

## Technological Change and Distribution of Agricultural Land: The Case of Pakistan

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### 1. INTRODUCTION

It has been claimed in the literature that the Green Revolution technology by its very nature tended to increase the concentration of agricultural land in Pakistan [Alavi (1976); Falcon (1970); Gotsch (1973) and Khan (1985)]. The view has very important implications for the development of Pakistan's agriculture. Agricultural land being the chief source of income in rural areas, a growing land concentration implies a continuous deterioration in the distribution of rural income. Empirical research has shown that productivity and labour input per acre are inversely related to farm size [Naqvi, Khan and Chaudhry (1989) and Chaudhry, Gill and Chaudhry (1985)]. As such, any increase in the size of agricultural holdings would be conducive to a slower growth of agricultural output and employment than would otherwise be the case. An increasing control of a productive resource like land by large and well-to-do farmers would endow them with sufficient economic, social and political powers to frustrate any measures for the improvement of social welfare of the rural masses.

The purpose of the present paper is to examine the trend of land distribution in Pakistan and to assess the validity of the conclusion that land distribution has deteriorated under the Green Revolution. Accordingly the paper is divided into five Sections. In Section 2, a brief review is presented of the literature which favours the conclusion that under Green Revolution the concentration of agricultural land has been on the increase. Section 3 empirically determines the trend of land distribution on the basis of ownership and operational holdings. Given the improvement of land distribution as verified by statistical data, Section 4 points to the fallacies of the arguments in the literature on the subject and identifies the factors that have led to a greater equality of land distribution in Pakistan with the progressive advancement of the Green Revolution technologies over time. Section 5 summarises the conclusions of the present study.

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## 2. AN OVERVIEW OF THE LITERATURE

The thesis that concentration of agricultural land has increased instead of relying on any direct empirical evidence, is based on a number of assumptions regarding the adoption pattern of Green Revolution technology and its impact on the profitability of agriculture. Following the initial adoption pattern, it was assumed, that large farmers,<sup>1</sup> mainly because of their financial superiority, were in a better position to adopt innovative methods and technologies and would, for the same reason, continue to maintain the lead in this respect over their smaller counterparts [Falcon (1970)]. As argued by Gotsch (1973), since the potential for utilizing a more advanced technology is greater on large holdings, it is only natural that adoption of advanced technology will produce further land agglomeration. Another reason cited for the growing land concentration is that technological concentration on large farms has enabled the large farmers to gain substantial increases in productivity and their reluctance to share these increases with their tenants has often led to large-scale tenant evictions so that the lands previously cultivated by tenants are now cultivated by the owners themselves [Gotsch (1973); Alavi (1976); Falcon (1970) and Khan (1985)]. There is also the likelihood that large farmers, encouraged by the rapid increase in their incomes and constrained by paucity of avenues for productive investment outside agriculture purchased land on a fairly large scale [Falcon (1970)]. Land purchases by large farmers may not have been very difficult as large landowners are always in a position to force small farmers to sell their land to them; and, of course, large landowners are always eager to buy the land of poorer neighbours [Alavi (1976) and Khan (1985)]. It has also been forcefully asserted by Khan (1985) that the concentration of tubewells and tractors has provided added incentives to large landowners to lease their neighbours' land. Although the impact of all these factors on land distribution may understandably have been significant, the studies reviewed above give no quantitative estimates of the land that may have been redistributed under that impact.

Reference, however, may be made to two more studies that have tried to quantify the impact of tractor introduction on farm size [McInerney and Donaldson (1975) and Lockwood and Munir (1981)]. The two studies have estimated that the average farm size more than doubled following the purchase of tractors by large farmers. Of the more than 100 percent increase in farm size, nearly 42 percent was attributed by McInerney and Donaldson (1975) to self-cultivation of the land previously rented out, 24 percent to the land newly rented in, 12 percent to the land purchased from others and the rest to the land newly brought under cultivation.

<sup>1</sup>Following the general literature, a large farm, estate or holding in this study is defined as a unit of 50.0 acres or more. A small farm or holding, on the other hand, has an area of less than 12.5 acres.

According to Lockwood and Munir (1981), the area previously rented out (62 percent) and the area newly rented in (30 percent) were the major contributions to the total increase in average farm size following tractor purchases by large farmers.

If we accept the arguments and data presented by the studies referred to above and also keep in mind the rapid progress made by technological innovations in Pakistan, we may well agree with the conclusion that, following the inception of Green Revolution in the early Sixties, land distribution has deteriorated considerably (or land concentration has increased notably) in Pakistan. But has this actually happened? This is the question which we address in the next Section.

