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Do Sharecroppers Undersupply Effort? Evidence from a Farm Level Survey in Assam Plains

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Using farm level data from Assam plains in Northeast India generated through a primary survey, this paper revisits the debate dating back to Alfred Marshall which centers on the question whether the sharecroppers undersupply effort in crop production as reflected in their input intensities. Our investigation, however, did not result in a categorical answer to the research question. It has been found that while the sharecroppers undersupply labour input conforming the Marshallian inefficiency hypothesis, tenancy or any of its forms does not have any significant impact on capital intensity. On the other hand, in the case of fertiliser consumption it has been found that the fixed rent tenants tend to apply chemical fertilisers more intensively than even the owner operators. This was not reported in the existing literature which has an adverse implication for the sustainable use of land. The tendency among the fixed rent tenants to apply more chemical fertilisers is outcomes of certain restrictive provisions in the existing tenancy law in the state. Accordingly, the paper suggests reforms in the existing tenancy law in order to overcome these problems and ensure efficient utilisation of land resources.

Keywords: Tenancy, Sharecropping, Fixed Rent, Input Intensities, Inefficiency
JEL Classification: Q15

I. INTRODUCTION

The Marshallian inefficiency hypothesis with respect to tenancy views sharecropping to be inefficient as compared to fixed rent (Marshall 1920). Sharecropping is considered to be inefficient in the sense that the sharecroppers tend to undersupply effort in terms of the application of inputs in crops production. As the sharecroppers get to retain only half of their marginal product, at the equilibrium they equate only half of their marginal cost of effort to half of marginal product. In other words, they stop supplying effort at a point when marginal product is still exceeding marginal cost. Consequently, economic

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surplus does not get maximised. In contrast, under fixed rent, as the fixed rent is in the nature of fixed cost and hence does not enter into the tenant's marginal calculation, at the equilibrium, the tenant equates his marginal cost to marginal product and supplies the required level of effort in order to maximise economic surplus. Thus, as explained above, the Marshallian school of thought argues that sharecroppers are inefficient in comparison to the fixed rent tenants. There is, however, another theoretical exposition countering the Marshallian proposition referred to as "monitoring approach" pioneered by Johnson (1950). According to this approach, sharecropping can be equally efficient as fixed rent provided the lessor specifies the amount of inputs to be supplied by the tenant while designing the contract and then monitors to ensure the desired supply of inputs by the tenant.

These two contesting theoretical propositions have already been verified empirically by many scholars over space and time. While some of such studies have found evidence in favour of the Marshallian argument, some others support the monitoring approach. In the Indian context, while Bell (1977), Pant (1983), Dobbs and Foster (1972), Tripathy (1985), Islam and Benerjee (1985), Bhaumik (1993), Shaban (1987), and Sharma, Mehta and Mohapatra (1995) had found evidence in support of the Marshallian school, the studies by Dwivedi and Rudra (1973), Chattopadhyay and Sarkar (1997), Junakar (1976), Rao (1971), Chattopadhyay and Sengupta (2001), and Chakravarty and Rudra (1973) confirmed the result of the Monitoring school. Thus, the debate has remained inconclusive till today. The present paper revisits this debate. *Using farm level data from Assam plains generated through a primary survey, the central question that the paper seeks to answer is whether the sharecroppers indeed undersupply effort in crop production as reflected in their labour, capital and fertiliser consumption intensities.*

The issue under consideration assumes crucial importance in the context of Assam as tenancy is widespread in the agrarian set-up of the state. Bezbaruah (1994), in his study, found that 42 per cent of the sample farmers in the Brahmaputra Valley had land on lease as part of their operational holdings. Based on the field survey in the Lakhimpur district of Assam, Kuri (2003) found that while 8.7 per cent of the total operational holdings were pure tenant holding, owner cum tenant holding accounted for 47 per cent of the total. These studies had also found that sharecropping was the predominant form of tenancy contract prevailing in Assam. Kuri (2003) found that 95 per cent of the leased-in land was under sharecropping in the study area. Gautam (1995) found that sharecropping was the most prominent type of tenancy contract for principal crops. Another study, conducted by the Land Reform Unit of the Lal Bahadur Shastri National

Academy of Administration (1994), found that there was high incidence of informal sharecropping in Assam and 78.3 per cent of the leased-in area was under this contract. Thus, in view of the evidence regarding widespread incidence of tenancy and predominance of sharecropping in Assam, the answer to the question raised by the present study has significant implications on agrarian relations which in turn have a very critical influence on the agricultural production in the state.

The paper has been organised into six sections. Section II elaborates on the materials and methods used in the study. Section III traces out the relationship between land distribution pattern and tenancy arrangement on the basis of survey data. Magnitudes of tenancy, patterns and duration of tenancy contracts as extracted from the primary survey data have been presented in section IV. Section V investigates whether the sharecroppers undersupply effort as reflected in their labour, capital and fertiliser consumption intensities. Section VI summaries the findings of the paper and discusses the implications of the findings for policy.

II. MATERIALS AND METHODS

2.1 Source of Data

This study is based on primary data collected during January-April 2011. The present study is limited to the plains which constitute 81 per cent of the state of Assam. To make a relatively small sample fairly representative of the geographical scope of the study, a multi-stage sampling design was followed. In order to represent the agro-climatic variations within the plains, four dispersed districts were selected in the first stage of the sampling. The selected districts are Dibrugarh in Upper Brahmaputra Valley, Morigaon in Central Brahmaputra Valley, Nalbari in Lower Brahmaputra Valley and Cachar in Barak Valley. In the second stage, in consultation with the district agriculture officers of the selected districts and keeping in view the representativeness of the district in terms of cropping pattern and socio-economic background, one development block from each of the districts had been selected. Then, from each block, three villages (thus a total of 12 villages) had been selected at random. Finally, from each selected village 7 to 10 per cent of households owning and/or operating on agricultural land were selected at random. A total of 240 households thus selected formed the final sample size covered in the survey.

2.2 Methodology

The question whether the sharecroppers undersupply effort has been dealt with at two levels. First, a graphical representation of the average values of labour, capital and fertiliser consumption intensities of the tenant farmers

belonging to different tenure categories has been made for comparing their input intensities. Then, to infer impacts of different types of tenancy contracts on the input intensities more rigorously, multiple regression analysis has been carried out. This exercise became necessary for disentangling the effect of tenancy contracts on the input intensities from those of other influencing factors, which are captured as control variables in the regressions. The details of the regression models framed, their estimation procedures and results obtained thereof have been elaborated in section V.

III. LAND DISTRIBUTION PATTERN AND TENANCY ARRANGEMENT

In this section, a possible correspondence between distribution of land ownership and leasing decisions of sample farm households is explored. To that end, the distribution patterns of ownership holdings and operational holdings both by numbers and area composition across size categories are presented in Table I (The location specific tables for the four sub-samples have been placed in appendix A).

Table I reiterates the well known explanation that imbalance in resource endowments across farm households is a factor behind the tenancy arrangement in agriculture (Ray 1998). Typically, farm households owning smaller landholding possess relatively abundant family labour in proportion to their land holdings. The conditions are the reverse for households owning larger holdings. The land lease market facilitating leasing in of land by smaller holders and leasing out of land by bigger holders affects a better balance of the primary factors of land and labour across farm households in agricultural operation. This can be seen in the present study too in the form of larger average size of operational holding than that of ownership holding.

TABLE I

LAND DISTRIBUTION PATTERN OF SAMPLE HOUSEHOLDS BY FARM SIZE CATEGORY AND AVERAGE SIZE OF LAND IN EACH CATEGORY

Farm Size Category (Operational/ Ownership)* (in Hectare)	Owned Land					Operated Land				
	No. of Farm House holds	% of Farm House holds	Amount of Land	% of Land	Average farm Size	No. of Farm House holds	% of Farm House holds	Amount of Land	% of Land	Average Farm Size
(1)	(2)	(3)	(4)	(5)	(6) =(4)/(2)	(7)	(8)	(9)	(10)	(11) =(9)/(7)
NIL	36*	15.0	-	-	-	19**	7.9	-	-	-
0 – 1	90	37.5	46.9	15.8	0.5	84	35.0	53.4	16.6	0.5
1 – 2	66	27.5	96.6	32.5	1.5	85	35.4	116.9	36.3	1.4
2 – 3	22	9.2	50.1	16.8	2.3	36	15.0	86.3	26.8	2.4
3 – 4	12	5.0	40.8	13.7	3.4	8	3.3	27.8	8.6	3.5
4 – 5	12	5.0	52.6	17.7	4.4	6	2.5	27.3	8.5	4.6
5 & above	2	0.8	10.7	3.6	5.4	2	0.8	10.4	3.2	5.2
All	240	100.0	297.7	100.0	1.2	240	100.0	322.2	100.0	1.3

Note:*These households are pure tenants.
** These households are pure lessors.

