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# *INFLUENCE OF TENURIAL STATUS OF LAND ON THE ADOPTION OF IMPROVED PRODUCTION TECHNOLOGY IN AN AREA OF BANGLADESH*

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## ABSTRACT

Analysis of field data collected from a sample of 100 part-tenant farmers has brought out findings about influence of tenurial status of land on adoption of improved seed-fertilizer-irrigation technology. Adoption of improved production technology tended to be the highest on owned land followed by cash rented land, crop-share rented land with input cost-sharing and crop-share rented land without input cost-sharing. Thus, the findings lead to suggest that irrespective of rental arrangements the mechanism of land tenancy acts as hinderance to adoption of improved production technology. Inter-rental system comparison reveals that cash renting system is a better mechanism than crop-share renting even if with input-cost sharing. However, input cost-sharing practice accelerated adoption of improved production technology on crop-share rented land.


## I. INTRODUCTION

The improved seed-fertilizer-irrigation technology plays the prominent role in improving agricultural production efficiency and growth. The important question that is often raised hare is whether the prevailing tenurial arrangements in Bangladeshl act as hinderance to the adoption of improved production technology. Asaduzzaman and Islam (1975) noted that the relationship between tenurial arrangement and adoption of improved production technology is not yet clearly established. Alamgir (1975, p. 271) argued that acceptance of new production technology is not affected significantly by the types of tenure. However, using 1977 Census data, Jabbar and Green (1983, p. 35) observed that districts with higher incidence of renting had significantly lower adoption of high-yielding crop varieties and lower cropping intensities. This is an indication that the adoption of improved production technology is adversely affected by the mechanism of

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land tenancy. But not enough is known about this issue in relation to farm level data. In view of this, the present study aims at examining the influence of tenurial status of land on adoption of improved production technology.

## II. THE DATA

The study pertains to farm level data from Mymensingh district of Bangladesh collected through survey method during the crop year 1984-85. One hundred part-tenant farmers[2] (those owning some land and renting-in additional land), randomly selected from a total of 332 part-tenants in a cluster of some villages of Bailor Union under Trishal Upazila of Mymensingh district, provided input-output data with respect to tenurial status of land for Aman paddy, Boro paddy and wheat crops.

## III. THE ANALYTICAL TOOLS

Criss-cross tables along with Chi-square and t-test statistics were employed to assess incidence and rate of adoption of improved seed-fortilizer-irrigation technology with respect to tenurial status of land.

## IV. THE FINDINGS

### Tenurial Status of Land

Fiftyseven per cent of the total culivated holdings of the sampled part-tenants was under ownership right, 38 per cent under crop-share renting and 5 per cent under cash renting. Half crop-sharing with sharing of half input (seed, fertilizer, irrigation and insecticide) cost accounted for 91 per cent of the total crop-share rented land. The remaining 9 per cent was also under half crop-sharing but without input cost sharing. Mandal (1980, p. 37) and Zaman (1973, pp. 149-172) found ample evidence of input sharing. However, Jabbar (1977, p. 19) observed scanty evidence of cash renting and input sharing (mostly seeds) in the relatively backward region and argued that cash renting and input sharing may be less prevalent where concentration of land ownership and competition among tenants for renting land are greater[3].

### Tenurial Status and Adoption of Improved Production Technology

**High-yielding crop varieties :** In general, proportion of cropped area devoted to high-yielding varieties appeared to be the highest on owned land followed by cash rented land, crop-share rented land with input cost sharing and crop-share rented land without input

cost sharing (Table 1). Individual crop analysis also revealed that the proportional area under high-yielding varieties for all the paddy crops[4] was significantly larger on owned land than either on crop-share rented or cash rented land (Table 2).

**Chemical Fertilizers :** Except Boro (TV) paddy and wheat crops, both incidence and extent of chemical fertilizer application was more on owned land than on rented land in general (Table 3).

