

Rural Income Distribution in Pakistan in the Green Revolution Perspective

by

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INTRODUCTION

Relatively higher income disparities are regarded as the characteristic phenomenon of the less developed countries and as a rule, the income concentration increases with economic growth during early stages of development [11,p.25]. In general, the more rapid the growth during early stages, the more intense the development of income inequality. The underlying reasons for this development are two. First, the development-conscious governments of the less developed countries, in order to raise investment, allow income disparities to widen. Second, the resource mobilization policies often lag behind and fail to cope with the continuing growth process and the resources tend to concentrate among resource owners.

Since spectacular growth in Pakistan has been experienced under the green revolution, it was thought that the green revolution might lead to magnification of income inequalities in rural West Pakistan. Falcon [5,Pp, 698-710] remarks that the green revolution might generate unprecedented income inequalities among the rural classes. Gotsch [6, p. 28] argues that since the green revolution technologies (e.g., tractors, tubewells, seed and fertilizer) were concentrated in the hands of a few well-to-do farmers, there was a strong tendency for the income inequality to increase. Nigar Ahmad [1, Pp. 3-4] Rafiq Ahmad [2, Pp. 5-6] and Dilawar Ali Khan [9, Pp. 62-83] also hold that the impact of the green revolution technology has been biased in favour of the large land owners.

The above studies have argued that since the large farmers have a greater potential for economic growth, the growth was either confined to large farms alone or incomes of the large farmers grew at a faster rate than those of their smaller counterparts. It follows from the above that the benefits of the green revolution accrued, more to the small class of privileged large farmers than to the much larger section of innumerable small farmers.

*The author is a Research Economist at the Pakistan Institute of Development Economics, Islamabad. Thanks are due to Mr. S.H.H. Naqvi, a Research Economist at PIDE, for editorial comments on an earlier draft of this paper. The author is thankful to Mr. Muhammad Shafique, a Research Assistant, for assistance in calculation work. However the author is solely responsible for the views expressed in the paper.

While the above view may be plausible it does not necessarily follow that the green revolution has aggravated income inequalities. The present study is an attempt to re-examine the conclusion of the above studies.

2. GREEN REVOLUTION AS AN ACCELERATOR OF RURAL INCOME INEQUALITIES

The argument that technological biases of the green revolution have accentuated the rural income disparities is subject to criticism because certain aspects which should have been considered for arriving at such conclusion have largely been ignored.

To begin with, the above argument appears to be based on the assumption that the agricultural inputs are non-substitutable. Such, however, is not the case. Farm yard manure can be used in place of chemical fertilizers, tractors can be substituted by manual labour and the efficiency of tubewell water can be almost matched by skillful water conservation techniques and more efficient use of canal water. Thus these parallel practices may enable small farmers to compete with large farmers with considerable success. It has been reported [20] that on an average small farmers with holdings of 12.5 acres or less use twice as much farm-yard manure per acre as large farmers with holding of 50 acres and above. Similarly small holders put in 79 man-day of labour per acre per annum in contrast to only 37 man-days put in by large farmers. Further it is established [8, P. 72] that the cropping intensity¹ of a non-tubewell small farm compares favourably with that of a farm of over 50 acres and served by tubewell.

The argument, also ignores the spillover effects of the green revolution technology. It seems to develop on the assumption that growth takes place in water tight compartments. Ample evidence, however, exists to show that the green revolution has generated an enhanced demand for agricultural labour. The small farmers have benefitted from the available rental services of tractors as well as from purchased tubewell water. Thus it will not be wholly correct to assume that the green revolution technology was restricted in its impact to large farmers alone.

Above all, the technological concentration does not imply necessarily a widening income gap between rural classes. It may be pointed out that for widening income inequalities, the rate of adoption of technology should successively be higher for the high income groups. It is true that the new technology is adopted by the large farmers in its early stages of introduction because of their risk bearing abilities but once its benefits become clear the smaller farmers, despite their financial problems also adopt it. Such was the experience with the expensive private tubewell installations in Pakistan. Ghulam Mohammad [13, Pp. 46-56] has noticed the increasing participation of smaller farmers in private tubewell installations. He points out that while "the larger² and wealthier farmers were installing more tubewells initially, this situation is changing. The small farmers owning private tubewells constituted 19 per cent of the total tubewell owners during 1960/62 and by 1963/65 they formed 23 per cent of the

¹Cropping intensity is defined as the ratio between the area cropped and the area cultivated.