The observation from Table I has been further substantiated from the presentation in Table II. Table II shows the distribution of the sample farm households over size classes of operational holdings for each size class of ownership holding. Here, the columns and the rows represent various size classes of ownership holding and operational holding respectively. The households in the first column under ownership holding, i.e. NIL, are the pure tenants who do not own any land but operate by leasing in. Pure tenants are basically small farmers as they are present predominantly in the size classes of 0-1 and 1-2 hectares of operational holding. The diagonal figures, i.e. a figure falling on the similar column and row (for example: second column and second row), represent the owner operators. For example, in the size class of 0-1 hectare, 54.4 per cent of the households in that size class are there on the diagonal. This implies that of the total households in that size class, 54.4 per cent owns and operates the equal amount of land. The figures above the diagonal represent the percentage of households who either operate no land or less than what they own. As for example, in the size class of 0-1 hectare, 3.3 per cent of households, although own land, do not operate any land, suggesting that they have leased[1] out the land. Thus the figures above the diagonal represent the households who lease out land (i.e. lessors). By contrast, the figures below the diagonal represent the households who operate on more land than they own, which means that they lease in (i.e. lessees).

TABLE II

PERCENTAGE DISTRIBUTION OF THE SAMPLE HOUSEHOLDS OVER SIZE CLASSES OF OPERATIONAL HOLDINGS FOR EACH SIZE CLASS OF OWNERSHIP HOLDINGS

Operational Holding (in hectare)	Ownership Holding (in hectare)						
	NIL	0-1	1-2	2-3	3-4	4-5	5-6
Nil	-	3.3	13.6	9.1	16.7	16.7	50.0
0-1	61.1	54.4	12.1	9.1	16.7	8.3	-
1 – 2	27.8	34.4	56.1	22.7	8.3	8.3	-
2 – 3	5.6	6.7	15.2	59.1	16.7	25	-
3 – 4	2.8	1.1	1.5	-	41.7	-	-
4 – 5	2.8	-	1.5	-	-	33.3	-
5 – 6	-	-	-	-	-	8.3	50.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1]The possibility of keeping land fallow does not arise as the fallow land has been deducted from owned land while calculating operational holding.

In this way, when we look at each size of ownership holding, two facts come to light. They are as follows: (i) in each size class, owner operators are predominant and (ii) as the size of ownership holding increases, the percentage of households leasing out land also increases. For example, in the size classes of 0-1 and 1-2 hectares of ownership holding, there are some households leasing out land; but most of the households are owner operators besides having a substantial portion of households leasing in. In the subsequent higher classes (2-3 and 3-4 hectares) of ownership holding, while the owner operators are still dominantly present, all the remaining households have leased out land. Barring the 8.3 per cent of households in the size class of 4-5 hectares of ownership holding, percentage of households leasing out is overwhelmingly larger than those leasing in. Thus, notwithstanding the presence of some lessor households in the size class of 1-2 hectares, the overall impression, that one gets from Table II is that within the size classes of 0-1 and 5-6 hectares of ownership holding (there is no landholder or tenant farmer in the sample owing or operation on more than 6 hectares of land), lessors are those who own more land.

IV. MAGNITUDES OF TENANCY, PATTERNS AND DURATION OF TENANCY CONTRACTS

4.1 Magnitude of Tenancy

The magnitude of tenancy is sought to be captured in terms of the number of tenant households and areas of sample farms under lease. Table III shows the distribution of the sample households belonging to five different tenure status.

TABLE III
PERCENTAGE DISTRIBUTION OF THE SAMPLE HOUSEHOLDS IN TERMS OF TENURE STATUS

Field Study Locations	Pure Tenant	Owner Operator cum Tenant	Owner Operator	Owner Operator cum Lessor	Pure Lessor	Total
Dibrugarh	11.9	40.7	33.9	5.1	8.5	100.0
Morigaon	13.8	36.9	32.3	9.2	7.7	100.0
Nalbari	18.9	34.0	34.0	5.7	7.5	100.0
Cachar	14.3	27.0	23.8	25.4	9.5	100.0
Overall	15.0	34.2	30.8	11.7	7.9	100.0

On the whole, the owner operator cum tenant is the largest category (34.2 per cent), followed by owner operator (30.8 per cent), pure tenant (15 per cent), owner operator cum lessor (11.7 per cent) and pure lessor (7.9 per cent). It is

clear from Table III that while 19.6 per cent (i.e. 11.7 per cent owner operator cum lessor and 7.9 per cent pure lessor together) of households have leased out their land, 49.2 per cent of sample households (i.e. 15 per cent pure tenant and 34.2 per cent owner operator cum tenant together) have leased in land. In other words, 49.2 per cent of the total sample households are either fully or partially tenant households.

TABLE IV
AREA OF THE SAMPLE FARMS UNDER LEASE (AS A PER CENTAGE OF THE OPERATIONAL HOLDING)

Field Study Locations	Leased in Area	Owned	Total
Dibrugarh	28.5	71.5	100.0
Morigaon	31.2	68.9	100.0
Nalbari	41.7	58.3	100.0
Cachar	32.0	68.0	100.0
Overall	32.8	67.2	100.0

Table IV shows that 32.8 per cent of the total sample area is under lease, while 67.2 per cent is owner operated area. The area under lease is the highest (41.7 per cent) in Nalbari. Thus, Tables III and IV show that while almost half of the farmers in the sample are tenant farmers (fully or partially), about one-third of the sample area is under lease.[2] It can be mentioned here that all the tenancy contracts in the present sample are informal contracts, which indicates that concealed tenancy is predominant in Assam plains.

[2]These findings are contrary to what the secondary data reflects. National Sample Survey (NSS) Reports and Agricultural Census and Farm Management Studies of the Ministry of Agriculture are the two main sources of secondary data on landholdings and tenancy. While agricultural census is not at all reliable in so far as tenancy is concerned, NSS underestimates the magnitudes of tenancy. In the context of Assam, while Agricultural Census, 2000-01 shown that there was no incidence of tenancy; NSS estimated the area under lease as a percentage of total operated area to be only 5.3 per cent in 2002-03 (59^{th} round, report number 492). The fact that NSS underestimates the incidence of tenancy has already been established by many studies (Ramachandran 1980, Sharma and Dreze 1998 and Ramakumar 2000). For a detailed discussion on the limitations of secondary data on tenancy, see Sharma (1995).

4.2 Location-wise Patterns of Tenancy Contracts

Fixed rent and sharecropping are the two major forms of tenancy contracts prevailing in the land lease market in Assam plains. Another form of tenancy contract, although not very significant, is mortgage.[3] Again within fixed rent and sharecropping, there are alternative contractual arrangements. For example, fixed rent may be either in cash or in kind. Similarly, costs of cultivation under sharecropping may not be shared in certain cases, while in some others it may be a cost sharing arrangement. Under cost sharing arrangement, the lessor usually provides the seed to the tenant which he saves from his share of last year's harvest. In few cases, lessors have borne the cost of fertilisers and that of tilling the land besides providing the seed.

Table V shows that while 49.6 per cent of the tenant farmers are sharecroppers, 38.9 per cent of the tenants have leased in under fixed rent. In terms of area (Table VI), 53.1 per cent of the leased in area is under sharecropping and 38.6 per cent is under fixed rent. *These findings imply that sharecropping is the predominant form of tenancy contract in the plains of Assam.*

However, the nature of the tenancy contracts across locations of field study is not uniform. While fixed rent is the predominant form of tenancy contract in Morigaon, overwhelming number of the tenant farmers in the other three locations are sharecroppers. In Morigaon, 73.2 per cent of the tenant farmers have leased in under fixed rent with 82.5 per cent of the leased in area under this contract. In contrast, 92.6 per cent of the tenant farmers are sharecroppers in Cachar where 93.6 per cent of the leased in area is under sharecropping. Table V and Table VI further reveal that within fixed rent, except in Dibrugarh, fixed rent in kind is the preferred mode of contract, as reflected in the number of tenant farmers and area under that contract. On the other hand, while in Cachar cost sharing arrangement under sharecropping is largely prevalent, costs of cultivation are not shared under majority of the sharecropping contracts in Dibrugarh and Nalbari.

[3]When land is leased in under mortgage, the lessee makes a onetime cash payment to the lessor. The amount of cash payment is decided through negotiation between the lessee and the lessor. The lessee continues to operator on the land until the lessor repays the money and gets back his land.

