Technological Change, Tenant Displacement and Adjustment in Pakistan: Some Preliminary Observations

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Agriculture in Pakistan has experienced a breakthrough which is commonly known as the Green Revolution. This breakthrough was achieved mainly through the introduction of high yielding varieties of wheat, rice and maize, increased use of chemical fertilizers, tractors, and substantial private and public investment in water development projects. All this has helped in shifting the country's agricultural production function outward. The agricultural policy of the government, which has encouraged the use of new technology, has also contributed to this shift and increased resource productivity.

The socio-economic consequences of the "Green Revolution" have been quite extensively discussed in the literature [3, 5, 6, 7, 11]. It has been argued, with some justification, that the new technology has benefitted different sections of the rural population according to their resource endowment and access to institutional services. Thus, it is argued, the green revolution has discriminated against the landless rural population and has further accentuated the socio-economic inequalities present in rural areas. Moreover, the new technology by raising farm productivity has also led to direct cultivation by the landlords resulting in the displacement of some tenants. The tendency for tenant displacement has been much more pronounced in cases where tractors were introduced due to lumpiness and indivisibilities of the investment, the economics of scale, and the landlords' desire to capture all the productivity gains of the new technology.

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Technological change in agriculture may be land augmenting, labour augmenting, and capital augmenting or some combination of these. There will be a tendency, ceteris paribus, for the factor that is augmented by the technological change to be substituted by other inputs in the production process [10, p. 6]. Farm tractors belong to the labour augmenting category of technology. Their primary impact is to substitute draft animals and the labour. However, farm tractors may provide new avenues and possibilities of handling increased farm and non-farm operations.

Tractor owning farmers in Pakistan have adopted various measures to make full use of their capacity. Principal among these are increasing cropping intensity and hiring out tractor services for custom work for farm as well as non farm operations. Studies on farm mechnization also point to an expansion in the farm area of tractor owning farmers through buying or renting in more farm area or extending direct cultivation to area previously cutivated by tenants [1, p. 125; 10, pp. 35-37; 12, p. 15].

The available studies on farm mechnization in Pakistan [1, 2, 6] indicate that the use of tractors has been encouraged by subsidized credit, an over-valued exchange rate, a liberal tractor import policy, World Bank loans, favourable product prices maintained by the government and skewed distribution of land ownership. Bose and Clark estimated that the Pakistani farmer paid about $65 per tractor horsepower compared to $100 or more paid by the U.S. farmer [2]. They estimated that net return for the farmer adopting a 40 horsepower tractor was approximately Rs. 2000 annually. Ahmed estimated a private return for investment in tractors on a 75 acre farm at 30 percent and for a combined tubewell tractor package in the range of 40-50 percent [1]. Gotsch argues that private benefits of tractor mechanization, while varying considerably between different regions, continue to outweigh private costs by substantial margins [4]. Thus the adoption of the tractor has shown major improvements in the farmer's profit position, especially on large farms where machine capacity can be more effectively utilized in terms of greater output and lower average cost. Moreover, these profits also stem from landlord's resorting to direct cultivation which makes it possible for them to capture the full benefits of increases in productivity resulting from the use of modern technology.

The studies mentioned above indicate that the extension of direct cultivation by landlords, after their purchase of tractors, to the land previously cultivated by their tenants has resulted in the latter's displacement. One could argue, a priori, that such displacement could cause hardships to tenants and their dependants. However, owing to a lack of empirical research on the subject, one does not know for certain the extent of displacement: whether this is temporary or permanent. If it is temporary, what type of farm adjustments the displaced tenants adopt? If there is a real reduction in the acreage available to them for cultivation what are the alternatives? Do the displaced tenants continue farming or adopt some other occupations? As the tanants occupy an important position in the rural sector of Pakistan's economy,[1] it

[1]Tenant farms account for 34 percent of the total farms and owner-cum-tenant for another 24 percent. Thus about 58 percent of total farms, comprising of about 60.5 percent of the farm area, are wholly or partially farmed by the tenants [13].

is important to know about these aspects which have acquired new dimensions in the wake of the technological changes discussed above. In this paper attempt is made to throw some light on these issues.