²A large farmer is one who owns more than 50 acres while a small farmer is defined to own less than 12.5 acres of arable land.

total owners". It is not impossible that the smaller farmers might be behaving similarly in respect of high yielding varieties and fertilizers.

2.1. Choice of Study Period

Before proceeding further, it is necessary to specify the period of the green revolution and that of our analysis. In line with the technological breakthroughs in agriculture, we have restricted the period of analysis to the decade of the sixties. An extension of the period into the seventies would have provided a better base for the analysis but this could not be done for the data on household incomes are not available beyond 1969/70.

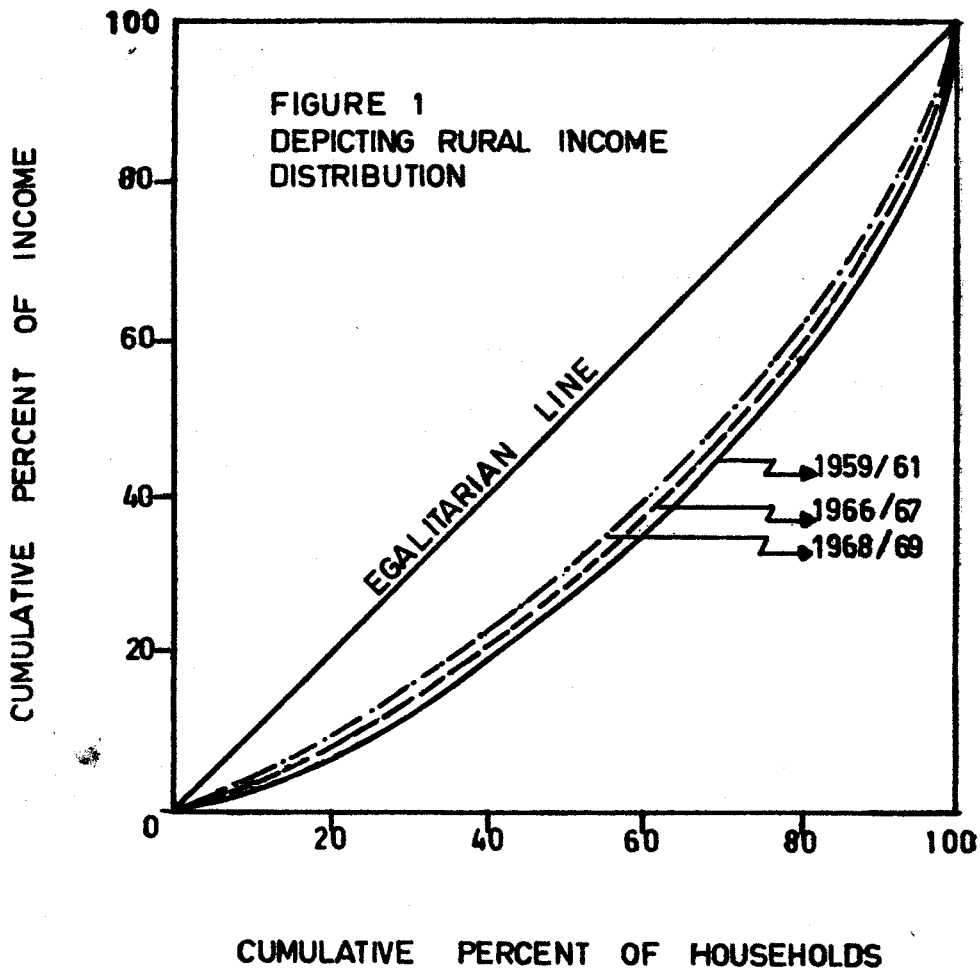
The choice of the base period, 1959/61 was made for three reasons. (1) This was the period when agriculture started transforming itself from a traditionally stagnant sector into a rapidly growing one; (2) The CSO rural income data became available for the first time during 1959/61 and its choice provided us with a greater period coverage for looking at the trend of income inequality and for observing even slow movements. (3) Sample surveys for three consecutive years 1959, 1960 and 1961 were available and when combined they reduced the non-sampling errors, because of the comparatively larger sample.

