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ARTICLES

Tenancy Relations and Productive/Allocative Efficiency: A Study in Orissa Agriculture

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I

INTRODUCTION

The effect of tenancy relations on agricultural development has remained a persistent theme of discussion since the days of Adam Smith. The moot point among classical economists was the relative productive/allocative efficiency of different land tenure systems such as share tenancy and fixed rent tenancy. The debate was carried forward by Alfred Marshall (1920) whose tax equivalent approach of share tenancy is well known. In more recent times, theoretical debate has branched into two schools: while one school supports the Marshallian inefficiency proposition, the other school has sought to demonstrate that resource allocation must be efficient regardless of types of tenure.[1]

In a somewhat related debate, the theorists of semi-feudalism have sought to explain the technological backwardness of poor agrarian economies in terms of archaic production relations. For example, it has been argued that the institution of tenancy, in particular share tenancy, in conjunction with the exploitative interlinkages in credit and labour markets acts as a formidable barrier in the introduction of new agricultural technology.[2]

Many empirical studies have been conducted to examine the relative productive/allocative efficiency of tenant operated farms and owner operated farms as well as share tenant farms and fixed rent tenant farms. The conclusions have been a mixed lot. For example, while Chattopadhyay (1979), Shaban (1987) and Bagi (1981) found tenancy as an inefficient institution, Bliss and Stern (1981), Vyas (1970) and Chakravarty and Rudra (1973) found it otherwise. The debate initiated by the theorists of semi-feudalism has also provoked theoretical and empirical works. A glance at the literature reveals that while theoretical works have, *inter alia,* questioned the deleterious effects of interlinkages on the incentives to innovate, the empirical works relate primarily to ascertaining the pervasiveness of interlinked factor markets.[3] Although some studies have looked into the effect of land tenures on the adoption of new farm innovations, firm empirical evidence between tenure and adoption is lacking.[4]

In brief, it may be noted that while empirical studies conducted to examine the relative productive/allocative efficiency of different land tenure systems have not succeeded in clinching the issue, not much empirical evidence is available regarding the effect of diverse agrarian features on the adoption of new agricultural technology. Against this background, this study seeks to (i) describe the salient features of the lease market in the sample villages

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and (ii) examine the effects of tenancy relations on the adoption of new agricultural technology and productivity levels and test the hypothesis of deleterious effects of tenancy, share tenancy, and of interlocking of factor markets on the use of high-yielding varieties (HYVs) and chemical fertiliser as well as of other traditional inputs and the level of output.

II

METHODOLOGY

The study is based on the data relating to a sample of 300 cultivating households in four villages of Orissa - two villages, one irrigated and one unirrigated, in a relatively agriculturally developed district (Balasore) and two, again one irrigated and one unirrigated, in an agriculturally backward district (Kalahandi) - pertaining to the agricultural year 1988-89.[5] The sample households relate only to operational holdings, classified into small and large on the basis of size of holding: those operating up to five acres are categorised as small and those who operate more than five acres as large. To meet the first objective, salient features of the lease market such as the magnitude and types of tenancy, interlocking of factor markets, the incidence of landlessness and so on have been analysed. To meet the second objective, input use and productivity levels have been compared between (a) owner operated farms, owner-cum-tenant farms and pure tenant farms, (b) fixed rent farms and share cropped farms, and (c) tenant farms free of interlocking and those involved in interlocking of land-credit and land-labour markets. To avoid the effect of large differences in farm size which is a surrogate for a large number of potentially important factors affecting the adoption of new agricultural technology and agricultural development such as access to credit, capacity to bear risk, access to scarce inputs and information, etc., the input use and productivity levels of only those households have been compared who operate upto five acres of land. In other words, households - pure owners, owner-cum-tenants and pure tenants - who operate more than five acres of land were not considered. Of course, households who leased out their land and did not cultivate on their own, stood excluded from the population from which the samples were drawn.[6]

III

SALIENT FEATURES OF THE LEASE MARKET

Tables I and II give some salient features of the functioning of the lease market in the sample villages. A few significant points may be noted. First, in both the regions, the incidence of landlessness was much more pronounced in the irrigated villages in contrast to the unirrigated villages.[7] Second, in the developed agricultural region for all categories of households, the magnitude of tenancy in terms of proportion of total cultivated area leased-in was higher in the unirrigated village (27.08) compared to the irrigated village (20.70). On the other hand, in the backward region tenancy was higher in the irrigated village (26.99) compared to the unirrigated village (19.38). The small tenants leased-in a higher proportion of their cultivated land than the large tenants in both the types of villages and regions. In so far as the status of the tenants is concerned, while in the unirrigated village the proportion of pure tenants was very small, in the irrigated village it was only a little less than that of owner-cum-tenants, which could, *inter alia*, be attributed to the higher incidence of landlessness in the latter compared with the former village.