### 3. TREND OF LAND DISTRIBUTION

The trend in land distribution connotes changes in the ownership and operational status of agricultural land by size. Since land purchases are an addition to the size of ownership units and changes in tenanted land are reflected in the size of operational holdings, a comprehensive study of land distribution must be based on size distribution of both ownership and operational holdings. Although land shares and land-concentration ratios have often been used as alternative measures of land distribution, a precise measurement of inequality and its trend may not be permitted by the former approach, especially under fluctuating and conflicting trends of land shares for various percentiles of households and population. On the other hand, land concentration ratios or Gini-coefficients may be helpful in measuring inequalities fairly accurately and have therefore, been used for the purpose of analysis in this study. Based on data from agricultural censuses, Table 1 reports the trend of land distribution in Pakistan and provinces since 1960.

Three major conclusions follow from Table 1. Firstly, operational holdings are less skewed than ownership holdings. This is as expected, because an overwhelming majority of the owners of large estates tend to cultivate land with the help of tenants, breaking up a single ownership unit into as many operational units as the number of tenants. Secondly, land concentration, though high, improved markedly in the Green Revolution period from 1960 to 1980. As Table 1 shows, there was a definite and marked reduction in the land concentration of operational holdings between 1960 and 1972. Although data about ownership of household holdings for the Sixties are not available, empirical data on individual ownership holdings show the same trend as mentioned above [Naqvi, Khan and Chaudhry (1989)]. By contrast, the period from 1972 to 1980 was marked by insignificant changes in the distribution of operational or ownership holdings. It may be noted that whatever improvement or deterioration in the concentration is revealed by Table 1 between 1972 and 1980 may be attributed to intersecting (although not in the relevant range) Lorenz curves [Naqvi, Khan and Chaudhry (1989)]. Finally, the trend of land distribution at the national level was closely followed by the provinces despite

Table 1  
*Land Concentration Ratios for Operational and Ownership  
 Holdings of Households*

Type of Holdings/ Pakistan and Provinces	Land Concentration Ratios		
	1960	1972	1980
<b>A. Operational Holdings</b>			
1. Pakistan	0.62	0.52	0.53
2. Punjab	0.59	0.49	0.51
3. Sind	0.51	0.43	0.47
4. NWFP	0.73	0.64	0.64
5. Balochistan	0.71	0.64	0.62
<b>B. Ownership Holdings</b>			
1. Pakistan	—	0.66	0.65
2. Punjab	—	0.63	0.62
3. Sind	—	0.69	0.63
4. NWFP	—	0.68	0.69
5. Balochistan	—	0.69	0.68

*Source:* Naqvi, Khan and Chaudhry (1989).

large variations in provincial concentration ratios. However, the distribution of land ownership improved considerably in the province of Sind between 1972 and 1980.

It may be interesting to note that the above conclusions imply that the Green Revolution has made some positive contributions to the nature or quality of land distribution in Pakistan. For example, although technological concentration during the initial years of the Green Revolution was high because of the leadership role of large farmers, land concentration improved considerably. Despite varying trends in the adoption of Green Revolution among the provinces from time to time, there are no significant variations in the trend of land distribution across the provinces. Likewise a consistent trend of land distribution of ownership and operational holdings suggests uniformity of changes in land purchases and rented land from time to time and does not support the arguments advanced in favour of a deteriorating land distribution. It however, remains to be seen as to what is wrong with those arguments and what other forces were responsible for shaping the trend in land distribution in Pakistan.

#### 4. FACTORS IN LAND DISTRIBUTION

The divergence between the empirically determined trend in land distribution and the trend predicted by some of the studies, is indicative of some fault in the arguments and reasoning of those studies. One of the major defects in the arguments based on land lease and land purchases by large farmers is that they begin with a wrong premise. They unrealistically assume that the large farmers were the sole beneficiaries of the Green Revolution and that land lease and land purchases by large farmers were essential for deriving benefits from the new technology. As a large body of evidence showing the widespread impact of Green Revolution has been produced in a number of recent studies [Chaudhry (1982); Naqvi, Khan and Chaudhry (1989) and Pinstup-Anderson and Hazell (1985)], there is no need to discuss the above-mentioned, unsubstantiated premise here. Is there any need for the large farmers to enter into land leases and land purchases to maximize benefits? And do they really enter into such bargains? These are the questions needing direct investigation.

It is a known fact that large farmers maintain vast reserves of uncultivated land and they cultivate land only extensively. According to the Pakistan Census of Agriculture 1980 [Government of Pakistan (1983)], only about 67 percent of the farm area of large holdings was under cultivation and only 86 percent of the actually cultivated area was sown to crops. Given this scenario, it would be far more rational for the large farmers to cultivate their own land more effectively than to engage in costly land purchases and land leasing from their small neighbours. The invalidity of the "land purchase" argument may also be obvious from the growing pressure of land reforms on large farmers. In spite of the relative ineffectiveness of land reforms in Pakistan, the fear of an effective land reforms and land confiscation constitutes a powerful factor in directing the large farmers' emphasis away from land purchases. The argument that increased incomes of large farmers under the Green Revolution are most likely to be channelled into land purchases is equally untenable as there can be no dearth of productive investment opportunities in a rapidly growing economy like that of Pakistan. In view of the growing scarcities of labour in Pakistan's agriculture despite mechanization [Chaudhry (1986)], it will be highly uneconomical on the part of the large farmers, who lack family labour to rent more land, evict tenants and undertake self-cultivation.