The next household income and expenditure survey after 1959/61 was conducted in 1963/64. We did not include it in our analysis because it suffered from a higher degree of non-sampling errors as the actual survey covered only 75 per cent of the planned sample. The quarterly surveys for 1964/65 and 1965/66 were partial in nature, both were undertaken for half years while the latter covered urban areas only. These two surveys had, therefore, also to be excluded from our analysis.

The 1966/67 survey was much more efficient than the previous ones as it had a complete coverage of the planned sample. The results of the 1967/68 survey were not compiled. However, the results of the 1968/69 and 1969/70 surveys have become available. Like 1966/67 survey, they are reasonably efficient and enjoy coverages of 99 and 98 per cent respectively. The three surveys namely, 1966/67, 1968/69 and 1969/70 have been included in our analysis which covers the period from 1959/68 to 1969/70 with two intermediate periods, 1966/67 and 1968/69.

3. THE PATTERN OF RURAL INCOME DISTRIBUTION

The preceding section presented a qualitative discussion on the trend of income distribution during the decade of the sixties. In the current section an attempt is made to explore the trend empirically. Three common but inter-dependent devices, (i) the income shares, (ii) the Lorenz curve analysis, and (iii) the income concentration ratios, form the basis of our analysis which restricts itself to household income alone, although it may also be extended to cover per capita and per earner incomes. The last two have not been included because, of the existence of a strong and positive correlation between these two variables and the household incomes. So the conclusions of our analysis should be applicable to per capita and per earner incomes as well.



3.1. The Household Income Shares

An exploration of the trend in income shares over time involves comparisons of income shares, at a given point of household proportion. Table 1 below presents cumulative income shares for different household proportions for different years. It shows the varying amounts of the total income shared by the various percentages of the households arranged from the lowest 10 per cent (lowest in terms of income per household) of the households cumulatively upwards.

TABLE I

RURAL HOUSEHOLDS AND THEIR INCOME SHARES FOR THE PERIOD
OF 1959/61, 1966/67, 1968/69 AND 1969/70

(Figures in percentages)

Household proportion		Cumulative income shares			
		1959/61	1966/67	1968/69	1969/70
Lowest 10	Per cent	2.8	4.0	4.0	3.7
" 20	"	6.2	8.6	9.0	9.2
" 40	"	19.0	21.0	22.2	21.9
" 50	"	26.3	29.2	30.1	30.3
" 60	"	35.1	37.3	39.2	39.0
" 70	"	56.6	58.9	61.1	61.1
" 80	"	71.5	73.3	76.4	76.1
" 90	"	81.0	82.7	85.4	85.1
" 100	"	100.0	100.0	100.0	100.0

Source: Calculations based on [14—19].

It is clear from the above table that the lowest 10 per cent of the households during the base year 1959/61, received 2.8 per cent of the total income while the top 10 per cent had 28.5 per cent. By 1966/67 the share of the lowest 10 per cent rose to 4.0 per cent and that of top 10 per cent declined to 26.7 per cent. During 1968/69, while the share of the lowest 10 per cent remained constant at 4.0 per cent, there was a further decline in the share of the top 10 per cent of the households. It may be observed that the income share of the lowest 10 per cent dropped to 3.7 per cent during 1969/70 following a corresponding rise in the income share of the top 10 per cent of the households. However, a more elaborate and concise picture emerges if we look at the income share of the lower 50 per cent households. During 1959/61, the lower half of the households in the country had 26.3 per cent of the total income. By 1969/70 their share had risen to 30.3 per cent. It follows from the above that the income shares for the lowest income groups were rising during the decade of the sixties while those of the top income groups experienced a corresponding decrease.