DATA AND THEIR LIMITATIONS

The study is based on data collected in the field through a survey of displaced tenants. This survey on labour mobility was organised to supplement the data obtained through World Bank—Agricultural Development Bank of Pakistan's Survey of Credit Use and Effects [9]. The list of displaced tenants was prepared while interviewing the tractor-owning farmers during 1973-74. A supplementary survey was designed to enquire more about the fate of "displaced tenants". The scope of the survey was [8]:

> "the questionnaire will cover about 40 people who formerly farmed land as tenants of a farmer, who purchased a tractor, but now for whatever reasons are no longer tenants of that land . . . we are concerned with the farmer who gave up the land they rented from their former landlord when he acquired a tractor, regardless of the tenure system under which they operated".

The tractor owners belonged to the provinces of Punjab and Sind.

The interviewers, who were agricultural graduates and employees of the Agricultural Development Bank of Pakistan, were advised to appreciate the sensitivity and emotional appeal of questions of tenant displacement and to be careful while collecting the names and addresses of the displaced tenants from tractor owning farmers. From the list of displaced tenants, the interviewers were to select the required number of tenants for interviews. In order to have unbiased information the interviewers were requested to make all possible efforts to locate these former tenants and not to include all those who had not shown locational or occupational mobility. They were to interview for at least one tractor loanee every one of the tenants who had left his land.

The survey in view of its limited objectives and scope collected data on only a few aspects of the sample tenants. The data pertained to locational and/or occupational mobility, reasons for such changes, use of family and permanent labour before and after displacement, and changes in farm operations. Information was also obtained on farm income of the tenants, which was incomplete and without necessary details. Since the years of tenants' displacement varied considerably, in the absence of necessary details the information on farm income was not compatible. Hence, while analysing the survey data to reflect various changes in farm size before and after displacement, no attempt was made to analyse the farm income data.

The results of the empirical analysis and the conclusions drawn from these are discussed in the following sections. Although the findings of the paper are based on an objective analysis—they originate from a small sample which was not randomly drawn. Therefore, the results may be treated as preliminary and tentative.

DISPLACEMENT

The various reasons provided by the sample tenants for their displacement are listed below:

Reasons for the Displacement of Tenants	*No. of respondents*
Self-cultivation by the landlord	21
Reduction of share by the ex-landlord ..	11
Voluntarily left the previous landlord's land	4
The landlord was afraid of the land reforms ..	1
The previous landlord sold that land	1
Total:	38

The perusal of these reasons reveals that the majority of the tenants were ejected to obtain land for direct cultivation by the former landlords, after they had purchased tractors. Second major reason for the tenant ejectment was the reduction in the output share of the tenants demanded by the landlords after the purchase of tractors which was not accepted by the tenants. This demand might have been insinuated by the landlords simply to eject the tenants and to extend direct cultivation.

It may be mentioned here that changing over of tenants is an old practice. Moreover, traditionally, the rental shares have varied according to local conditions and arrangements. Land reforms enacted from time to time have attempted to provide security of tenure to the tenants by prohibiting their ejectment under ordinary circumstances and to regulate the rental shares by fixing input-output share of landlords and tenants. Nevertheless, the strict enforcement and implementation of these measures is a very difficult task.

It appears that the rigidities of the relative shares which do not take into consideration the dynamic forces of technical change are leading to direct cultivation by the landlords to capture the productivity gains and also resulting in the displacement of tenants. Our conclusion is also supported by Gotsch's observations that given the characteristics of technical change embodied in improved seed and fertilizers there was no precedent for radically altering the traditional rental share. Therefore, the landlords in Pakistan found it convenient to work on other methods in particular on the land/nonland input ratio that resulted in their extension of direct cultivation to the land previously cultivated by the tenants [4].