Aggregate analysis of all the selected crops showed that use of chemical fertilizers per hectare of crop production was the highest on owned land (101 kg), followed by cash rented land (97 kg), crop-share rented land with input cost sharing (90 kg) and crop-share rented land without input cost sharing (60 kg). Except cash rented land, other differences in fertilizer use with owned land appeared to be statistically significant[5]. Difference in fertilizer use between cash rented land and crop-share rented land with input cost sharing was not significant ; while such difference between cash rented land and crop-share rented land without input cost sharing was significant. Per hectare fertilizer use difference between crop-share rented land with input cost sharing and crop-share rented land without input cost sharing was highly significant. This suggests that input cost shared by the land owners accelerated level of fertilizer use on crop-share rented land (also see, Mandal, *op. cit.*, p. 39).

Fertilizer-mix and method of fertilizer application were not significantly influenced by tenurial status of land. However, there was some indication that proportion of farmers using fertilizer-mix of N, P and K was more on owned land than either on crop-share rented or cash rented land[6].

**Irrigation :** Both incidence of irrigation-input use and proportion of cropped area under irrigation were observed to be significantly higher on owned land than on rented land in general (Tables 4 and 5). However, incidence of irrigation-input use was found to be independent of rental system (Table 6).

**Insecticide :** With the exception of Boro (HYV) paddy crop, incidence of insecticide use appeared to be higher on owned land than either on crop-share rented or cash rented land (Table 7)[7]. Irrespective of tenurial status of land, name of the part-tenants applied insecticide in Boro (TV) paddy and wheat crops.

## V. SUMMARY AND POLICY IMPLICATIONS

The findings of this study suggest that adoption rate of improved seed-fertilizer-irrigation technology tended to be adversely affected by the mechanism of land tenancy. Inter-rental system comparison revealed that part-tenant farmers adopted improved production technology at a higher rate on cash rented land than on crop-share rented land. Incidence of input cost sharing enhanced adoption rate of improved production technology

on crop-share rented land. However, cash renting system appeared to be the better mechanism than crop-share renting system even if with input cost sharing.

The policy implications emerging from the study lead to recommend that the mechanism of land tenancy should be abolished through a series of land reform measures. If such major land reform measures are not feasible under the existing political ideology of the government, cash renting rather than crop-share renting should be encouraged through legal policy actions. If crop-share renting is not abolished, legal provisions are to be made for sharing variable inputs in proportion to the crop-share.

**Notes :**

1. In 1977, there were 58.3 per cent owner holdings, 41.2 per cent owner-cum-tenant holdings (i.e., part-tenants) and 0.5 per cent tenant holdings, compared to 60.8, 37.6 and 1.6 per cent in 1960 (Bangladesh 1981, p. 291). In 1960, about 22.2 per cent of the total land was cultivated under tenancy, the principal farm being half crop share without shring of inputs. In 1977, around 23 per cent of total cultivated land was under tenancy, about 91 per cent of which were transacted under crop-sharing arrangements.

2. The logic of selecting only part-tenants for examining effect of tenurial status of land on adoption of improved production technology is that it will control the effects of extrinsic factors, such as, management skill and resource availability of farms (also see, Talukder 1980 ; Mandal 1980 ; Bell 1977 ; Hossain 1977 ; Jabbar 1975 and Heady 1952). Until Bell (1977) this method has been rarely used in estimating the effect of land tenancy.

3. For a theoretical and empirical discussion on the relationship between technology, wage rate and incidence of share-cropping, see, Bardhan and Srinivasan (1971, pp. 48-64).

4. Paddy crops accounted for 81 per cent of the total cropped area for the sampled part-tenants.

5. Mandal (*op. cit.*, pp. 34, 39) ; Talukder (*op. cit.*, p. 53) and Hossain (*op. cit.*, P. 328) also observed that part-tenants used less fertilizers on crop-share rented land than on their owned land. Sidhu *et. al.* (1982., p. 8) reported that per hectare use of fertilizer was higher on cash rented land than on crop-share rented land and owned land. They found apparently equal average levels of fertilizer use on owned and crop-share rented lands. However, the results from their estimation of fertilizer demand provide consistent indication that crop share renting influences fertilizer use negatively in all crop seasons.

6. For empirical results and discussion on this point, see, Bhuiyan (1986, pp. 141-144)

7. Respondents could not report quantity of insecticide used, because almost all insecticides were appliep by professional sprayers on rental charge basis.