3.2. The Lorenz Curve Analysis

The Lorenz curve is the technique most commonly used to indicate differences in the degree of inequality of different income distributions. It is a simple graphic device which depicts the relationship between cumulative income

shares and cumulative percentage of income receivers. As a general rule the extent of the convexity of the curves indicates the degree of inequality. The greater the convexity of the curve the greater the inequality of income distribution.³

For the purposes of our own analysis, Lorenz curves, based on the information in Table-I have been drawn in Figure-I. The cumulative income shares have been plotted on the vertical Y axis against the corresponding household proportions on the horizontal X axis. It can be seen from the figure that all the four curves take their positions to the right of the egalitarian line. The 1959/61 curve lies to the extreme right of the egalitarian line. One can notice, that 1966/67 curve lies to the left of the 1959/61 curve. A further left-ward shift is noticeable over the period 1966/67 to 1968/69.

The curve depicting 1969/70 income distribution (not drawn to avoid blurring) however swirls around 1969/70 but lies to the left of the curves for 1959/61 and 1966/67. This shows that the income distribution was more skewed during 1959/61 and that it was slowly improving during the period of our analysis. However, we are not clear about the trend of income equality over the period 1968/69 and 1969/70 as the use of the Lorenz curves for comparison may be limited. In fact Lorenz [12, p. 213] himself recognized the possible ambiguity in comparison in situations where two curves of varying distributions are intersected.

3.3. The Income Concentration Ratio

The income concentration ratios play a decisive role in over-coming the problem of intersecting curves and in making it possible to draw firm conclusions about the trend of income distribution. In terms of the Lorenz curve analysis concentration ratio is defined as the ratio of the area between the curve and the egalitarian line divided by the total area under the egalitarian line.⁴

Using the mean difference approach we applied the concept to CSO data published in its surveys on current economic conditions. The calculated concentration ratios for different years based on household and per capita incomes have been presented in Table II.

³The diagonal joining the lower left-hand corner and the upper right-hand corner forms the egalitarian line showing perfect equality of income distribution. Curves lying to the extreme right of the egalitarian line by definition of convexity signify a greater income inequality.

⁴Statistically speaking the income concentration ratio or Gini coefficient [7, p. 629] may be approximated either (i) from the Lorenz curve itself, (ii) From mean difference or, (iii) from Pareto's α . We, however have mainly depended on mean difference approach for our calculation. Here is the sample calculation. Average incomes, $Y_1, Y_2, Y_3,$ and Y_4 with corresponding frequency distributions, X_1, X_2, X_3 and X_4 .

$$\text{Mean Differences: } \frac{[(Y_1 - Y_2)X_1X_2 + (Y_2 - Y_3)X_2X_3 + (Y_3 - Y_4)X_3X_4 + (Y_4 - Y_1)X_4X_1 + (Y_1 - Y_2)X_2X_3 + (Y_2 - Y_3)X_3X_4 + (Y_3 - Y_4)X_4X_1 + (Y_4 - Y_1)X_1X_2]}{n!}$$

Where n is the total frequency and is equal to $\sum X_i$; and r represents No. of income groups involved in difference taken at a time. It equals to 2 in all the cases.

$$\text{Concentration ratio} = \frac{\text{Mean difference}}{\text{Twice the arithmetic mean income}}$$

TABLE II
GINI INCOME CONCENTRATION RATIOS OVER THE GREEN REVOLUTION PERIOD

Period	Income concentration ratios based on	
	Household income	Per capita income
1959/61	0.3583	0.2158
1966/67	0.3203	0.1881
1968/69 ^a	0.2940	0.1591
1969/70	0.2958	0.1605

Source: Calculations based on [14-19].

(a) The income concentration ratio based on income per capita, is slightly lower than that calculated by Khandkar [10, p.33]. His figure perhaps is overstated due to the difference in calculation procedure and use of original data sheets since the 1968-69 CSO survey was published after his study was completed.