TABLE V
PERCENTAGE DISTRIBUTION OF THE SAMPLE TENANT FARMERS BY TERMS OF LEASE

Field Study Locations	Fixed Rent			Sharecropping			Mortgage
	In cash	In kind	Total	With cost sharing	Without cost sharing	Total	
Dibrugarh	25.0	5.6	30.6	5.6	47.2	52.8	16.7
Morigaon	7.3	65.9	73.2	9.7	4.9	14.6	12.2
Nalbari	11.4	22.9	34.3	5.7	48.6	54.3	11.4
Cachar	-	3.7	3.7	85.2	7.4	92.6	3.7
Overall	11.5	27.3	38.9	22.3	27.4	49.6	11.5

Note: Figures in all the columns have been expressed as a percentage of the total tenant farmers.

TABLE VI
PERCENTAGE DISTRIBUTION OF THE AREA LEASED IN BY TERMS OF LEASE

Field Study Locations	Fixed Rent			Sharecropping			Mortgage
	In cash	In kind	Total	With cost sharing	Without cost sharing	Total	
Dibrugarh	33.3	7.5	40.7	7.0	43.3	50.4	8.9
Morigaon	19.3	63.2	82.5	8.4	2.4	10.7	6.8
Nalbari	5.2	18.5	23.7	9.0	53.3	62.3	14.0
Cachar	-	4.6	4.6	88.1	5.5	93.6	1.8
Overall	15.1	23.5	38.6	24.7	28.4	53.1	8.4

Note: Figures in all the columns have been expressed as a per centage of the total area leased in.

What explains the location specific variations in the existence of tenancy contracts? The answer to the above question may be sought in the cropping patterns prevailing in the field study locations. A look at the location wise and tenure status wise cropping patterns, as shown in tables VII and VIII respectively, reveals that choice of a tenancy contract is influenced by the crop grown.

Table VII shows that, on the whole, winter paddy is the major crop (58.2 per cent) grown in the locations under consideration, followed by summer paddy (22.1 per cent), winter vegetable (9.4 per cent) and rape and mustard (7.8 per cent).

TABLE VII
LOCATION-WISE CROPPING PATTERN

Field Study Locations	Winter Paddy	Summer Paddy	Potato	Winter Vegetable	Rape & Mustard	Jute
Dibrugarh	74.4	-	2.8	24.6	0.5	-
Morigaon	18.6	53.5	-	5.4	23.7	-
Nalbari	78.7	11.8	1.2	4.1	2.9	3.9
Cachar	75.1	18.7	3.7	2.4	-	-
Overall	58.2	22.1	1.7	9.4	7.8	0.8

TABLE VIII
TENURE STATUS-WISE CROPPING PATTERN

Tenure Status	Winter Paddy	Summer Paddy	Potato	Winter Vegetable	Rape & Mustard	Jute
Owner Operator	58.3	21.7	2.2	9.2	7.7	0.9
Sharecropping	88.4	9.4	0.5	-	1.3	0.4
Fixed rent	22.1	39.4	0.4	21.5	16.2	0.4
Overall	58.2	22.1	1.7	9.4	7.8	0.8

The scrutiny of the location specific cropping patterns reveals that while summer paddy (53.5 per cent) along with rape and mustard (23.7 per cent) are the principal crops grown in Morigaon, about 75 per cent of area is under winter paddy in each of the other three locations. These three are also the locations where sharecropping prevails largely, whereas fixed rent is the major form of tenancy contract in Morigaon. Thus, from the above discussion, one can infer that sharecropping is usually the preferred form of contract when crop grown is the conventional winter paddy. Winter paddy is the paddy grown during the rainy season and harvested during winter.[4] As a result, winter paddy is subjected to risk and uncertainty caused by weather conditions. As, under sharecropping, risk associated with the crop is also shared along with the output, the tenants prefer sharecropping when they grow winter paddy. An associated observation in this context is that although winter paddy is subjected to weather risk, rice especially winter paddy being the staple food, sharecroppers grow this type of paddy mainly for subsistence motive.

On the other hand, crops like summer paddy, rape and mustard and winter vegetables involve little weather risk. The fact that these crops involve little weather risk induces the farmers to apply costly inputs like HYV seeds,

[4]The period coverage of the winter paddy is July to November during which the monsoon rain is regular and abundant in Assam. On the other hand, the summer paddy is sown during January and harvested by May before the onset of the heavy monsoon. Another crop, rape and mustard, is grown during the period of November to February.

irrigation, chemical fertilisers and pesticides and grow the crops largely on commercial basis. Application of these inputs increases the production and productivity and fetches higher returns. Thus, due to minimum risk involved and higher returns, the tenants like to lease in land under fixed rent contract for growing these crops and retain the entire returns. This explains as to why the fixed rent is the principal form of tenancy contract in Morigaon, where the tenants grow mainly summer paddy and rape and mustard. Again, when land is leased in for growing winter vegetable, rent is paid in cash as vegetables are perishable and cannot be stored for long. This is why the fixed rent in cash is predominant in Dibrugarh, where winter vegetables are grown on a sizeable portion of the sample area (24.6 per cent).

Table VIII further confirms the above discussion. It shows that 88.4 per cent of the sharecropped area is under winter paddy. In contrast, notwithstanding the 22.1 per cent of area under winter paddy, the fixed rent tenants devote their leased in area mainly to summer paddy (39.4 per cent), followed by winter vegetables (21.5 per cent) and rape and mustard (16.2 per cent).

4.3 Tenancy Contracts with respective to Rent Structure

Arrangement of fixed rent contracts differs across locations and even within a location (Table IX). The variability is more pronounced in the case of rent paid in cash.[5] On the whole, the cash rent varies within the range of a minimum of Rs.

[5]Location wise variations in rent may be explained in terms of two factors: (i) pressure of population on land or demand for land, and (ii) fertility of land. Rent may be expected to vary positively with both the factors. If the number of rural population per hectare of net sown area is considered to be an indicator of pressure on land, then it becomes clear that among the three locations under consideration, the pressure on land is the highest in Nalbari, followed by Morigaon and Dibrugarh. Rural population per hectare of net sown area in Nalbari, Morigaon and Dibrugarh is 10.15, 9.61 and 7.77 respectively (These figures have been computed from the data sourced from *Handbook of Statistics, 2010* and *Economic Survey of Assam*, 2011-12 published by the Directorate of Economics and Statistics, Government of Assam). On the other hand, fertility of land is the highest in Dibrugarh, followed by Morigaon and Nalbari as reflected in the yield rate of rice (see figure A.1 in appendix A). Thus Morigaon appears to be the location where fertility of land is not low, although not as high as in Dibrugarh, and the pressure of population on land is high, though not as high as in Nalbari. Hence, both the factors come into play and induce the rent to go up in Morigaon. On the other hand, in Dibrugarh while fertility is high, pressure on land is less. The opposite is the case in Nalbari. In other words, one factor neutralises the other in these two locations which may be the reason as to why the average rent is almost the same in these two locations. The slightly higher average rent in Nalbari than that in Dibrugarh is probably because of the higher demand for lease in Nalbari (see Table IV).

200 and a maximum of Rs. 3,000 with an average rent of Rs. 1,220 per bigha (one bigha = 0.13387 hectare) of land leased in. In the case of rent in kind, while 3.19 mounds of paddy per bigha of land is paid on the average, the minimum and maximum are 2 mounds and 5 mounds respectively. The average rent, whether in cash or in kind, is higher in Morigaon than that in the other locations.

Under sharecropping, however, output is shared on a 50:50 ratio in all the locations irrespective of whether costs of inputs are shared or not. It may be mentioned in this context that the share of output that the lessors receive is much higher than the amount stipulated in the existing tenancy legislation in Assam.[6]

TABLE IX
TYPES OF TENANCY CONTRACTS WITH RESPECTIVE TO RENT STRUCTURE

Types of tenancy contracts		Dibrugarh	Morigaon	Nalbari	Cachar	Overall
Fixed rent in cash (in Rs. for per Bigha*)	Average	811	2,000	850	-	1,220
	Maximum	1,000	3,000	1,500	-	3,000
	Minimum	500	1,000	200	-	200
Fixed rent in kind (in Mound# of paddy for per bigha)	Average	3	3.85	2.9	3	3.19
	Maximum	4	5	3	3	5
	Minimum	2	3	2.5	3	2
Sharecropping with or without cost sharing (share of output)		50:50	50:50	50:50	50:50	50:50

Note: *One bigha = 0.13387 hectares, one maund = 40 kg.

4.4 Duration of Lease

Most of the tenancy contracts, whether fixed rent or sharecropping, are for short duration. About 15 per cent of the fixed rent contracts are for one agricultural season and another 50 per cent of the contracts are for 1-2 years (Table X). Thus a total of 64.8 per cent of the fixed rent contracts have been agreed upon for less than three years. In the case of sharecropping, 60.8 per cent of the contracts are for less than 3 years (Table X). The short duration of the tenancy contracts may be attributed to a specific provision in the existing tenancy legislation in Assam. The prevailing tenancy law allows a tenant to become an

[6] In the case of crop rent, the rent as fixed in the existing tenancy legislation is one-fifth of the produce of the principal crop. In practice, however, the lessors receive half of the produce. In cases when the costs of cultivation are shared, the lessor's share may not, however, be excessive.

occupancy tenant[7] and subsequently the owner of the land if he cultivates the land continuously for three years. This provision has prevented, in most of the cases, the owners of the land to lease out for a long period even when the contract is informal.