TYPES OF ADJUSTMENT AND OCCUPATIONS ADOPTED BY THE DISPLACED TENANTS

Types of adjustments and occupations adopted by the sample tenants after their displacement are given below:

Adjustments and Occupations	*No. of respondents*
Workings as farm labourer	3
Farming combined with labour	2
Farming combined with business	2
Farming only	29
Sheep rearing	1
Hawking	1
Total:	38

It appears that a great majority of the displaced tenants continued farming. Nevertheless, it would be interesting to know what happened to their farm size because it could determine to a large extent the levels of their income and material well being. We shall discuss the changes in their farm size and its operations in the next section.

In order to continue their farming 9 out of 38 displaced tenants in the sample had to migrate from their previous villages in search of farming land that could provide them employment and enough income to support their families. Eight out of nine tenants who migrated from their previous villages, after being ejected from their land, left in search of farm land while one of them moved out in order to sell footwear and shoes. It may be mentioned here that all those farmers who migrated from their previous villages were landless tenants.

Out of the total of 38 displaced tenants in the sample, four had given up their tenancy farming altogether after their displacement. Three out of 4 such tenants had joined the ranks of landless farm labourers, while the fourth one was selling footwear and shoes and had also moved out from his previous village of residence.

FARM ADJUSTMENTS ACCORDING TO TENURE

Owner-cum-Tenant: On average, owner-cum-tenants owned 9.43 acres per farm family and rented a farm area of about 12.96 acres. Thus the cultivated area per farm before displacement was approximately 22.39 acres (Table 1). However, after displacement the average farm size operated by this group of farmers was only 16.32 acres. This resulted from a substantial cut in the area that was previously rented in. The rented in area on the average declined from 12.96 acres before displacement to only 6.80 acres after displacement, the decline amounting to about 48 percent. On the average, the frm size at the time of the farm survey was only 72 percent of the farm size before displacement. Some of the previous owner-cum-tenants having experienced the ejectment, at the hands of their previous landlords who had acquired tractors, had given up tenancy farming altogether. They were operating their own farms, of course, on a reduced scale, and were not willing to go back to tenancy farming again. The number of family workers per acre increased from 0.13 before displacement to 0.16 after ejection. The number of acres available per family farm worker before displacement declined from 8.65 to about 6.24 after displacement (Table 2).

Table 1

Cultivated Area Before and After Displacement According to Land Tenure

Farm tenure categories	Before Displacement					After Displacement		
	No. of observations	Total area owned (acres)	Average area owned per family	Total farm area	Average area per farm	No. of observations	Total farm area	Average area per farm
			(acres)				(acres)	
Pure tenants	23	—	—	383.25	16.66	19	295.50	15.55
Owner-cum-tenant*	15	141.50	9.43	335.90	22.39	15	243.40	16.23
Total sample	38	—	—	719.15	18.93	34	538.90	15.83

* The difference between farm sizes before and after displacement are significant at 20 percent level. In other case the differences are statistically insignificant.

Table 2

Changes in Farm Land and Family Farm Labour Ratio Before and After Displacement According to Land Tenure

Farm Tenure Categories	Before Displacement				After Displacement			
	No. of observations	Total no. of family farm workers	Average no. of workers per farm	No. of acres per family farm worker	No. of observations	Total no. of family farm workers	Average no. of workers per farm	No. of acres per family farm worker
Pure Tenants	23	61	2.65	6.29	19	53	2.79	5.57
Owner-cum-Tenant	15	39	2.60	8.65	15	39	2.60	6.24
Total Sample	38	100	2.63	7.19	34	92	2.63	5.85

Since the area operated by a farmer is the major source of his income and a key factor in determining his material well being, we may be justified in inferring from the foregoing analysis that these owner-cum-tenants had suffered a loss in their incomes in the short run, due to the introduction of tractors which had led to their displacement. However, this may not necessarily be true in the long run.