Appreciable declines in income concentration ratios may be observed from the table. The income concentration ratio based on household incomes fell from 0.3583 in 1959/68 to 0.3203 in 1966/67 and further to 0.2940 in 1968/69 but rose to 0.2958 in 1969/70. Similar trend is revealed by income concentration ratios based on per capita incomes. A declining income concentration ratio is synonymous with improving income distribution.

On the basis of the preceding analysis one final comment is in order. The rising income shares of the low income groups, the left-ward shifts in Lorenz curves, and the declining income concentration ratios, over time, imply a gradual reduction of income inequalities among the rural population during the sixties. Although 1969/70 showed improvement over 1959/61 and 1966/67 the analysis suggests that the income distribution for this year actually deteriorated in relation to 1968/69. However the magnitude of deterioration was insignificant.

Two factors may explain this visible reversal in trend. First the two years lie closer together and the deterioration of income distribution to the reported extent might be the result of fluctuations in growth and in this case the deterioration will assume an intrinsic value. Second (and this is more probable) the reversal may be illusory due to the under and over estimations of income inequality for 1968/69 and 1969/70 respectively. That this may be the case is revealed by the following Table III.

TABLE III
MAGNITUDE OF BIASES RESULTING FROM ACTUAL COVERAGE OF THE CSO SURVEYS

Year	Percentage coverage of households	
	Income below Rs 100/- p.m.	Income below Rs 750/- p.m.
1966/67	17.61	0.93
1968/69	16.32	0.41
1969/70	13.60	0.98

Source; Calculations based on [17-19].

It is evident from the above table that the coverage of high income groups in the total sample during 1968/69, in relation to somewhat more comprehensive⁵ survey of 1966/67, was significantly low, implying that the 1968/69 survey missed more of high income groups resulting in a relatively greater understatement of inequality. Similarly, it can also be seen that the 1969/70 survey overstated the inequality because of the low proportion of the coverage of the low income groups

3.4. Authenticity of the CSO Data

The underlying sources of data for the preceding analysis were the quarterly surveys of current economic conditions published by the Central Statistical Office which themselves were a continuation of the national sample surveys of the early sixties. It may be pointed out that these surveys suffered from certain short-comings, and thus, the analysis based on such statistics, may be of doubtful validity. It seems inevitable, therefore, to include a discussion of the biases inherent in CSO surveys and the following paragraphs provide an exploration of these.

First the sampled households form a significantly low proportion of the total which is noticeable from Table IV.

TABLE IV

ESTIMATED TOTAL NUMBER OF HOUSEHOLDS AND THE SAMPLED HOUSEHOLDS AS PERCENT OF TOTAL

Year	West Pakistans* estimated rural population	Average number of members per households	Estimated number of households	Sampled households	Sampled as per cent of total households
1	2	3	(4)=(2)/(3)	(5)	(6)=(5)/(4)
1959/61	34,939,325	5.6	6,239,165	5449	0.087
1966/67	40,741,750	5.6	7,275,313	2589	0.035
1968/69	42,973,750	5.4	7,958,103	2702	0.33
1969/70	44,136,250	5.3	8,327,594	2764	0.33

Source: Calculations based on [22, p.2 and 14-19].

*According to 1961 population census the rural population stood at 77.5 per cent of the total. The same proportion has been used in the estimation of rural population. Since rural population is subject to decline due to out-migration, the figures in col. 6 may be understated as we did not take cognisance of the declining trend. Non-the-less the understatement is negligible and may be ignored.

It can be seen from the table, that the sampled households do not represent even one-tenth of a per cent of the whole universe. In a small sample like this, the sampling errors may become significant especially for the characteristics

⁵Comprehensive in the sense of complete coverage (100 per cent) of the planned sample. It may be stated that 1968/69 missed 10 and 1969-70 15 villages of the totally planned 628 villages.

of the thinly populated income groups [4. p. 162]. The non-sampling errors further add to the sampling errors, if there are significant deviations between the planned and actual samples. In so far as the CSO surveys suffer from both the weaknesses, the conclusions drawn from the survey data need to be treated with caution.