The short duration of the contracts has an adverse implication for the sustainable use of land. The tenants may not be interested in undertaking any investment for the development of the land. Besides, they may not have any incentive to use the land sustainably. Rather they may only be interested in maximising the returns from land during the stipulated short period by making excessive use of chemical fertilisers and such inputs without caring for the natural quality of land. This tendency may particularly be strong among the fixed rent tenants as after paying the rent the only objective that they have is to maximise the returns from land.

TABLE X
PERCENTAGE DISTRIBUTION OF TENANCY CONTRACTS UNDER FIXED RENT AND SHARECROPPING BY DURATION OF LEASE

Duration	Fixed Rent	Sharecropping
1 agri. season	14.8	
1-2 years	50.0	60.8
3-6 years	24.1	29.7
7-9 years	5.6	4.1
10-14 years	1.9	
15-19years	3.7	1.4
20-24 years	-	1.4
25-30 years	-	2.7
Total	100.0	100.0

Thus, it is clear from the discussion in this section that the incidence of tenancy in the rural agrarian economy of Assam is extensive and virtually all of it is informal. Almost half of the farmers in the sample covering four different agro-climatic zones of Assam are fully or partially tenant farmers and about one-third of the sample area is under lease. On the whole, sharecropping is the predominant form of tenancy contract. However, there is variation across locations in terms of the form of tenancy contracts. Explanation for the location specific variations in the existence of tenancy contracts may be sought in the cropping patterns prevailing in the field study locations. Insofar as the arrangement of the fixed rent contracts is concerned, it differs across locations

[7] An occupancy tenant is the one who holds land continuously for three years and has a permanent heritable and transferable right of use and occupancy in the land.

and even within a location. In the case of sharecropping, however, the tenants invariably pay 50 per cent of the produce as rent across locations, which is much higher than the rent stipulated in the existing tenancy legislation in Assam. Further, it has been found that most of the tenancy contracts, whether fixed rent or sharecropping, are for short duration.

V. LABOUR, CAPITAL AND FERTILISER CONSUMPTION INTENSITIES OF TENANT FARMERS IN CROP PRODUCTION

In section IV, it has been observed that about one-third of the survey area is under tenancy and sharecropping is the predominant form of tenancy contract. In view of such high incidence of tenancy and predominance of sharecropping, the concern of the present paper is to understand as to whether the sharecroppers undersupply effort in crop production as reflected in their labour capital and fertiliser consumption intensities. This section of the paper investigates into this question. The input intensities have been defined and calculated, as outlined in Table XI.

TABLE XI
DEFINITIONS AND MEASUREMENT OF THE INPUT INTENSITIES

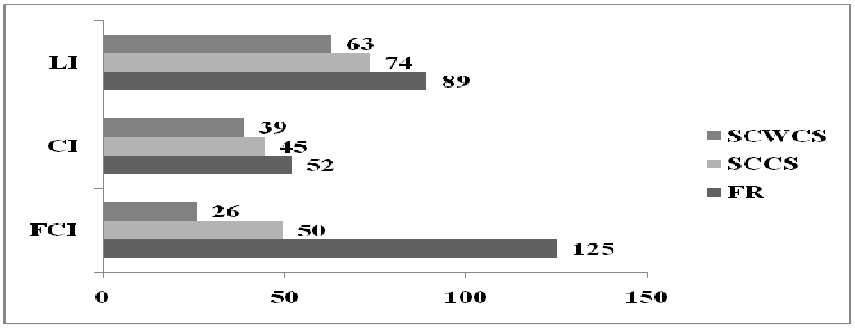
Input Intensities	Definitions and Measurement
Labour Intensity	Total amount of money spent on labour by a household has been divided by the gross cropped area. Total monetary value of labour = number of man days * wage paid; this include the imputed value of family labour.
Capital Intensity	Total capital expenditure of a household is divided by the gross cropped area of the household. Expenditures on capital include payment made in terms of rents for the services of tractor, power tiller, pump-set and motor and bullock pair and/or the imputed value of the services of these capital items in case a household owns some or all of them.
Fertiliser Consumption Intensity	NPK (in Kg) per hectare of gross cropped area

5.1 Average Levels of Labour, Capital and Fertiliser Consumption Intensities and their Reflection in Value of Production across Categories of Tenant Farmers

Labour, capital and fertiliser consumption intensities of three categories of sample tenant farmers are depicted in Figure 1, which shows that fixed rent tenants on the average tend to use both labour and capital more intensively and apply fertilisers at higher dose than the share croppers. This finding is in conformity with the Marshallian theoretical proposition. Among the

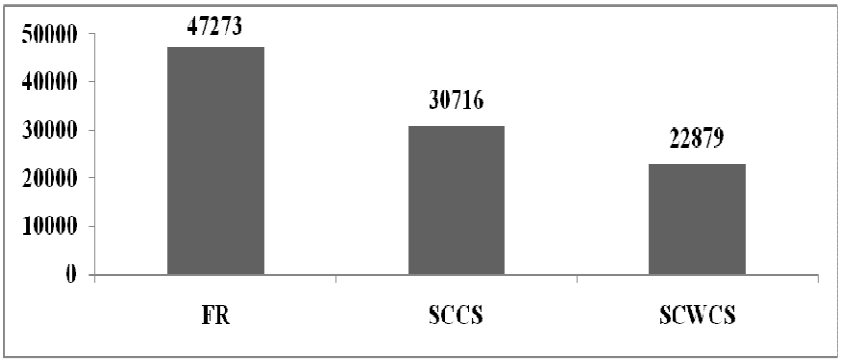
sharecroppers, those who lease in land under cost sharing arrangement tend to supply more inputs per unit of land than those whose costs of cultivation are not shared by the lessors. Thus, it may be inferred that cost sharing eliminates the incentive problem to some extent. Accordingly, the output produced per hectare by fixed rent tenants is the highest and that by the share croppers without cost sharing is the least (refer Figure 2).

Figure 1: **Average Levels of Labour, Capital and Fertiliser Consumption Intensities across Categories of Sample Tenant Farmers**



Note: (a) LI – labour intensity (in Rs. hundred per hectare), CI–capital intensity (in Rs. hundred per hectare) and FCI – fertiliser consumption intensity (in kg of NPK per hectare); (b) SCWCS – sharecropping without cost sharing, SCCS - sharecropping with cost sharing and FR – fixed rent.

Figure 2: **Average Value of Production[8] per Hectare of Operational Holding Generated by the Tenant Farmers (in Rupees)**



Note: SCWCS–sharecropping without cost sharing, SCCS–sharecropping with cost sharing and FR–fixed rent.

[8]Value of Production = summation of the market values of the crops produced during one agricultural year. Market value of a crop is given by the product of the total crop output and the average price received by sample farmers selling the crop in their respective locality.

While this graphical representation is very instructive, it is not conclusive enough to firmly claim that sharecroppers undersupply efforts in cultivation. To be able to draw inference more rigorously, it is necessary to examine the relation of labour, capital and fertiliser consumption intensities with the nature of tenancy contracts while controlling for other factors that are also expected to influence the input intensities. This is sought to be achieved through multiple regression analysis, details of which are laid out in the next sub-section.

5.2 Econometric Analysis

(a) Labour Intensity

In order to verify whether the sharecroppers undersupply labour, a regression model has been developed as shown below in which the dependent variable labour intensity is modeled as a function of tenancy in general and also its various forms alongside some control variables.

Variables Included in the Regression Model which may Influence Labour Intensity

Independent Variable

Tenancy: the variable of our prime concern is tenancy. There are, however, five variants of the tenancy variable. The purpose behind constructing five different forms of the tenancy variable is to examine the impact of tenancy in general and that of its various forms separately. Accordingly, the following five alternate forms of the tenancy variable[9] have been considered:

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[9]While the first variant of the tenancy variable represents the total magnitude of tenancy or tenancy in general, second and third variants have been constructed to disentangle the effects of sharecropping and fixed rent. The remaining two forms, i.e. the fourth and the fifth, further allow us to examine the impacts of another two types of tenancy contracts within sharecropping, i.e. sharecropping with cost sharing and without cost sharing. The motivation for further categorisation of sharecropping into the above two has come from the existing theoretical knowledge. Existing literature suggests that when the tenant and the lessor share the cost of cultivation, the tenant equates his marginal cost to marginal product, especially in the case of the observable inputs (Ray 1998), and hence the Marshallian inefficiency may be eliminated. Thus, a sharecropping contract with cost sharing arrangement is as much efficient as a fixed rent contract. Hence, areas under fixed rent and sharecropping with cost sharing have been clubbed together to form the fifth variant while keeping area under sharecropping without cost sharing under the fourth variant of the tenancy variable.