TABLE I. SELECTED AGRARIAN FEATURES OF SAMPLE VILLAGES: DEVELOPED AGRICULTURAL REGION

Sr. No.	Particulars	Irrigated village			Unirrigated village		
		Small	Large	All households	Small	Large	All households
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(i)	Pure owner operators	49.65 (0.00)	77.78 (0.00)	52.80 (0.00)	47.44 (0.00)	36.00 (0.00)	45.68 (0.00)
(ii)	Owner-cum-tenant operators	23.78 (75.00)	-	21.12 (75.00)	35.04 (48.62)	36.00 (54.17)	35.19 (50.66)
(iii)	Owner-cum-lessor operators	6.29 [58.33]	22.22 [18.39]	8.07 [27.03]	12.41 [55.24]	28.00 [32.14]	14.81 [47.20]
(iv)	Pure tenant operators	20.28 (100.00)	-	18.01 (100.00)	5.11 (100.00)	-	4.32 (100.00)
(v)	Households owning no land	-	-	43.89	-	-	11.93
(vi)	Share tenants	26.56 (82.56)	-	22.66 (82.56)	19.05 (50.81)	16.67 (60.60)	18.67 (53.83)
(vii)	Fixed rent tenants	17.18 (78.52)	-	14.66 (78.52)	23.81 (65.30)	25.00 (48.72)	24.00 (59.76)
(viii)	Tenants free from interlocking	10.94 (74.07)	-	9.34 (74.07)	23.81 (47.26)	16.67 (46.43)	22.67 (47.05)
(ix)	Interlocked tenants	34.38 (83.33)	-	29.34 (83.33)	19.05 (71.87)	25.00 (59.09)	20.00 (66.85)
(x)	Average size of operational holding (acres)	1.52	7.91	2.38	2.35	7.08	3.14
(xi)	Gini ratio of operational holding	-	-	0.45	-	-	0.32
(xii)	Family size (No.)	6.86	11.82	7.59	6.54	8.42	6.84
(xiii)	Per capita income (Rs.)	1,711.60	2,492.00	1,889.28	979.86	1,207.58	1,024.67
(xiv)	Households below poverty line	50.00	27.27	46.67	73.00	50.00	69.33
(xv)	Total number of sample households	64 (37.08) [7.29]	11 (0.00) [9.41]	75 (20.70) [8.46]	63 (29.42) [25.04]	12 (22.94) [12.08]	75 (27.08) [19.97]

Source: Computed from field data.

Notes: (i) Figures are in percentages unless otherwise specified.
(ii) Figures in round brackets are percentages of operated area leased-in.
(iii) Figures in square brackets are percentages of owned area leased-out.
(iv) The percentages in rows (i) to (v) refer to all cultivators in the village; the figures in rows (vi) onwards refer only to the sample of cultivating households in the village.
(v) The unbracketed figures are number of cultivators in the category expressed as a percentage of the total number of cultivating households either in the village or sample.

Third, share tenants leased-in a higher proportion of their cultivated land compared to the fixed rent tenants in the irrigated villages of both the regions whereas in the unirrigated villages, the proportion of leased-in area was comparatively higher in the case of fixed rent tenants. Fourth, in the developed agricultural region, while the proportion of interlocked tenants was higher in the irrigated villages, there was no significant difference in the two categories of tenants in the unirrigated village. In the backward region, the proportion of interlocked tenants was much higher compared to free tenants in both the types of villages. Fifth, the distribution of operational holdings was more skewed in the irrigated village of the developed region compared to that in the backward region where it was more skewed in the unirrigated village. Sixth, the average size of operational holding was lower in the irrigated villages of both the regions than in the unirrigated villages. Seventh, as expected,