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**TABLE 1. EXTENT OF AREA DEVOTED TO HIGH-YIELDING CROP VARIETY ACCORDING TO TENURIAL STATUS OF LAND**

| Tenurial status of land | % cropped area under high-yielding variety |
|---|---|
| Owned (a) | 33.0 |
| Share rented with cost shared (b) | 25.7 |
| Share rented without cost shared (c) | 20.0 |
| All share rented (b & c) | 25.2 |
| Cash rented (d) | 28.2 |
| All rented (b, c & d) | 26.1 |
| Owned and all rented (a, b, c & d) | 29.6 |

**TABLE 2. PROPORTION OF AREA UNDER TRADITIONAL AND HIGH-YIELDING VARIETIES OF PADDY CROP BY TENURIAL STATUS OF LAND**

| Tenurial status of land | Per cent area under | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Aus | | | Aman | | | Boro | | |
| | TV | HYV | All varie-ties | TV | HYV | All varie-ties | TV | HYV | All varie-ties |
| Owned (a) | 62 | 38 | 100 | 58 | 42 | 100 | 54 | 46 | 100 |
| Share rented with cost shared (b) | 75 | 25 | 100 | 71 | 29 | 100 | 75 | 25 | 100 |
| Share rented without cost shared (c) | 83 | 17 | 100 | 67 | 33 | 100 | 0 | 0 | 0 |
| All share rented (b & c) | 76 | 24 | 100 | 70 | 30 | 100 | 75 | 25 | 100 |
| Cash rented (d) | 67 | 33 | 100 | 75 | 25 | 100 | 0 | 0 | 0 |
| All rented (b, c & d) | 74 | 26 | 100 | 72 | 28 | 100 | 75 | 25 | 100 |
| Owned and all rented (a, b, c & d) | 67 | 33 | 100 | 66 | 34 | 100 | 64 | 36 | 100 |

**TV means Traditional Variety.**
**HYV means High-Yielding Variety.**

**TABLE 3. INCIDENCE AND EXTENT OF CHEMICAL FERTILIZER APPLICATION IN DIFFERENT CROPS ACCORDING TO TENURIAL STATUS OF LAND**

| Tenurial status of land | % farmers using | | | Quantity applied (kg/ha) | | | |
|---|---|---|---|---|---|---|---|
| | Urea | TSP | MP | Urea (a) | TSP (b) | MP (c) | All (a+b+c) |
| **T. Aman (TV)** | | | | | | | |
| Owned | 91 | 24 | 0 | 63 | 16 | 0 | 79 |
| Share rented with cost shared | 89 | 9 | 0 | 51 | 6 | 0 | 57 |
| Share rented without cost shared | 80 | 40 | 0 | 33 | 33 | 0 | 66 |
| All share rented | 88 | 12 | 0 | 49 | 8 | 0 | 57 |
| Cash rented | 93 | 7 | 0 | 71 | 7 | 0 | 78 |
| All rented | 89 | 11 | 0 | 51 | 8 | 0 | 59 |
| Owned and all rented | 90 | 17 | 0 | 57 | 7 | 0 | 64 |
| **T. Aman (HYV)** | | | | | | | |
| Owned | 99 | 28 | 4 | 69 | 20 | 2 | 91 |
| Share rented with cost shared | 100 | 30 | 4 | 73 | 16 | 1 | 90 |
| Share rented without cost shared | 67 | 17 | 0 | 39 | 15 | 0 | 54 |
| All share rented | 96 | 28 | 3 | 69 | 16 | 1 | 86 |
| Cash rented | 100 | 25 | 0 | 120 | 20 | 0 | 140 |
| All rented | 97 | 27 | 3 | 74 | 16 | 1 | 91 |
| Owned and all rented | 98 | 28 | 4 | 71 | 18 | 2 | 91 |
| **Boro (TV)** | | | | | | | |
| Owned | 72 | 28 | 0 | 79 | 16 | 0 | 95 |
| Share rented with cost shared | 89 | 37 | 11 | 89 | 22 | 1 | 112 |
| Owned and rented | 79 | 31 | 4 | 85 | 19 | 1 | 105 |
| **Boro (HYV)** | | | | | | | |
| Owned | 100 | 85 | 19 | 196 | 89 | 5 | 290 |
| Share rented with cost shared | 96 | 79 | 8 | 154 | 76 | 4 | 234 |
| Owned and rented | 98 | 82 | 14 | 179 | 84 | 5 | 268 |