1. Total leased in area as a percentage of operational holding (POHLI).
2. Leased in area under sharecropping (SC) as a percentage of operational holding (POHSC).
3. Leased in area under fixed rent (FR) as a percentage of operational holding (POHFR).
4. Leased in area under sharecropping without cost sharing (SCWCS) as a percentage of operational holding (POHSCWCS).
5. Leased in area under fixed rent and sharecropping with cost sharing (SCCS) together as a percentage of operational holding (POHFRSCCS).

The significance and signs of the alternative specifications of the tenancy variable will determine whether tenancy and its various forms have positive or negative effect on labour intensity.

Control Variables

Apart from tenancy, there are some other variables that may influence the labour intensity of a farmer. In the present context, those variables have been used as control variables. The theoretical justifications for the inclusion of these variables along with their definitions have been given below.

Family labour (FL): It may be expected that a household having more farm workers will also have higher labour intensity.

Imputed value of family labour per hectare of gross cropped area has been taken as a measure of family labour.

Area under Winter Paddy (AWP): Winter rice is the predominant crop grown in Assam. In the context of our sample also, it has been found that about 60 per cent of the gross cropped area is under winter paddy. It has been observed during the course of field visit that the farmers apply relatively lesser amount of all inputs while growing winter paddy. The reason may be the fact that winter paddy is grown during the rainy season and is subjected to weather risk. As a result, the farmers may not like to apply certain inputs like fertilisers, etc. in large quantity. Besides, it does not require irrigation and consequently the requirement for applying other inputs, including labour, also gets reduced. Hence, a priori, it may be expected that higher is the share of winter paddy in total cropped area, lower will be the labour intensity.

Area under winter paddy as a proportion of the total cropped area has been used as a measure of the present variable.

Locational characteristics: It has been mentioned in section II that the locations of the field study fall in four different agro-climatic zones. Agricultural

practices may vary across these agro-climatic zones and hence the labour intensity too. Thus taking Dibrugarh as the reference category, three dummies have been used, viz., L_1, L_2 and L_3.

Where $L_1 = 1$ for Morigaon, 0 otherwise; $L_2 = 1$ for Nalbari, 0 otherwise; and $L_3 = 1$ for Cachar, 0 otherwise.

Specification of the Functional Form of the Model

The dependent variable, labour intensity (LI), is modeled in three different formulations, each having alternative specification(s) of the tenancy variable but the same set of control variables. These formulations are as follows:

Formulation 1: LI = f (POHLI, FL, AWP, L_1, L_2, L_3)

Formulation 2: LI = f (POHSC, POHFR, FL, AWP, L_1, L_2, L_3)

Formulation 3: LI = f (POHSCWCS, POHFRSCCS, FL, AWP, L_1, L_2, L_3)

As the dependent variable can take only positive values, the following exponential specification is considered to be more appropriate[10] than the simple linear formulation.

$$LI_i = \exp (\beta_0 + \beta_1 POHLI_i + \beta_2 FL_i + \beta_3 AWP_i + \beta_4 L_{1i} + \beta_5 L_{2i} + \beta_6 L_{3i} + U_i) \quad (1)$$

$$LI_i = \exp (\beta_0 + \beta_1 POHSC_i + \beta_2 POHFR_i + \beta_3 FL_i + \beta_4 AWP_i + \beta_5 L_{1i} + \beta_6 L_{2i} + \beta_7 L_{3i} + U_i) \quad (2)$$

$$LI_i = \exp (\beta_0 + \beta_1 POHSCWCS_i + \beta_2 POHFRSCCS_i + \beta_3 FL_i + \beta_4 AWP_i + \beta_5 L_{1i} + \beta_6 L_{2i} + \beta_7 L_{3i} + U_i) \quad (3)$$

The above formulations of the regression model are non-linear in nature. However, by taking logarithm in both sides, the above formulations have been transformed into linear specification which makes the estimation procedure easy. Thus the final forms of the formulations of the model to be estimated are:

$$Ln\ LI_i = \beta_0 + \beta_1 POHLI_i + \beta_2 FL_i + \beta_3 AWP_i + \beta_4 L_{1i} + \beta_5 L_{2i} + \beta_6 L_{3i} + U_i \quad (4)$$

$$Ln\ LI_i = \beta_0 + \beta_1 POHSC_i + \beta_2 POHFR_i + \beta_3 FL_i + \beta_4 AWP_i + \beta_5 L_{1i} + \beta_6 L_{2i} + \beta_7 L_{3i} + U_i \quad (5)$$

$$Ln\ LI_i = \beta_0 + \beta_1 POHSCWCS_i + \beta_2 POHFRSCCS_i + \beta_3 FL_i + \beta_4 AWP_i + \beta_5 L_{1i} + \beta_6 L_{2i} + \beta_7 L_{3i} + U_i \quad (6)$$

Where, U_i is the random disturbance which is assumed to be normally distributed with zero mean.

As the data used in the present exercise is based on a cross–section sample, it is quite possible that the disturbance term may not be homoskedastic. Hence,

[10]The predicted values of the dependent variable from the linear regression model fall within the range of $-\infty$ to ∞. In the present context, as the dependent variable takes only positive value, a linear regression is therefore not the appropriate tool.

before estimating the model, the Breusch-Pagan test has been applied to check for the presence of heteroskedasticity in the data sets for all the three formulations. The test shows the presence of heteroskedasticity in each of the data sets. Subsequently, the problem has been corrected by estimating White heteroskedasticity consistent robust standard errors.[11] In fact, this test has been performed in the case of capital intensity and fertiliser consumption intensity also.

The results of regression analysis for labour intensity, as presented in Table XII, show that the first variant of the tenancy variable, i.e. leased in area as per centage of operational holding or tenancy in general, has a highly significant (significant at a 1 per cent level of significance) and negative coefficient. Again, the coefficient of the second specification of the tenancy variable, area under sharecropping as a percentage of operational holding, is significant with a negative sign at 1 per cent in the second formulation of the model. The coefficient of the fourth specification of the tenancy variable is also significant at 1 per cent bearing a negative sign in the third formulation. Thus, the above results imply that tenancy in general and sharecropping in particular have a negative impact on labour intensity. In other words, tenant farmers and especially the sharecroppers supply relatively lesser amount of labour. This is in conformity with the Marshallian inefficiency hypothesis.

Among the control variables, the coefficients of family labour and area under winter paddy are significant at 1 per cent in all the three formulations. While the coefficient of family labour takes positive sign, that of area under winter paddy has a negative sign. It implies that the households having more family labour tend to supply more labour per hectare of gross cropped area, whereas the households devoting larger part of their cropped area to winter paddy supply relatively less labour per hectare of total cropped area. Among the locational dummies, the dummy for Cachar appears to be significant with a positive sign in all the three formulations, implying that the farmers in this location have higher labour intensity as compared to those in the reference category, i.e. Dibrugarh. The reason for the above finding may be as follows. Although sharecropping is predominant in both Cachar and Dibrugarh, unlike in Dibrugarh, cost is shared between the tenants and the lessors in case of most of the sharecropping contracts in Cachar. Sharing of costs by the lessors might have given an incentive to the sharecroppers to supply relatively more labour input.

[11] See Gujarati (2004).

TABLE XII
RESULTS OF THE REGRESSION ANALYSIS FOR LABOUR INTENSITY

Versions →	Formulation 1	Formulation 2	Formulation 3
Test of → Heteroskedasticity	Breusch-Pagan test Chi^2 [6] =53.43 Prob. = 0.0000 Result: presence of heteroskedasticity	Breusch-Pagan test Chi^2 [7] = 53.46 Prob. = 0.0000 Result: presence of heteroskedasticity	Breusch-Pagan test Chi^2 [7] = 53.68 Prob. = 0.0000 Result: presence of heteroskedasticity
Variables	Estimates of coefficients/values		
% OH Leased in	-0.0016*** (0.0006)		
% OH under SC		-0.002*** (0.0006)	
% OH under FR		-0.0005 (0.001)	
% OH under SCWCS			-0.003*** (0.001)
% OH under FR+SCCS			-0.001 (0.0007)
Family Labour	0.00005*** (0.00001)	0.00005*** (0.00001)	0.00005*** (0.00001)
Area under Winter Paddy	-0.0036*** (0.0009)	-0.003*** (0.0009)	-0.003*** (0.0009)
L_1	0.1115 (0.092)	0.105 (0.094)	0.098 (0.093)
L_2	0.029 (0.081)	0.029 (0.082)	0.033 (0.08)
L_3	0.186** (0.072)	0.209*** (0.073)	0.149* (0.077)
Constant	8.99*** (0.105)	8.96*** (0.106)	8.98*** (0.103)
R^2	0.2028	0.2107	0.2177
F	8.89*** [6, 211]	9.27*** [7, 210]	8.8*** [7, 210]

Note: Figures within ( ) and [ ] are White robust standard error and degrees of freedom respectively.
***, ** and * indicate significant at 1, 5 and 10 per cent respectively.