In the case of Pakistan, the logic of "land lease" and "land purchase" arguments can be challenged not only on theoretical grounds but also on empirical grounds. The data on the area under ownership and operational holdings by farm size, presented in Table 2, enable us to verify the validity of some of the issues discussed above.

The data in Table 2 point to several obvious conclusions. Firstly, the movement in the ownership of agricultural land between 1972 and 1980 was inversely

Table 2

*Area of Ownership and Operational Holdings, Area Leased\* and  
Self-cultivated Area by Farm Size for 1972 and 1980*

Farm Size Categories	Farm Area of Ownership Holdings		Farm Area of Operational Holdings		Area Leased-out by Owners		Area Self-cultivated by Owners	
	1972	1980	1972	1980	1972	1980	1972	1980
Under 1.0 Acres	135	150	77	89	58	61	60	78
1.0 – 5.0 Acres	3064	3721	2485	3230	579	491	1556	2267
5.0 – 12.5 Acres	6967	8726	13338	12855	-6371	-4129	5288	6908
12.5 – 25.0 Acres	6945	8276	13061	11617	-6116	-3341	5904	6823
25.0 – 50.0 Acres	6948	7333	9215	8386	-2267	-1053	5024	5444
50.0 – 150.0 Acres	8590	8723	7402	6913	1188	1810	5000	5319
150.0 Acres and Above	8870	7484	4482	4004	4388	3480	3556	3434

Source: Calculations based on data in Government of Pakistan (1975) and (1983).

\*As a matter of principle area leased-in and leased-out must be identically the same. The equality does not hold in the present case as some of the land could also be leased from government departments.

related to farm size and thus negates the possibility of large-scale land purchases by large farmers.<sup>2</sup> Assuming that some of the small farmers entered into distress sales, the ownership data indicate that the buyers of the land offered for sale were in all probability also the small farmers. It may, however, be pointed out that redistribution of the area of ownership holdings from large to small farmers may also be induced by land reforms and inheritance laws. All else remaining constant, inheritance laws tend to subdivide large holdings into smaller pieces with the passage of time. In view of the increase in ownership area between 1972 and 1980, and assuming that the census data are correct, it is reasonable to conclude that land allotment to or purchases by small farmers of government land would be another factor in the redistribution of area of ownership holdings.

Secondly, the operational farm area swells or contracts in relation to the ownership farm area in various farm-size categories, depending upon the amount of

<sup>2</sup>Due to lack of data on ownership holdings for 1960, it is not possible to consider changes in land ownership or those in land leases between 1960 and 1972. The analysis is, therefore, restricted to changes between 1972 and 1980.

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land rented in or rented out in the categories concerned. As a general rule, rented out land is positive for the category of large farmers and negative for small farmers. Between 1972 and 1980, the land rented out by large farmers fell only slightly precluding the possibility of large-scale tenant displacements. Small farmers continued to rent in land, although at a decreasing rate, to supplement their small ownership holdings. These tendencies of large and small farms seem to have been the result of the growing scarcities of labour in the case of large farms and the alleviation of land constraint by intensive cultivation under the Green Revolution in the case of small farmers. Since large farmers are characterized by scarcities of family labour and hired-labour wages have risen enormously over the period under consideration [Chaudhry (1981)], the dependence of the large farmers on the tenants as a cheap and assured source of labour supply is only natural and inevitable [Majid and Nadvi (1987)]. In addition to this economic necessity, large farmers are likely to retain their tenants for political support in local and national elections.

Finally, self-cultivated land belonging to large owners either decreased or increased only marginally while that belonging to small owners increased rapidly. Although the total tenant-cultivated area fell between 1972 and 1980, the fall was induced not by increased self-cultivation of land on large farms but by that on farms of other size categories. Assuming that the rise in the profitability of agriculture under the Green Revolution was a factor in the cultivation of land by owners themselves the pattern of self-cultivation seems to suggest that it appealed more to small owners than to large ones. Increased cultivation of land by owners themselves may also be the result of normal process of economic development. As development proceeds, owners of land may be forced to take up land cultivation themselves because of the migration of rural labour to urban areas, particularly the industrial ones. In the case of Pakistan, the labour market in the rural areas doubly suffered from labour shortages during the Seventies because of labour migration to domestic urban centres and to international labour markets.