TABLE II. SELECTED AGRARIAN FEATURES OF SAMPLE VILLAGES: BACKWARD AGRICULTURAL REGION

Sr. No.	Particulars	Irrigated village			Unirrigated village		
		Small	Large	All households	Small	Large	All households
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(i)	Pure owner operators	40.57 (0.00)	29.41 (0.00)	39.35 (0.00)	57.25 (0.00)	23.81 (0.00)	52.41 (0.00)
(ii)	Owner-cum-tenant operators	21.74 (62.11)	58.82 (27.92)	25.81 (42.34)	30.65 (50.50)	38.10 (43.89)	31.03 (48.01)
(iii)	Owner-cum-lessor operators	10.14 [45.56]	11.76 [14.29]	10.32 [1.33]	4.84 [47.62]	28.57 [47.11]	9.66 [47.18]
(iv)	Pure tenant operators	27.54 (100.00)	-	24.52 (100.00)	7.26 (100.00)	4.76 (100.00)	6.90 (100.00)
(v)	Households owning no land	-	-	50.62	-	-	19.10
(vi)	Share tenants	20.00 (77.44)	10.00 (31.03)	18.67 (69.14)	9.38 (56.96)	18.18 (38.60)	10.67 (46.11)
(vii)	Fixed rent tenants	30.76 (88.14)	30.00 (27.30)	30.67 (58.68)	28.13 (57.41)	18.18 (79.02)	26.67 (62.58)
(viii)	Tenants free from interlocking	13.85 (69.05)	30.00 (27.76)	16.00 (40.54)	12.50 (60.33)	18.18 (63.86)	13.33 (62.00)
(ix)	Interlocked tenants	36.92 (87.17)	10.00 (28.57)	33.33 (79.31)	25.00 (55.89)	18.18 (46.34)	24.00 (52.65)
(x)	Average size of operational holding (acres)	2.01	8.37	2.86	2.35	11.35	3.68
(xi)	Gini ratio of operational holding	-	-	0.38	-	-	0.42
(xii)	Family size (No.)	5.27	11.10	6.05	5.78	9.40	6.31
(xiii)	Per capita income (Rs.)	1,477.75	2,534.52	1,737.61	562.39	884.44	632.84
(xiv)	Households below poverty line	53.85	10.00	48.00	93.75	45.45	86.67
(xv)	Total number of sample households	65 (36.77) [19.86]	10 (11.70) [1.33]	75 (26.99) [12.07]	64 (22.10) [6.36]	11 (16.09) [33.59]	75 (19.38) [21.52]

Source: Computed from field data.

Notes: (i) Figures are in percentages unless otherwise specified.
(ii) Figures in round brackets are percentages of operated area leased-in.
(iii) Figures in square brackets are percentages of owned area leased-out.
(iv) The percentages in rows (i) to (v) refer to all cultivators in the village; the figures in rows (vi) onwards refer only to the sample of cultivating households in the village.
(v) The unbracketed figures are number of cultivators in the category expressed as a percentage of the total number of cultivating households either in the village or sample.

the per capita income was substantially higher in the irrigated villages compared to the unirrigated villages of both the regions. Naturally, the incidence of poverty was significantly lower in the former villages compared to the latter ones.[8]

IV

TENANCY AND PRODUCTIVE/ALLOCATIVE EFFICIENCY

The effects of tenancy, share tenancy and of interlocking of land-labour and land-credit markets on the use of HYVs, chemical fertiliser and other inputs and the level of output are analysed in this section and the results are presented in Tables III through VIII.[9] Before proceeding to do this, however, it is necessary to note one point. It is possible that the level of input, the variety of paddy and the level of output on leased-in and owned lands may be affected by factors other than tenancy and interlocked factor markets. If the leased-in lands

happen to be the better quality lands in a village or are irrigated to a greater extent than the owner operated land, then the input and output levels may be different irrespective of tenancy status. It has not been possible to examine this aspect due to non-availability of the relevant data. This limitation of the findings may be kept in mind.

(i) Pure Owners, Owner-cum-Tenants and Pure Tenants

The data show that the institution of tenancy did not affect adversely the allocation of modern and traditional inputs and consequently the level of output both in the agriculturally developed and backward region and irrigated and unirrigated villages (Tables III and IV). For example, while tenants - both mixed and pure - in the unirrigated villages of both the regions spent a significantly higher amount on HYVs and chemical fertiliser and produced a higher amount of output compared to pure owners, in the irrigated villages, there was no significant difference in the use of inputs and output produced between pure owners and tenants.