(b) Capital Intensity

To answer the concern of the paper, the following regression model has been developed in which capital intensity has been regressed on alternative specifications of the tenancy variable and certain control variables.

Variables Included in the Regression Model which may Influence Capital Intensity

Independent Variable

Tenancy: As formulated in the case of labour intensity.

Control Variables

Farm Size (FS): It may be expected that capital intensity will vary positively with farm size. Large farmers with better access to financial resources may tend to be more capital intensive. Operational holding in hectare is the measure of farm size.

Locational characteristics: As formulated in the case of labour intensity.

Specification of the Functional Form of the Model

Taking into account the alternative specifications of the tenancy variable, we have three formulations of the dependent variable (CI), i.e. capital intensity. These three formulations differ only with respect to the alternative specifications of the tenancy variable but otherwise identical in terms of the control variables. These three formulations are as follows:

Formulation 1: CI = f (POHLI, FS, L_1, L_2, L_3)

Formulation 2: CI = f (POHSC, POHFR, FS, L_1, L_2, L_3)

Formulation 3: CI = f (POHSCWCS, POHFRSCCS, FS, L_1, L_2, L_3)

As the dependent variable can take only positive value, the following exponential specification is considered to be more appropriate than the simple linear formulation.

$$CI_i = \exp (\beta_0 + \beta_1 POHLI_i + \beta_2 FS_i + \beta_3 L_{1i} + \beta_{4i} L_{2i} + \beta_5 L_{3i} + U_i) \quad (7)$$

$$CI_i = \exp (\beta_0 + \beta_1 POHSC_i + \beta_2 POHFR_i + \beta_3 FS_i + \beta_4 L_{1i} + \beta_5 L_{2i} + \beta_6 L_{3i} + U_i) \quad (8)$$

$$CI_i = \exp (\beta_0 + \beta_1 POHSCWCS_i + \beta_2 POHFRSCCS_i + \beta_3 FS_i + \beta_4 L_{1i} + \beta_5 L_{2i} + \beta_6 L_{3i} + U_i) \quad (9)$$

The above formulations of the regression model are non-linear in nature. However, by taking logarithm in both sides, the above formulations have been transformed into linear specification which makes the estimation procedure easy. Thus the final forms of the formulations of the model to be estimated are:

$$\text{Ln } CI_i = \beta_0 + \beta_1 POHLI_i + \beta_2 FS_i + \beta_3 L_{1i} + \beta_{4i} L_{2i} + \beta_5 L_{3i} + U_i \quad (10)$$

$$\text{Ln } CI_i = \beta_0 + \beta_1 POHSC_i + \beta_2 POHFR_i + \beta_3 FS_i + \beta_4 L_{1i} + \beta_5 L_{2i} + \beta_6 L_{3i} + U_i \quad (11)$$

$$\text{Ln } CI_i = \beta_0 + \beta_1 POHSCWCS_i + \beta_2 POHFRSCCS_i + \beta_3 FS_i + \beta_4 L_{1i} + \beta_5 L_{2i} + \beta_6 L_{3i} + U_i \quad (12)$$

Where, U_i is the random disturbance which is assumed to be normally distributed with zero mean.

The results of regression analysis for capital intensity, as shown in Table XIII, suggest that tenancy as such does not have any impact on capital intensity of the farmers. The coefficients of none of the specifications of the tenancy variable appear to be significant in any of the three formulations of the regression

model. However, the variable farm size has a highly significant (at 1 per cent) and positive coefficient in all the three formulations. This implies that capital intensity is rather a function of the farm size and larger farms tend to be more capital intensive. Among the locational dummies, the dummies for Morigaon and Cachar are significant at 1 per cent with positive signs in all the three formulations, implying that the farmers in these locations are more capital intensive than those in the reference category, i.e. Dibrugarh.

TABLE XIII
RESULTS OF THE REGRESSION ANALYSIS FOR CAPITAL INTENSITY

Versions →	Formulation 1	Formulation 2	Formulation 3
Test of Heteroskedasticity →	Breusch-Pagan test Chi^2 [5] = 17.31 Prob. = 0.0040 Result: presence of heteroskedasticity	Breusch-Pagan test Chi^2 [6] = 20.32 Prob. = 0.0024 Result: presence of heteroskedasticity	Breusch-Pagan test Chi^2 [6] = 17.59 Prob. = 0.0073 Result: presence of heteroskedasticity
Variables	Estimates of coefficients/values		
% OH Leased in	-0.00002 (0.0006)		
% OH under SC		-0.0007 (0.0006)	
% OH under FR		0.001 (0.001)	
% OH under SCWCS			-0.00037 (0.0008)
% OH under FR+SCCS			0.0001 (0.0006)
Farm Size	0.068*** (0.023)	0.065*** (0.023)	0.066*** (0.024)
L_1	0.229*** (0.064)	0.20*** (0.064)	0.219*** (0.063)
L_2	0.088 (0.059)	0.085 (0.06)	0.088 (0.059)
L_3	0.330*** (0.057)	0.35*** (0.06)	0.321*** (0.058)
Constant	8.08*** (0.064)	8.08*** (0.063)	8.08*** (0.065)
R^2	0.1466	0.1583	0.1475
F	7.95*** [5, 212]	7.31*** [6, 211]	6.60*** [6, 211]

Note: Figures within ( ) and [ ] are White robust standard error and degrees of freedom respectively.
*** indicates significant at 1 per cent.

(c) Fertiliser Consumption Intensity

As in the case of labour intensity and capital intensity, a regression model has been developed as shown below in order to verify whether the sharecroppers use relatively lesser amount of fertilisers.

Variables Included in the Regression Model which may Influence Application of Fertilisers

Independent Variable

Tenancy: As formulated in the case of labour intensity.

Control Variables

Farm Size (FS): A priori there is no reason as to why a small or a large farmer should apply more or less of NPK per hectare than the other. However, in view of the perceived financial resource constraint faced by the small farms, the extent of fertiliser application by them may be relatively less. Hence, the sign of the coefficient of this variable cannot be anticipated a-priori. Operational holding in hectare has been used as the measure of farm size.

Extent of Irrigation (IR): Irrigation is usually considered to be a precondition for the use of fertilisers. Irrigation leads to better absorption of fertiliser. Hence, it is expected that irrigation will induce the application of fertilisers and therefore the coefficient of the variable will take a positive sign. Proportion of irrigated area in the operational holding has been used as the measure of the extent of irrigation in the present context.

Access to Extension[12] *(EXT)*: It is a dummy variable, where D = 1 if the i-th farmer has received any direct benefit from the government's extension service network and otherwise D = 0.

A priori, it is expected that the farmers who have benefited from the extension service network would make judicious use of fertilisers which may be more or less than that used by the farmers on their own. Thus it is again a question of empirical investigation as to whether the access to extension service induces the farmers to use more or less fertilisers.

Access to Finance (FIN): It is a dummy variable, where, D = 1, if the i-th farmer has access to institutional credit and otherwise D= 0.

It may be expected that the coefficient of the variable will take a positive sign as purchasing fertilisers require financial resources. Thus a farmer having access to finance may use more fertilisers compared to a farmer who does not have access to finance.

Area under Fertiliser Intensive Crops (AFIC): Area under fertiliser intensive crops as a per centage of operational holding has been used as a measure of the

[12] We had asked six questions relating to the extension service while interviewing the farmers. Farmers' responses to these questions indicate whether they have received any direct benefits from the extension service. On the basis of the farmers' responses to these questions, the variable D has been assigned the value 0 or 1.

present variable. It is obvious that fertiliser consumption will be more if a farmer grows fertiliser intensive crops on a larger part of his operational holding. Hence, the coefficient of this variable should bear a positive sign.

Locational Characteristics: As formulated in the case of labour intensity.