**TABLE 3 contd...**

| Tenurial status of land | % farmers using | | | Quantity applied (kg/ha) | | | |
|---|---|---|---|---|---|---|---|
| | Urea | TSP | MP | Urea (a) | TSP (b) | MP (c) | All (a+b+c) |
| | | | | **Wheat** | | | |
| Owned | 85 | 26 | 9 | 66 | 15 | 2 | 83 |
| Share rented with cost shared | 91 | 32 | 14 | 57 | 24 | 2 | 83 |
| Owned and rented | 87 | 28 | 11 | 62 | 19 | 2 | 83 |
| | | | | **All Crops** | | | |
| Owned | 92 | 33 | 6 | 75 | 25 | 1 | 101[d] |
| Share rented with cost shared | 93 | 30 | 6 | 71 | 18 | 1 | 90[e] |
| Share rented without cost shared | 73 | 27 | 0 | 35 | 25 | 0 | 60[f] |
| All share rented | 91 | 29 | 5 | 68 | 19 | 1 | 88[g] |
| Cash rented | 96 | 13 | 0 | 86 | 11 | 0 | 97[h] |
| All rented | 92 | 28 | 4 | 70 | 18 | 1 | 89[i] |
| Owned and all rented | 92 | 31 | 5 | 72 | 19 | 1 | 92 |

T. Aman means Transplanted Aman.
TSP means Triple Superphosphate.
MP means Muriate of Potash.

% differences and results of t-tests :

% (d-e)=12.2, t=2.13, Significance =0.050
% (d-f)=68.3, t=7.98, significance =0.001
% (d-g)=14.8, t=2.24, significance =0.050
% (d-h)=4.1, t=1.07, nonsignificance =0.100
% (d-i)=13,5, t=1.99, significance =0.050
% (e-f)=50.0, t=5.36, significance =0.005
% (h-e)=7.8, t=1.02, nonsignificance =0.100
% (h-f)=61.7, t=5.99, significance =0.001
% (h-g)=10.2, t=3.11, significance =0.010

**TABLE 4. EFFECT OF TENURIAL STATUS OF LAND ON INCIDENCE OF IRRIGATION WATER USE**

| Tenurial status of land | Per cent of irrigation water | | |
|---|---|---|---|
| | Users[a] | Non-users | All farmers |
| Owned | 38 | 62 | 100 |
| Rented[b] | 13 | 87 | 100 |

a. Used irrigation water at least once during the whole crop year.

b. Includes both crop-share rented and cash rented lands.

Chi-square=16.45, DF=1, Significance=0.005

**TABLE 5. EFFECT OF TENURIAL STATUS OF LAND ON EXTENT OF IRRIGATED AREA**

| Tenurial status of land | % farms by % cropped area under irrigation | | | | % cropped area irrigated[a] |
|---|---|---|---|---|---|
| | 0 | Below 10 | 10-20 | Above 20 | |
| Owned | 62 | 8 | 14 | 16 | 23 |
| Rented[b] | 87 | 1 | 5 | 7 | 8 |

a. Used irrigation water at least once during the whole crop year.

b. Includes both crop-share rented and cash rented lands.

Chi-square :=9.84, DF=3, Significance=0.025

**TABLE 6. EFFECT OF RENTAL SYSTEM ON INCIDENCE OF IRRIGATION WATER USE**

| Rental system | Per cent of irrigation water | | |
|---|---|---|---|
| | Users[a] | Non-users | All farmers |
| Crop-share renting | 12 | 88 | 100 |
| Cash renting | 10 | 90 | 100 |

a. Used irrigation water at least once during the whole crop year.

Chi-square=0.08, DF=1, Nonsignificance=0.100

**TABLE 7. PROPORTION OF PART-TENANTS USING INSECTICIDE IN PADDY CROP ACCORDING TO TENURIAL STATUS OF LAND**

| Tenurial status of land | % part-tenants using insecticide in | | |
|---|---|---|---|
| | T. Aman (TV) | T. Aman (HYV) | Boro (HYV) |
| Owned | 8 | 11 | 19 |
| Share rented with cost shared | 0 | 6 | 33 |
| Share rented without cost shared | 0 | 0 | NA |
| Cash rented | 7 | 0 | NA |

NA means Not Available.