TABLE III. COMPARISON OF USE OF MODERN AND TRADITIONAL INPUTS AND LEVEL OF OUTPUT BETWEEN PURE OWNERS, OWNER-CUM-TENANTS AND PURE TENANTS: DEVELOPED AGRICULTURAL REGION

Use of inputs and level of output (1)	Pure owners (2)	Owner-cum-tenants (3)	Pure tenants (4)	't' value for difference between (2) and (3) (5)	't' value for difference between (2) and (4) (6)	't' value for difference between (3) and (4) (7)
			Unirrigated village			
H	35.37	32.33	46.41	0.24	-0.44	-0.70
B	31.73	26.34	35.23	0.54	-0.17	-0.61
M	33.54	35.51	27.19	-0.17	0.31	0.43
F	7.27	14.40	49.60	-23.01*	-1.54***	-1.92**
HYV	17.79	31.56	65.61	-25.77*	-2.19**	-1.21
O	9.39	9.83	13.04	-3.06*	-1.88***	-0.55
N	28	22	5			
			Irrigated village			
H	53.48	24.67	45.24	2.17**	0.41	-1.33
B	43.53	28.41	32.71	1.18	0.76	-0.34
M	92.07	38.68	64.69	2.35**	0.98	-1.20
F	63.40	66.04	67.69	-0.11	-0.17	-0.06
HYV	201.31	123.74	159.58	1.17	0.56	-0.54
O	15.56	13.08	14.10	0.50	0.27	-0.18
N	32	16	13			

Source: Computed from field data.

Notes: (i) H = Human labour (man-days per acre); B = Bullock labour (pair-days per acre); F = Chemical fertiliser (Rs. per acre); HYV = Expenditure on high-yielding varieties (Rs. per acre); M = Manure (Rs. per acre); O = Output (quintals per acre); N = Number of observations.

(ii) *, ** and *** denote level of significance at 1, 5 and 10 per cent respectively.

TABLE IV. COMPARISON OF USE OF MODERN AND TRADITIONAL INPUTS AND LEVEL OF OUTPUT BETWEEN PURE OWNERS, OWNER-CUM-TENANTS AND PURE TENANTS: BACKWARD AGRICULTURAL REGION

Use of inputs and level of output (1)	Pure owners (2)	Owner-cum-tenants (3)	Pure tenants (4)	't' value for difference between (2) and (3) (5)	't' value for difference between (2) and (4) (6)	't' value for difference between (3) and (4) (7)
			Unirrigated village			
H	57.59	57.99	70.63	-0.02	-0.42	-0.68
B	36.08	36.55	37.87	-0.04	-0.99	-0.07
M	29.49	39.71	47.17	-0.99	-1.05	-0.36
F	0.00	4.74	0.00	-1.37	-	1.37
HYV	2.97	23.97	41.33	-2.42**	-1.47***	-0.86
O	5.70	9.28	10.50	-1.42***	-1.49***	-0.92
N	37	19	5			
			Irrigated village			
H	35.96	34.53	55.84	0.12	-1.21	-1.24
B	39.99	36.81	37.20	0.23	0.18	-0.03
M	46.22	44.67	51.21	0.09	-0.31	-0.36
F	43.12	23.34	64.65	0.96	-0.96	-1.90**
HYV	111.06	76.73	145.59	0.72	-0.72	-1.27
O	11.25	11.06	14.49	0.04	-0.75	-0.66
N	25	14	19			

Source: Computed from field data.

Notes: (i) H = Human labour (man-days per acre); B = Bullock labour (pair-days per acre); F = Chemical fertiliser (Rs. per acre); HYV = Expenditure on high-yielding varieties (Rs. per acre); M = Manure (Rs. per acre); O = Output (quintals per acre); N = Number of observations.

(ii) ** and *** denote level of significance at 5 and 10 per cent respectively.