Functional Specification of the Model

As in the preceding two cases of labour intensity and capital intensity, the dependent variable (FCI), i.e. NPK per hectare, has been modeled as three formulations which differ only with respect to the specifications of the tenancy variable but are identical in terms of the control variables. These formulations are as follows:

Formulation 1: FCI = f (POHLI, FS, IR, EXT, FIN, AFIC, L_1, L_2, L_3)

Formulation 2: FCI = f (POHSC, POHFR, FS, IR, EXT, FIN, AFIC, L_1, L_2, L_3)

Formulation 3: FCI = f (POHSCWCS, POHFRSCCS, FS, IR, EXT, FIN, AFIC, L_1, L_2, L_3)

The value that the dependent variable, i.e. FCI as measured in terms of NPK per hectare, takes is either 0 or any value greater than 0. For the farmers who do not apply chemical fertilisers at all, the value of the dependent variable is 0. This implies that the lower end of the value of the dependent variable is 0 with no limit for the upper end. In the data set, there are 43 farmers for whom the value of the dependent variable is 0. Thus, there is a cluster of observations at 0. In such a situation, a linear regression is not appropriate; rather a Tobit model with censoring at the lower (left) end will be a better technique.

The Tobit model is formulated with the help of the latent variable FCI^*_i which may take any probable value but is not always observable. Thus, in the context of the above three formulations, FCI^*_i have been formulated in the following manner.

$$FCI^*_i = \beta_0 + \beta_1 POHLI_i + \beta_2 FS_i + \beta_3 IR_i + \beta_4 EXT_i + \beta_5 FIN_i + \beta_6 AFIC_i + \beta_7 L_{1i} + \beta_8 L2_i + \beta_9 L_{3i} + U_i \quad (13)$$

$$FCI^*_i = \beta_0 + \beta_1 POHSC_i + \beta_2 POHFR_i + \beta_3 FS_i + \beta_4 IR_i + \beta_5 EXT_i + \beta_6 FIN_i + \beta_7 AFIC_i + \beta_8 L_{1i} + \beta_9 L_{2i} + \beta_{10} L_{3i} + Ui \quad (14)$$

$$FCI^*_i = \beta_0 + \beta_1 POHSCWCS_i + \beta_2 POHFRSCCS_i + \beta_3 FS_i + \beta_4 IR_i + \beta_5 EXT_i + \beta_6 FIN_i + \beta_7 AFIC_i + \beta_8 L_{1i} + \beta_9 L_{2i} + \beta_{10} L_{3i} + U_i \quad (15)$$

Where, U_i is the random disturbance which is assumed to be normally distributed with zero mean.

The observed dependent variable FCI_i is linked to the latent variable FCI^*_i as per the following formulation:

$FCI_i = 0$ for $FCI^*_i < 0$

$= FCI^*_I$ for $FCI^*_i \geq 0$

TABLE XIV
RESULTS OF THE LEFT CENSORED TOBIT REGRESSION FOR FERTILISER CONSUMPTION INTENSITY

Versions ⟶	Formulation 1	Formulation 2	Formulation 3
Test of Heteroskedasticity ⟶	Breusch-Pagan test Chi^2 [9] = 54.74 Prob. = 0.0000 Result: presence of heteroskedasticity	Breusch-Pagan test Chi^2 [10] = 78.04 Prob. = 0.0000 Result: presence of heteroskedasticity	Breusch-Pagan test Chi^2 [10] = 69.96 Prob. =0.0000 Result: presence of heteroskedasticity
Variables	Estimates of coefficients/values		
% OH Leased in	0 .0015 (0.0016)		
% OH under SC		– 0.002 (0.002)	
% OH under FR		0.006** (0.003)	
%OH under SCWCS			-0.0035 (0.0021)
% OH under FR+SCCS			0.003* (0.0018)
Farm Size	0.229*** (0.052)	0.224*** (0.05)	0.219*** (0.05)
Extent of Irrigation	0.006*** (0.002)	0.005*** (0.002)	0.006*** (0.002)
Access to Extension	-0.064 (0.287)	–0.105 (0.288)	-0.038 (0.277)
Access to Finance	0.262* (0.139)	0.234* (0.134)	0.26* (138)
% Area under FIC	0.012*** (0.002)	0.012*** (0.002)	0.012*** (0.003)
L_1	-0.212 (0.278)	-0.252 (0.273)	-.27 (0.28)
L_2	-0.422 (0.259)	-0.363 (0.245)	-0.381 (0.249)
L_3	0.327* (0.193)	0.448** (0.186)	-0.229 (0.200)
Constant	-0.728*** (0.168)	-0.649*** (0.161)	-0.628*** (0.164)
Pseudo R^2	0.1784	0.1948	0.1883
F	12.58*** [9, 209]	11.49*** [10, 208]	11.83*** [10, 208]

Note: Figures within ( ) and [ ] are White robust standard error and degrees of freedom respectively.

***, ** and * indicate significant at 1, 5 and 10 per cent respectively.

The results of the regression analysis for fertiliser consumption intensity, presented in Table XIV, show that while coefficients of the third and the fifth variants of the tenancy variable are significant, remaining three are insignificant. The coefficient of the third variant - area under fixed rent as a percentage of

operational holding- is significant at 5 per cent with a positive sign in the second formulation of the model. Again, the coefficient of the fifth variant, i.e. area under fixed rent plus area under sharecropping with cost sharing as a percentage of operational holding, appears to be significant at 10 per cent with a positive sign in the third formulation. This implies that on the average fixed rent tenants and those sharecroppers with whom the lessors share the cost of production use more fertiliser (NPK per hectare) relative to other farmers. In fact, the fixed rent tenants apply more fertilisers than even the owner operators. Even an owner operator cum tenant applies more fertilisers on his leased in land under fixed rent than on own land and land leased in under sharecropping (see appendix B, figure B2). This observed fact was unanticipated and not found in the existing literature.

Among the control variables, the coefficient of the variable firm size is significant at 1 per cent with a positive sign in all the three formulations of the model. This implies that larger the farm size, higher is the intensity of fertiliser consumption. Again, the coefficient of the variable, area under fertiliser intensive crops (AFIC), is also significant at 1 per cent with a positive sign in all the three formulations. The other two variables which have positive and significant impacts on fertiliser use are extent of irrigation (IR) and access to finance (FIN). The coefficient of the extent of irrigation appears to be significant at 1 per cent in all the three formulations of the model. Thus, as expected, irrigation induces the use of fertilisers. The dummy for access to finance is significant at 10 per cent in all the three formulations, implying that the farmers having access to institutional credit apply relatively more fertilisers. Again, among the locational dummies, the dummy for Cachar is significant at 10 per cent and 5 per cent with positive sign in the first and the second formulation of the model respectively. This implies that the farmers in this location tend to apply more chemical fertilisers as compared to the farmers in the reference category, i.e. Dibrugarh. The explanations provided to explain relatively higher labour intensity of the farmers in Cachar hold good in the present context too.

VI. CONCLUSION WITH IMPLICATIONS FOR POLICY

The incidence of tenancy in the rural agrarian economy of Assam plains is extensive and virtually all of it is informal. Notwithstanding the location specific variations, it has been found that sharecropping is the predominant form of tenancy contract prevailing in the state. Under the sharecropping contract, the tenants have the obligation of invariably paying 50 per cent of the produce as rent, which is much higher than the rent stipulated in the existing tenancy

legislation in Assam. Further, it has been found that most of the tenancy contracts are for short duration.

In view of the evidence regarding widespread incidence of tenancy and predominance of sharecropping in Assam, the present study attempted to understand whether the sharecroppers undersupply effort in crop production which, in turn, has significant implications on agrarian relations and critical influence on the agricultural production in the state. The findings of the study, however, do not provide a categorical answer to our research question. It has been found that while the sharecroppers do undersupply labour input (thereby conforming the Marshallian inefficiency hypothesis), tenancy or any of its forms does not have any significant impact on capital intensity. On the other hand, in the case of fertiliser consumption intensity it has been found that the fixed rent tenants tend to apply more chemical fertilisers than even the owner operators. This phenomenon was unanticipated and is not found in the existing literature. This tendency among the fixed rent tenants may be because the crops that this category of tenants grows involve little weather risk which induces them to apply more of such inputs like chemical fertilisers. Again, unlike those sharecroppers who bear the entire cost of production by themselves, the fixed rent tenants do not suffer from the incentive problem. Rather, they have all the incentives to supply utmost possible efforts in terms of all inputs and maximise the output. The short duration of the fixed rent contracts makes such incentives even stronger. The tenants probably intend to increase the returns from the leased in land as much as possible during the short period of the contracts. Consequently, they do not have hesitation in using agro-chemicals like fertilisers at liberal doses without caring much for the natural quality of land. In other words, the short duration of the contracts provides incentives to the tenants to maximise the use value rather than balancing it against the asset value of land (i.e. the future flow of returns which an owner operator should ideally consider).

The findings of the study imply that there is scope for better utilisation of the scarce land and other resources. The measures which would ensure better utilisation of the resources should attempt to correct the following two problems: (i) the Marshallian inefficiency that ensnares the sharecroppers, resulting in them undersupplying their labour input, and (ii) the tendency among the fixed rent tenants to apply liberal doses of chemical fertilisers.

