgrains in the case of both East and West Pakistan.

From the study it appears that the improvement in the yields of crops and reduction of family size are the two most important measures for increasing the size of the marketed surplus in this country.

REFERENCES

1. Coale, A.J., and E.M. Hoover, *Population Growth and Economic Development in Low-income Countries*. (Princeton, New Jersey: Princeton University Press, 1958).

2. Dandekar, V.M., "Prices, Production and Marketed Surplus of Food-grains", *Indian Journal of Agricultural Economics*, Vol. XIX, July-December, 1964. Pp. 186-195.
3. Dharam Narain, *Distribution of the Marketed Surplus of Agricultural Produce by Size-level of holding in India 1950-51*. (Delhi: Institute of Economic Growth, 1961).
4. *Indian Journal of Agricultural Economics*, Vol. XVI, January-March, 1961. Pp. 26-121.
5. Johnston, B.F., "Agricultural Productivity and Economic Development in Japan", *Journal of Political Economy*, Vol. LIX, December 1951. Pp. 498-513.
6. Johnston, B.F., and J.W. Mellor, "The Role of Agriculture in Economic Development", *American Economic Review*, Vol. LI, September 1961. Pp. 566-593.
7. Johnston, J., *Econometric Methods*. (New York: McGraw-Hill Book Company, 1960).
8. Kahlon, A.S., and H.N. Dwivedi, "Interrelationships between Production and Marketable Surplus", *Asian Economic Review*, Vol. V, August 1963. Pp. 471-488.
9. ✓ Khan, A.R., and A.H.M.N. Chowdhury, "Marketable Surplus Function: A Study of the Behaviour of West Pakistan Farmers", *Pakistan Development Review*, Vol. II, No. 3, Autumn 1962, Pp. 354-376.
10. Kruger, A.O., "Interrelationships between Industry and Agriculture in a Dual Economy", *Indian Economic Journal*, Vol. X, July 1962. Pp. 1-13.
11. Lewis, Arthur, "Economic Development with Unlimited Supplies of Labour", *Manchester School of Economics and Social Studies*, Vol. XXII, May 1954. Pp. 139-191.
12. Mathur, P.N., and H. Ezekiel, "Marketable Surplus of Food and Price Fluctuations in a Developing Economy", *Kyklos*, Vol. XIV, Fasc. 3., 1961. Pp. 396-408.
13. Pakistan, Central Statistical Office, *National Sample Survey (First Round) 1959. NSS Series: No. 1*. (Karachi: Manager of Publications).
14. Pakistan, Central Statistical Office, *National Sample Survey (Second Round) 1960. NSS Series: No. 2*. (Karachi: Manager of Publications).

15. Pakistan, Ministry of Agriculture and Works, Department of Agricultural Economics and Statistics, *Survey Report on Utilization of Agricultural Commodities in Pakistan, S.S. III*. (Karachi: Manager of Publications, June 1961. Pp. 1-6.).
16. Pakistan, Planning Commission, *The Third Five-Year Plan, 1965-70*. (Karachi: Planning Commission, May 1965).
17. Raj Krishna, "A Note on the Elasticity of the Marketable Surplus of a Subsistence Crop", *Indian Journal of Agricultural Economics*, Vol. XVII, July-September 1962. Pp. 79-84.
18. Sinha, S.N., "Marketable Surplus in Agriculture in Underdeveloped Countries", *Economic Review*, Vol. XIII, No. 22, April 7, 1962.

Appendix A

SOURCES OF DATA

i) The Family Expenditure Schedules of the *National Sample Survey* [14] (Second Round, 1960—referred to as NSS) provided the data which formed the basis of this study. The sample survey was carried out on the basis of a three-stage stratified sampling design. The total number of schedules collected by the NSS was two thousand; nine hundred for East Pakistan and eleven hundred for West Pakistan. An examination of the schedules revealed that a large number were internally inconsistent. Some did not report the variables which were relevant to our analysis and some were referred to units other than farmers. Out of the remaining schedules we randomly selected 180 returns for West Pakistan and 120 for East Pakistan. Because of the poorer quality of the original sample returns in East Pakistan, our subsample consists of only 13.3 per cent of the total returns obtained from that province. In the case of West Pakistan the subsample consists of 16.4 per cent of the total returns for that province. The total number of schedules in our subsample is three hundred.

ii) The Family Expenditure schedules of the NSS gave the following information:

- a) Family composition, on date of enquiry.
- b) Births during survey year.
- c) Deaths during survey year.
- d) Name of crop; area cultivated under each crop; owned and tenanted proportion of area for each; quantity produced; yield per acre.
- e) Quantity paid in kind for harvesting, threshing *etc.*; quantity paid to the landlord as share of crop or rent in kind; quantity sold for cash; quantity for purchase of goods or services rendered excluding harvest *etc.* but including menials and milling; quantity given for repayment of loans; quantity used for seed, quantity used for fodder; quantity wasted; other uses, quantity purchased, quantity received as wages in kind for harvesting and other services by family members; quantity received as rent in kind or share of crop and quantity consumed.
- f) Consumption of food; clothing and household accessories; miscellaneous articles.
- g) Savings and insurance.
- h) Receipts, disbursements.

Appendix B

ANALYSIS OF THE RESULTS

Table I shows that about 10 per cent of the quantity produced was marketed in East Pakistan and about 17 per cent in West Pakistan. These results can be compared with the results obtained by the *Survey on Utilisation of Agricultural Commodities* [15, pp. 3-5]. For West Pakistan, the *Survey* found that about 16 per cent of foodgrains production was marketed. This compares favourably with our result. For East Pakistan, however, the comparison leads to a less reassuring conclusion. The *Survey* [15] shows that about 17 per cent of foodgrains produced were marketed in East Pakistan, as compared with our result of only 10 per cent. Thus not only is there a major discrepancy in the level of foodgrains marketed in East Pakistan but, according to the *Survey*, the per cent marketed in East Pakistan is higher than in West Pakistan while our results show a reverse situation. Although we cannot give any definitive answer to these discrepancies, we suggest two possibilities. The *Survey* [15, p. 11] points out that although the "survey year," was 1959/60, the study in many cases had to be continued well after the end of the survey year. "...the field staff was small.....the schedule was detailed and the sample was large. This necessitated continuation of the study till after the expiry of the year 1959/60 with increased dependence on the memory of the farmers" [15, p. 11]. Given the difficult terrain in East Pakistan and the fact that the sample size there was relatively large, it may be that the results for East Pakistan suffered more from the limitations mentioned above than West Pakistan. Furthermore, our results are based on a carefully selected subsample from the NSS schedule returns. We have, thus, had an opportunity to scrutinize the returns and use only those which were internally consistent (see Appendix A). On the other hand, we have no assurance that a similar careful process of selection was undertaken for the *Survey*. Although these reasons may help to account for the differences in survey result and the result we obtain from the NSS schedule, a more thorough explanation will have to await a detailed analysis of the returns used for the *Survey*.