TABLE V. COMPARISON OF USE OF MODERN AND TRADITIONAL INPUTS AND LEVEL OF OUTPUT BETWEEN, PURE OWNERS, FIXED RENT TENANTS AND SHARE TENANTS: DEVELOPED AGRICULTURAL REGION

Use of inputs and level of output (1)	Pure owners (2)	Fixed rent tenants (3)	Share tenants (4)	't' value for difference between (2) and (3) (5)	't' value for difference between (2) and (4) (6)	't' value for difference between (3) and (4) (7)
			Unirrigated village			
H	35.37	36.80	32.52	-0.09	0.17	0.27
B	31.73	29.93	25.52	0.14	0.47	0.39
M	33.54	38.81	27.88	-0.38	0.41	0.72
F	7.27	37.66	0.00	-2.25**	1.74**	2.93*
HYV	17.79	64.83	4.16	-2.29**	1.87**	3.10*
O	9.39	13.94	6.01	-1.94***	1.89**	1.87**
N	28	15	12			
			Irrigated village			
H	53.48	29.34	38.83	1.58***	0.96	-0.62
B	43.53	29.25	32.82	0.94	0.86	-0.27
M	92.07	58.63	42.29	1.19	2.21**	0.78
F	63.40	73.81	66.16	-0.39	-0.12	0.26
HYV	201.31	239.59	83.46	-0.45	2.37**	1.93**
O	15.56	20.26	9.98	-1.75***	1.46***	1.50**
N	32	11	18			

Source: Computed from field data.

Notes: (i) H = Human labour (man-days per acre); B = Bullock labour (pair-days per acre); F = Chemical fertiliser (Rs. per acre); HYV = Expenditure on high-yielding varieties (Rs. per acre); M = Manure (Rs. per acre); O = Output (quintals per acre); N = Number of observations.

(ii) *, ** and *** denote level of significance at 1, 5 and 10 per cent respectively.

(ii) Pure Owners, Fixed Rent Tenants and Share Tenants

However, the share tenancy deterred the use of modern and traditional inputs in the developed and backward agricultural regions and also on both the irrigated and unirrigated farms (Tables V and VI). It may be seen from the tables that share tenants were way behind the pure owners and fixed rent tenants in the use of HYVs and chemical fertiliser; the difference, however, was more pronounced in the agriculturally developed region than in the backward region. The fixed rent tenants were more efficient and secured larger output per hectare to the pure owners and share tenants.

TABLE VI. COMPARISON OF USE OF MODERN AND TRADITIONAL INPUTS AND LEVEL OF OUTPUT BETWEEN PURE OWNERS, FIXED RENT TENANTS AND SHARE TENANTS: BACKWARD AGRICULTURAL REGION

Use of inputs and level of output (1)	Pure owners (2)	Fixed rent tenants (3)	Share tenants (4)	't' value for difference between (2) and (3) (5)	't' value for difference between (2) and (4) (6)	't' value for difference between (3) and (4) (7)
			Unirrigated village			
H	57.59	61.54	59.11	-0.26	-0.06	0.08
B	36.08	37.89	34.19	-0.17	-0.09	0.20
M	29.49	44.79	30.67	-0.12	-0.10	0.66
F	0.00	5.00	0.00	-1.37	-	1.37
HYV	2.97	63.96	0.00	-1.86**	1.27	1.95**
O	5.70	10.52	6.16	-1.70***	0.26	1.55***
N	37	18	6			
			Irrigated village			
H	35.96	48.57	43.87	-0.89	-0.53	2.49*
B	39.99	35.85	38.86	0.34	0.08	-0.20
M	46.22	52.37	42.38	-0.39	0.23	0.54
F	43.12	68.62	14.04	-1.14	1.73**	2.68*
HYV	111.06	174.67	26.69	-1.45***	2.41**	3.22*
O	11.25	16.72	7.36	-1.51***	1.45***	2.09**
N	25	20	13			

Source: Computed from field data.

Notes: (i) H = Human labour (man-days per acre); B = Bullock labour (pair-days per acre); F = Chemical fertiliser (Rs. per acre); HYV = Expenditure on high-yielding varieties (Rs. per acre); M = Manure (Rs. per acre); O = Output (quintals per acre); N = Number of observations.

(ii) *, ** and *** denote level of significance at 1, 5 and 10 per cent respectively.