Moreover, the calculations based on CSO data reflect understatement of income inequality because (1) the highest income groups are not represented fully in the CSO surveys and the number of the respondents does not exceed one or two in most cases, and (2) the CSO surveys do not take cognisance of the increased urbanization, since outmigration from the rural areas is more pronounced for the low income families, there is a possibility that their income shares are overstated in relation to high income groups.

Comparisons of income concentration ratios for Pakistan with those of the developed and developing countries further point to the understatement of income inequality in the case of Pakistan. One of the reasons for the low income concentration coefficients may be the fact that Pakistan is still predominantly an agricultural country and that the land ownership is more egalitarian than in many other countries [3, p. 3].

Despite the apparent possibility of inherent biases in the CSO data it may be stated that the data are not wholly disappointing for intertemporal comparisons. The quarterly survey data might reflect understatement of income inequality but they are good enough to measure relative trends in income distribution over time as the direction of sampling biases is the same. In addition, the CSO surveys are comprehensive enough to render non-sampling errors insignificant. Their encroachment on the conclusions because of over-lapping, may further be minimised by choosing consecutive periods of analysis as distinctly apart.

With reservations about the validity of the CSO statistics, and in view of our own earlier conclusions, it seems inevitable to look for alternative sources of data which may, provide insights into the trend of inequality. The pattern of growth for the rural classes is one of the commonest of such devices, which, in addition to reflecting growth impulses, may also be used for tracing the path of movement of changes in income distribution.

The growth performance in respect of income of farms below and above 12.5 acres has been analysed in Table V. The table is based on three-year moving averages in order to avoid year to year fluctuations.

It can be seen that the rate of growth of income of farms below 12.5 acres was significantly higher than that of farms of above 12.5 acres during the period under review except from 1967/68 to 1969/70. The most significant increase took place during 1965-66 to 1968-69, the period of the Green Revolution. It can also be seen that the average income of the farms below 12.5 acres as a per cent of average income of farms above 12.5 acres increased from 55.5 per cent in 1965-66/1967-68 to 61.2 per cent during 1966-67/1968-69, the proportion remaining more or less constant thereafter. This reflects a greater improvement in the income of farms below 12.5 acres than of the farms of a larger size. In any case, it does not support the view that income inequalities have increased as a result of the Green Revolution.

TABLE V

AVERAGE FARM INCOMES AND THEIR GROWTH RATES BY FARM SIZE GROUPS* (THREE YEAR MOVING AVERAGES)

Period	Farms below 12.5 Acres		Farms above 12.5 Acres		(2) As percentage of (4)
	Farm income (in rupees)	Growth rate over the preceding period (per cent)	Farm income (in rupees)	Growth rate over the preceding period (per cent)	
(1)	(2)	(3)	(4)	(5)	(6)
1965/66-67/68	3306.1	—	5955.9	—	55.5
1966/67-68/69	3876.5	17.25	6334.6	6.36	61.2
1967/68-69/70	4342.1	12.01	7020.4	10.83	61.8
1968/69-69/70	4426.0	1.93	7267.3	3.52	60.9
1969/70	4909.2	10.92	7925.6	9.06	61.9
Aggregated growth over the Period	—	48.48		33.07	

Source: Calculations based on corresponding pages in [21].

*The paucity of data has led us to deviate from our usual definition of large farmers. It may, however, be pointed out that the growth rate for farmers owning more than 50 acres should be expected to be even lower than has been reported in col. (5) of this table. Kaneda and Ghaffar [8, p. 84] have argued that "the output augmenting effect of tubewell water is more pronounced in the farms holding between 12.5 and 50 acres, particularly favouring, on balance, those with 25 to 50 acres in both the rice and cotton areas".

4. CONCLUSIONS

It is clear from the analysis carried out in this study that the income inequalities in the rural areas show an appreciable decline during the period of the Green Revolution. In any case, the view that the Green Revolution has resulted in increasing income inequalities in rural areas is not borne out by the available evidence.

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