## 5. SUMMARY AND CONCLUSIONS

The purpose of this paper was to study the pattern of land distribution with a view to checking the legitimacy of the thesis that land distribution deteriorated under the Green Revolution in Pakistan as well as of the arguments given in support of this thesis. The empirical evidence cited in this study indicates that land distribution in Pakistan either improved (as was the case from 1960 to 1972) or remained unchanged (as was the case between 1972 and 1980). This trend in land distribution serves to show that technological changes were accompanied by significant improvements in land distribution between 1960 and 1980. Large increases in the ownership area of small farmers between 1972 and 1980 *vis-à-vis* decreases in the ownership area of large farmers during the same period render untenable the view that

under the Green Revolution land distribution had worsened because of land purchases by large farmers. Substantial gains in the operational area of large farmers due either to large areas of land rented in or to increased self-cultivation appear to be unlikely in view of the continued and rising dependence of those farmers on tenants. Favourable changes in the distribution of ownership and operational holdings seem to be the result of the widespread impact of Green Revolution on the profitability of agriculture, growing labour scarcities, land reforms, inheritance laws and the general trends in the economic development of Pakistan. The Green Revolution accomplished the desirable redistribution of land from large to small farmers which politically motivated and thus necessarily ineffective programmes of land reforms failed to achieve. Whether the Green Revolution has had the same redistributive impact as is expected from an effective land-reform programme is a moot question which can be adequately answered only when a large body of more reliable data is available.

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## Comments on “Technological Change and Distribution of Agricultural Land: The Case of Pakistan”

Dr Chaudhry has written a provocative paper. He has vigorously attacked the well-known hypothesis which stipulates that the Green Revolution has tended to increase the concentration of agricultural land in Pakistan. Various arguments in support of the hypothesis have been refuted by Dr Chaudhry. However, two additional arguments not considered by Dr Chaudhry need also to be mentioned. First, that with heavy investment in machinery and equipment by large farmers, an increase in the size of holdings became an economic necessity to spread out the heavy fixed costs. Secondly, that big landowners in Pakistan deliberately chose to purchase rather big (45-55 h.p.) tractors at subsidized prices which put a premium on increasing the farm size.

Using aggregate agricultural census data, Dr Chaudhry has attempted to dismantle the said hypothesis. His empirical findings can be stated briefly: During the Green Revolution period (1960–80), the concentration of both ownership and operational holdings *decreased* instead of *increasing* as stipulated in the hypothesis. Operational holdings were found to be less skewed than the ownership holdings.

Having challenged the hypothesis, Dr Chaudhry makes the most controversial statement that “the Green Revolution has accomplished the desirable redistribution of land from large to small farmers”. In other words, according to him, the Green Revolution has accomplished what the land reform was supposed to do. Not much evidence, however, has been provided in support of the new hypothesis.

Relying on calculations in Table 2 of his paper, he has arrived at two rather unusual conclusions: First, that between 1972 and 1980, the land area leased out by the big landowners to tenants *increased* substantially which would indicate an increased dependence of the large farmers on tenants. This contradicts the earlier studies which discovered that increased self-cultivation by big landowners had resulted in the large-scale eviction of tenants. Secondly, that there was a *decrease* in the area self-cultivated by large farmers between 1972 and 1980. This again runs counter to the earlier findings which showed that widespread tractor cultivation had increased the area under self-cultivation of the large farmers. In actual fact, however, both of Dr Chaudhry's findings fail to be substantiated by the data in his paper. This is due to an unfortunate data error in the table which has distorted the

findings. The figure of total farm area in Table 7, column 2 for the size category 150 acres and above, in *the Pakistan Census of Agriculture, 1972*, was erroneously picked up by Dr Chaudhry as 6482 (thousand) acres, instead of the real 4482 (thousand) acres. This depressed the area leased out to tenants in 1972.

The rectified figures would show that the land area leased out by large land-owners to tenants actually *decreased* between 1972 and 1980, which is in line with the earlier findings.

The next conclusion of Dr Chaudhry that there was a decline in the area under self-cultivation of large farmers between 1972–1980 is also open to question. The table on which this conclusion is based fails to take notice of the cautionary statement in the *1980 Agricultural Census – All Pakistan Report* that the area resumed by the Government under the Land Reforms of 1972 and 1977 is not accounted for in the 1972 census figures. If the census figures of land ownership of large farmers were adjusted to reflect the resumption of 3.6 million acres by the Government and then compared with the 1980 census figures, it would show a significant increase in the owner-operated area of the large landowners during the period 1972–1980.

Notwithstanding these weaknesses, Dr Chaudhry's paper stands out as an important contribution to the current debate on the economic and social consequences of the Green Revolution. Hopefully, it will lead to a great deal of further research. In that sense it is a provocative paper.

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