(iii) Pure Owners, Free Tenants and Interlocked Tenants

In the literature, while the Marxists view interlocking of factor markets as a source of exploitation and barrier to the introduction of new agricultural technology, neo-classicals argue that it is motivated by a desire to accomplish economic efficiency and explain their *raision d'etre* in terms of incomplete markets, imperfect information, moral hazards and high transaction costs.[10]

The evidence emanating from the field data does not support the Marxian view that interlocking of factor markets discourages the use of modern technology. As may be seen from Tables VII and VIII, there is no significant difference in the use of modern as well as

TABLE VII. COMPARISON OF USE OF MODERN AND TRADITIONAL INPUTS AND LEVEL OF OUTPUT BETWEEN PURE OWNERS, TENANTS FREE FROM INTERLOCKING AND INTERLOCKED TENANTS: DEVELOPED AGRICULTURAL REGION

Use of inputs and level of output (1)	Pure owners (2)	Tenants free from inter-locking (3)	Interlocked tenants (4)	't' value for difference between (2) and (3) (5)	't' value for difference between (2) and (4) (6)	't' value for difference between (3) and (4) (7)
			Unirrigated village			
H	35.37	40.31	30.57	-0.29	0.32	0.63
B	31.73	28.17	27.80	0.27	0.32	0.03
M	33.54	31.51	35.91	0.14	-0.18	-0.29
F	7.27	26.14	16.74	-1.61***	-1.14	0.44
HYV	17.79	43.06	33.71	-1.33	-1.22	0.44
O	9.39	10.35	10.47	-0.22	-0.27	-0.03
N	28	15	12			
			Irrigated village			
H	53.48	34.76	31.15	1.32***	0.87	0.21
B	43.53	31.88	25.49	1.00	0.99	0.43
M	92.07	55.26	34.88	1.55***	2.31**	0.81
F	63.40	72.90	47.54	-0.45	0.51	0.77
HYV	201.31	146.98	144.84	0.91	0.56	0.03
O	15.56	13.86	12.53	0.38	0.44	0.20
N	32	7	22			

Source: Computed from field data.

Notes: (i) H = Human labour (man-days per acre); B = Bullock labour (pair-days per acre); F = Chemical fertiliser (Rs. per acre); HYV = Expenditure on high-yielding varieties (Rs. per acre); M = Manure (Rs. per acre); O = Output (quintals per acre); N = Number of observations.

(ii) ** and *** denote level of significance at 5 and 10 per cent respectively.

traditional inputs and the amount of output produced between the interlocked tenants and free tenants both in the agriculturally developed and backward regions and also between the irrigated and unirrigated villages.[11]

V

DETERMINANTS OF THE TYPES OF TENANCY

The data presented in the previous section show that fixed rent tenancy is distinctly of greater efficiency than share tenancy. This naturally raises the question about the circumstances leading to these two types of tenancy in the same village. Glancing through literature, one finds different views regarding the co-existence of different types of tenurial contracts. For example, Hallagan (1978) argues that tenurial contracts are used as a self-screening device; tenants with higher entrepreneurial ability favour fixed rent tenancy while those having no such ability opt for wage employment. The intermediate tenants go for share tenancy. Likewise, Stiglitz (1989) maintains that in an imperfect information regime, characterised by moral hazards, asymmetric information, high transaction cost, etc., share cropping emerges, *inter alia*, in response to risk aversion on the part of the tenants. In contrast, Pearce (1983), using Marxian perspective, explains the emergence of share tenancy as a mode of surplus appropriation between forms of agrestic servitude and full commoditisation of rural labour itself.

TABLE VIII. COMPARISON OF USE OF MODERN AND TRADITIONAL INPUTS AND LEVEL OF OUTPUT BETWEEN PURE OWNERS, TENANTS FREE FROM INTERLOCKING AND INTERLOCKED TENANTS: BACKWARD AGRICULTURAL REGION

Use of inputs and level of output (1)	Pure owners (2)	Tenants free from interlocking (3)	Interlocked tenants (4)	't' value for difference between (2) and (3) (5)	't' value for difference between (2) and (4) (6)	't' value for difference between (3) and (4) (7)
			Unirrigated village			
H	57.59	53.46	66.45	0.22	-0.35	-0.46
B	36.08	34.03	37.42	0.18	-0.09	-0.20
M	29.49	36.33	46.13	-0.63	-0.88	-0.50
F	0.00	2.50	0.00	-0.60	-	0.60
HYV	2.97	26.63	22.00	-2.94*	-1.54***	0.26
O	5.70	8.68	9.75	0.85	-1.06	-0.24
N	37	8	16			
			Irrigated village			
H	35.96	46.11	48.34	-0.76	-0.69	-0.11
B	39.99	35.79	40.33	0.37	-0.02	-0.30
M	46.22	47.39	51.22	-0.08	-0.25	-0.19
F	43.12	44.70	53.59	-0.08	-0.38	-0.34
HYV	111.06	118.95	109.52	-0.18	0.03	0.16
O	11.25	12.79	13.68	-0.40	-0.46	-0.16
N	25	9	24			

Source: Computed from field data.