Pure Tenants: Out of the 23 pure tenant farmers, four had given up farming at the time of interview and the remaining 19 continued farming, albeit, not on their previous farms. The farm area operated by them had declined from 16.66 acres to 15.15 acres after displacement. The number of family farm workers available per acre of cultivated land increased from 0.16 to 0.18 in the process and the farm area available per family worker declined from 6.29 acres to only 5.57 acres (Table 2). The differences in the average farm size before displacement and after displacement was only a net reduction of 7 percent in the operated area in this group as compared to a decline of about 28 percent in the case of owner-cum-tenant farmers.

It may be pointed out here that in the years initially following the displacement the differences in cultivated area before and after displacement in both the categories were very much pronounced but over the years these differences had narrowed down, indicating a process of some sort of stablization and settling down (Table 3). But this had its costs also. The previous owner-cum-tenants had suffered a significant loss in their cultivated acreage and as a result of this might have experienced a reduction in their income as well, at least in the short run. In the case of pure tenants, some had to migrate also from their villages in search of new farm lands causing dislocation and additional expenditure.

Nevertheless, the differences in the mode of adjustments are clear. The owner-cum-tenants in the sample accepted a cut in their farm operations while many a pure tenant migrated out of his village in search of an adequate piece of farm land which could ensure his family labour and capital resources reasonable employment and income. The reasons for these differences in the mode of adjustment and adoption are not difficult to trace. The tenant farmers, having been evicted by their previous landlords and with the increasing use of tractors may find it quite difficult to operate a farm of reasonable size that could provide their family labour and capital adequate employment opportunities in their present localities. Some of them may also have developed a bad farming reputation so that no landlord would like to have them as their tenants. However, it may be more plausible to think that with the introduction of tractors many a small land owner who previously would find it uneconomical to maintain a pair of bullocks and do his own farming is finding it convenient enough to adopt self cultivation through hiring in of tractor service for custom work instead of renting out his land for tenant farming. Thus supplies of farm land available for tenancy farming are shrinking. At the same time the tractor owning farmer is not only adopting self cultivation but also expanding his farm operations [1, p. 125; 12, p. 15]. These factors are making it more difficult for the traditional landless tenants to compete with the tractor owners for the shrinking supplies of farm land available for tenancy. In extreme cases it is displacing the poor tenants, either from farming altogether, or from their previous villages to other villages where they could continue their farming.

Table 3

Adjustment's in Cultivated Area Over Time

Farm Tenure Categories	Before Displacement			After Displacement 1970—71		
	No. of observations	Total cultivated area	Average cultivated area per farm	No. of observations	Total cultivated area	Average cultivated area per farm
		(acres)			(acres)	
Owners-cum-tenants	15	335.90	22.39	9	127.5	14.17
Pure tenants	23	383.25	16.66	18	253.5	14.08

Farm Tenure Categories	After Displacement 1971—72			After Displacement 1972—73		
	No. of observations	Total cultivated area	Average cultivated area per farm	No. of observations	Total cultivated area	Average cultivated area per farm
		(acres)			(acres)	
Owners-cum-tenants	13	172.4	13.26	15	243.40	16.23
Pure tenants	19	281.50	14.82	19	295.50	15.55

ADJUSTMENTS ACCORDING TO FARM SIZE

Farm size up to 12.5 Acres: The average size of farm operated by a farm family in this group was 11.2 acres before displacement (Table 4). However, after displacement, the farm size had declined by 0.56 acres, on the average. Moreover, four out of the sixteen displaced tenants in this group gave up farming altogether. While the rest of them continued farming but on slightly smaller farms. It may be mentioned here that the reduction in farm size was not only negligible but also statistically insignificant.