Notes: (i) H = Human labour (man-days per acre); B = Bullock labour (pair-days per acre); F = Chemical fertiliser (Rs. per acre); HYV = Expenditure on high-yielding varieties (Rs. per acre); M = Manure (Rs. per acre); O = Output (quintals per acre); N = Number of observations.

(ii) * and *** denote level of significance at 1 and 10 per cent respectively.

It is well known that the provision of irrigation facilities reduces the risk and uncertainty associated with the crop production to a large extent. Going by the Stiglitzian views that share tenancy is a risk sharing mechanism, tenants under these circumstances are more likely to prefer fixed rent tenancy to share tenancy. In a similar vein, households with large families, which is a surrogate of the labour force available in the family, and not owning any productive assets like land and bullocks, are generally poor and more vulnerable to risk and uncertainty. These households are expected to opt for share tenancy because of their vulnerability to risk and also because fixed rent tenancy very often entails advance cash payment. From the Hallaganian perspective too, such households bereft of any entrepreneurial acumen and skills would prefer wage employment. However, because of lack of wage employment, they are obliged to opt for share tenancy.

To examine the effect of different factors on the choice of the tenancy contracts, a logit regression was done. Keeping in view the data at our disposal, the variables such as the availability of irrigation, the ownership of productive assets, namely, land and bullocks, family size and whether a family is below the poverty line or not were considered. It, however, needs to be underlined that in addition to the above-mentioned factors, there are many more important factors which could influence the choice of tenancy contracts. For example, some of these could be whether the lessor resides in the village or not, whether any cash crop is grown or not, whether the land produces second crop in addition to paddy, and so on.[12] It is essential to consider all these variables to draw firm conclusions. The results of the present logit model are, therefore, indicative only.

The results, presented in Table IX, indicate that in both the regions, poverty was the most significant factor affecting the probability of a tenant household opting for share tenancy. However, the results show that the probability of a tenant household opting for share tenancy is more pronounced in the irrigated villages than in the unirrigated ones. And the results also show that households who own land have higher probability to opt for share tenancy. The remaining two factors, namely, family size and ownership of bullocks did not affect the choice of tenancy contracts significantly.

$$\text{Prob}\,[y = 1] \quad \frac{e^{(b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5)}}{1 + e^{(b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5)}}$$

where y = 1 for those who opt for share tenancy, 0 otherwise;
x_1 = number of family members;
x_2 = 1 for those who do not own bullocks, 0 otherwise;
x_3 = 1 for those who are below poverty line, 0 otherwise;
x_4 = 1 for those who do not own land, 0 otherwise;
x_5 = 1 for irrigated villages, 0 otherwise.

TABLE IX. FACTORS AFFECTING PROBABILITY OF A TENANT HOUSEHOLD OPTING FOR SHARE TENANCY: RESULTS OF LOGISTIC REGRESSIONS

Explanatory variables	Developed region		Backward region	
	I	II	I	II
(1)	(2)	(3)	(4)	(5)
Constant	-4.75*	-4.75*	-3.24*	-2.91*
	(-3.17)	(-3.16)	(-2.80)	(-2.82)
x_1	-0.15	-	0.22	-
	(-0.86)		(1.24)	
x_2	-1.13	-	-0.64	-
	(1.28)		(0.79)	
x_3	4.24*	4.04*	1.01	1.24***
	(3.87)	(3.91)	(1.33)	(1.68)
x_4	-1.23*	-1.11*	-0.37	-0.69***
	(2.15)	(2.23)	(0.66)	(1.61)
x_5	-3.52*	-2.90	-1.21***	-1.41***
	(2.97)	(2.86)	(1.57)	(1.82)
Log likelihood ratio	-22.78	-23.78	-32.17	-33.15

Notes: (i) Figures in parentheses are 't' values.
(ii) * and *** denote level of significance at 1 and 10 per cent respectively.

VI

SUMMING UP

To sum up, the lease market in the sample villages is characterised by very high incidence of tenancy, particularly in the irrigated villages. Nevertheless, the institution of tenancy, *per se*, does not appear to have any adverse effect on the use of modern and traditional inputs and level of output both in the agriculturally developed and backward regions and also in the irrigated and unirrigated villages. For example, while tenants were relatively more efficient in the unirrigated villages, there was no significant difference in the allocative and productive efficiency of tenant operated farms and self-operated farms in the irrigated villages. There is, however, an imposing evidence to indicate that in both the regions and types

of villages, share tenancy is disincentive ridden and acts as a barrier to the use of modern and traditional inputs, thereby hindering the process of agricultural development. The field data also do not support the hypothesis that interlocking of factor markets has deleterious effect on the use of modern and traditional inputs and agricultural output. Regarding the factors affecting the choice of tenancy contracts, the results of logistic regressions indicate that the availability of irrigation facilities, ownership of land and poverty were the important factors affecting the probability of a household opting for share tenancy.

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NOTES

1. For a summary of theoretical debate, see Cheung, 1969; Quibria and Rashid, 1984; Bliss and Stern, 1981 and Otsuka and Hayami, 1988.

2. Bhaduri, 1973 and Prasad, 1973 are the main protagonists of this view.

3. The interlocking of factor markets has been defined as the simultaneous contract between landlord and tenant in more than one markets, for example, a tenant leasing-in land from the landlord and agreeing to work on his farm. For a review of theoretical works, see Braverman and Stiglitz, 1986; Stiglitz, 1989; Ghosh and Saith, 1976. The empirical studies have been carried out by Bardhan and Rudra, 1978; Chattopadhyay and Ghosh, 1983; Bell and Srinivasan, 1989.

4. For an excellent survey of these studies, see Feder *et al.*, 1985.

5. For the details on sampling design and data collection, see Mohapatra, 1991.

6. The small households who leased out some of their land were excluded from the analysis because of two reasons: First, definitionally, it was decided to make comparison between pure owner operators, owner-cum-tenant operators and pure tenant operators. Second, the input use and productivity in respect of owner-cum-lessors could have been influenced by the amount of rent they earn by leasing out some part of their land.

7. The landless households have been defined to include all those, whether cultivating any land or not, who do not own any land.

8. The percentage of households below poverty line has been computed using Rs. 14.50 per capita monthly expenditure at 1960-61 prices (see Bardhan, 1974).

9. To test the difference in the use of inputs and level of output between households belonging to different categories, the following procedure was adopted: To begin with, $H_0 = \sigma_1^2 = \sigma_2^2$ was tested by applying 'F' test.

$$F_{cal} = \frac{s_1^2}{s_2^2}\left(s_1^2 > s_2^2\right) \sim F_{(n_1-1,\, n_2-1)}$$

degrees of freedom. Further, in those cases where H_0 is rejected, Cochran and Cox test was applied:

$$|t_{cal}| = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s_1^2/n_1 + s_2^2/n_2}}$$

It was compared with t'

$$t' = \frac{t_1(n_1-1)\frac{s_1^2}{n_1} + t_2(n_2-1)\frac{s_2^2}{n_2}}{s_1^2/n_1 + s_2^2/n_2}$$

In the remaining cases, Fisher's 't' test was applied;

$$|t_{cal}| = \left|\frac{\bar{x}_1 - \bar{x}_2}{\sqrt{s^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}\right| \sim t_{(n_1+n_2-2)} \text{ degrees of freedom}$$

where

$$s^2 = \frac{(n_1-1)\, s_1^2 + (n_2-1)\, s_2^2}{n_1 + n_2 - 2}$$

See Croxten and Cowden (1973).

10. See Stiglitz (1989). For a review of theoretical issues, see Bardhan (1980).

11. There is also no difference in the production elasticities and the elasticities of the new inputs and family labour between the interlocked and free tenants (see Mohapatra, 1994).

12. The effect of some of these factors like whether the lessor resides in the village or not on the choice of tenancy contracts was examined by Bhalla for Haryana agriculture (see Bhalla, 1983).

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