Only two of the tenants in this group (total 16) moved out of their village as a consequence of their ejectment from their previous farms and only one of them in search of farm land. The remaining tenants were still living in the same villages, of course a few were not farmers any more but had joined the ranks of landless labourers. The farm area available per family worker had declined from 5.18 to 4.82 acres, and consequently farm labour and farm land ratio increased from 0.19 to 0.21 indicating more supplies of family labour per unit of land (Table 5).

Farm Size Over 12.5 Acres: The average farm operated area in this category was 24.68 acres which at the time of the survey (after the ejectment was over) had declined to about 18.79 acres per farm family (Table 4). This was only 76 percent of the acreage cultivated before displacement, a substantial decline which was also statistically significant. The reduction in farm size occurred despite the fact that seven out of 22 tenant farmers in this group migrated out of their previous villages in search of new farm lands. Nevertheless, this migration could not entirely make up for the deficit created by the non-migration of the owner-cum-tenants. This resulted, as noted above, in a significant reduction in the farm area operated by this group which may have led to lower incomes, at least in the short run, in addition to the expenditure and hardships suffered by some of the farmers because of dislocation. Perhaps it would not be too difficult to speculate that had these farm families which migrated from their villages not done so, the reduction in farm size might have been even more severe and also pushed down more families to the ranks of landless labourers. The farm area available per family worker declined from 8.22 acres before displacement to only 6.26 acres, after displacement (Table 5).

CONCLUSIONS

The evidence presented in the preceding sections suggest that one of the main reasons for tenant displacement by the tractor farmers is their extension of direct cultivation to the lands previously cultivated by tenants. The second main reason in this connection has been a cut in the tenants' share of farm produce demanded by the landlords after their purchase of tractors which has not been acceptable to the tenants.

This confirms Gotsch's findings that as no precedent existed for radically altering the traditional rental share, the landlords have been working on land and non-land input (capital in this case) ratio in the wake of the seed-fertilizer revolution in Pakistan. This has been done mainly to capture the productivity gains of modern technology.

Table 4

Cultivated Area Before and After Displacement According to Farm Size

	Before Displacement			After Displacement		
	No. of observations	Total farm area	Average area per farm	No. of observations	Total farm area	Average area per farm
		(acres)			(acres)	
Up to 12.5 acres	16	176.25	11.02	12	125.50	10.46
Over 12.5 acres*	22	542.90	24.68	22	413.40	18.79
Total sample	38	719.15	18.93	34	538.90	15.85

* The difference between farm sizes before and after displacement are significant at 20 percent level. In other cases the differences are statistically insignificant.

Table 5

Changes in Farm Land and Family Labour Ratio Before and After Displacement According to Farm Size

Farm Categories	Before Displacement				After Displacement			
	No. of observations	Total No. of family farm workers	Average no. of workers per farm	No. of acres per family farm worker	No. of observation	Total No. of family farm workers	Average no. of workers per farm	No. of acres per family farm worker
Up to 12.5 acres	16	34	2.13	5.18	12	26	2.17	4.82
Over 12.5 acres	22	66	3.00	8.22	22	66	3.00	6.26
Total Sample	38	100	2.63	7.19	34	92	2.63	5.85

The available evidence suggests that a great majority of the tenants, after their displacement as a consequence of tractor mechanization by the landlords, continue farming. However, their continuation in farming has required different types of locational, occupational and farm size adjustments.

The displacement has resulted in a reduced farm size and the reduction has been more severe for owners-cum-tenants and relativley larger tenants. The ejectment has also forced many tenants to migrate from their village causing additional expenditure in the process.

In view of the extremely large number of tenants and their important role in the farm sector of Pakistan it is important to know more about their socio-economic conditions and problems, such as the type of changes which are affecting them over time, the changes in the terms and conditions of their tenancy as a result of innovations in agriculture, effect of government policies and programmes on their socio-economic conditions, changes in terms of their farm productivity, income and well being vis-a-vis owner farmers and other landless groups in rural areas. The present study could not answer these and many other questions on account of its limited scope and lack of relevant information. Nevertheless, these are important questions for future research.

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