Insofar as the Marshallian inefficiency with respect to labour intensity is concerned, the problem can be attributed to the exorbitant rent that the sharecroppers have to pay in terms of the share of produce in spite of the law being in place to regulate rent. Hence, the solution to the problem may be the better implementation of the existing tenancy law in terms of the regulation of

rent. However, given the past experience,[13] there is little hope that the tenancy law will ever be implemented seriously. In fact, even if the tenancy law is implemented, it may not serve any purpose as the tenancy contracts are informal or remain unrecorded. Tenancy contracts being informal, the sharecroppers cannot take recourse to law to safeguard their interest when required. Hence, if the sharecroppers' interest is to be protected, steps must be taken in order to facilitate the recording of tenancy contracts. This, in turn, will require relaxing a restrictive provision in the tenancy law which is responsible for the emergence of informal tenancy. The existing tenancy law has the provision of a tenant becoming an occupancy tenant if he holds the land for three years continuously and consequently he may take over the possession of land. This stringent provision in the tenancy law has instilled a sense of fear in the mind of the lessors. Hence, the lessors do not want the tenancy contracts to be recorded and to lease out land to a single tenant for a long period[14] as it may create trouble for them later and, in fact, they may lose the ownership right. Thus, in order to facilitate the recording of tenancy contracts, the above stringent provision must be relaxed so that the lessors can lease out land without the fear of losing ownership right. In other words, the use right of land should be distinguished from the ownership right. Distinguishing the use and ownership right would mean that while the lessors would have the ownership right, the lessee would have the use right. If the lessors can lease out without the fear of losing the ownership right, they may not resist the recording of the tenancy contracts. If recording of the tenancy contracts becomes possible, it will allow the tenants to

[13]As in other states of India, the Government of Assam passed the tenancy law after the independence. In fact, even before independence, the relationship between lessors and tenants in the state was governed by various tenancy Acts. After independence, the Assam (Temporary Settled District) Tenancy Act, 1935 was amended in 1953 and finally after a great deal of discussion in the Legislative Assembly the Assam (Temporary Settled areas) Tenancy Act, 1971 was put on place. The Tenancy Act of 1971 is the tenancy legislation governing the tenancy relations in the entire state even today. The Tenancy Act of 1971 was considered to be a progressive step when it had been formulated. Later on, independent studies, however, shown that the progressive provisions of the Act did little to improve the conditions of the tenants. As Borgohain (1992) had said that though the government had shown intentions of improving the conditions of the peasantry, various incidents, however, proved that such intentions and motives of the government were not so genuine. The class interest of the policy makers took precedence over the interest of the tenant. Thus the Tenancy Act has never been implemented properly in Assam and now it has been relegated into history.

[14] Most of the lessors do not prefer to lease out land to a single tenant for more than two years. That is why it has been found that more than 60 per cent of the tenancy contracts are for less than three years.

realise the benefits of the tenancy law with respect to, among others, the protection against the payment of higher rent. Protection against the payment of exorbitant rent should improve the incentive of the sharecroppers to supply desired effort which in turn will contribute towards increasing the agricultural production in the state.

Distinguishing the use right from the ownership right should also help to overcome the second problem. The tendency of the fixed rent tenants to apply more chemical fertilisers may, at least partly, be attributed to the short duration of contracts within which they want to maximise returns from land. Distinguishing the use right from the ownership right would allow the owner of the land to lease out without the fear of losing the ownership right for a considerably long period of time. If land can be leased in for a long period of time, the tenants may have the incentives to make investment for the development of the land and also to use the land sustainably by making judicious use of inputs like chemical fertilisers. As the land will be under the possession of the tenant for a long period, he will balance the use value against the asset value of land. Thus the problem arising out of the short duration of tenancy contracts may be avoided and thereby the efficient and sustainable utilisation of the land will be ensured.

REFERENCES

Bell, Clive. 1977. "Alternative Theories of Sharecropping: Some Tests using Evidences from Northeast India." *Journal of Development Studies*, 13(4): 317-346.

Bezbaruah, Mahdurjya Prasad.1994. *Technological Transformation of Agriculture–A Study in Assam.* New Delhi: Mittal Publications.

Bhaumik, Sankar Kumar.1993. *Tenancy Relations and Agrarian Development: A Study of West Bengal.* New Delhi: Sage Publications.

Borgohain, Rooplekha. 1992. *Politics of Land Reforms in Assam*. New Delhi: Reliance Publishing House.

Chakravarty, Aparajita and Ashok Rudra.1973. "Economic Effects of Tenancy: Some Negative Results." *Economic and Political Weekly*, 8 (28):1239-1246.

Chattopadhyay, Manabendu and Debnarayan Sarker. 1997. "A New Look at the Old Bottle: A Study on Land Tenure and Farm Productivity." *Indian Journal of Labour Economics*, 36 (2).

Chattopadhyay, Manabendu and Atanu Sengupta. 2001. "Tenancy Inefficiency: A Study Based on West Bengal Agriculture." *Economic and Political Weekly*, 36 (5-6): 497-502.

Dobbs, Thomas and Phillips Foster. 1972. "Incentives to Invest in New Agricultural Inputs in North India." *Economic Development and Cultural Change*, 21(1): 101-117.

Dwivedi, Harendranath and Ashok Rudra. 1973. "Economic Effects of Tenancy: Some Further Negative Results." *Economic and Political Weekly*, 8(29): 1291-1294.

Gautam, H. C.1995. "Agrarian Relations: A Study on Some Aspects of Land Tenancy System in Assam." *Indian Journal of Agricultural Economics*, 50 (4): 682-687.

Gujarati, Damodar N. 2004. *Basic Econometrics.* New Delhi: McGraw-Hill.

Islam, Md. Mafizul and Biswa Nath Benerjee.1985. *Tenancy and Resource Use Efficiency in Agriculture.* New Delhi: Mittal Publications.

Johnson, D. Gale.1950. "Resource Allocation under Share Contracts." *Journal of Political Economy*, 58 (2): 111-123.

Junakar, P. N. 1976. "Land Tenure and Indian Agricultural Productivity." *Journal of Development Studies,* 13 (1):42-60.

Kuri, Pravat Kumar. 2003. "Factor Market Imperfections and Explanation of Tenancy: Testing an Econometric Model using Evidence from Assam of North East India." *Indian Journal of Agricultural Economics*, 58 (2): 234-245.

Lal Bahadur Shastri National Academy of Administration. 1994. "Land Reforms in Assam: An Empirical Study (1988-1991)." Land Reforms Unit, Mussoorie.

Marshall, Alfred.1920. *Principles of Economics.* London: U. K: Macmillan.

Pant, Chandrashekar.1983. "Tenant and Family Resources: A Model and Some Empirical Analysis." *Journal of Development Economics*, 12 (27-39): 27-38.

Ramachandran, V. K .1980. "A Note on the Sources of Official Data on Landholdings in Tamil Nadu." Data Series No. 1. Madras Institute of Development Studies, Madras.

Ramakumar, R.2000. "Magnitude and Terms of Agricultural Tenancy in India: A State wise Analysis of Changes in 1980s." *Indian Journal of Agricultural Economics*, 55 (3): 337.

Rao, C. H. H. 1971. "Uncertainty, Entrepreneurship and Sharecropping in India." *Journal of Political Economy*, 79 (3): 578-595.

Ray, Debraj. 1998. *Development Economics.* New- Delhi: Oxford University Press.

Shaban, Radwan Ali. 1987. "Testing between Competing Models of Sharecropping." *Journal of Political Economy*, 95 (5): 893-920.

Sharma H. R. 1995. *Agrarian Relations in India: Patterns and Implications.* New-Delhi: Har- Anand Publications.

Sharma, H. R. P. Mehta and K. Mohapatra. 1995. "Tenancy Relations and Productive/Allocative Efficiency: A Study in Orissa Agriculture." *Indian Journal of Agricultural Economics,* 50(4): 597-608.

Sharma, Naresh and Jean Dreze. 1998. "Tenancy." In Peter Lanjouw and Nicholas Stern, eds., *Economic Development in Palanpur over Five Decades.* Oxford: Clarendon Press.

Tripathy, R. N.1985. *Tenancy and Efficiency of Farming in a Developing Economy.* New-Delhi: Mittal Publications.

Appendix A

Table A.1: Land Distribution Pattern of Sample Households by Farm Size Category and Average Size of Land in each Category in Dibrugarh

Farm size Category (Operational/ Ownership)* (in Hectare)	Owned Land					Operated Land				
	No. of Farm House holds	% of Farm House holds	Amount of Land	% of Land	Average Farm Size	No. of Farm House holds	% of Farm House holds	Amount of Land	% of Land	Average Farm Size
	(2)	(3)	(4)	(5)	(6) =(4)/(2)	(7)	(8)	(9)	(10)	(11) =(9)/(7)
NIL	7*	11.9	-	-	-	5**	8.5	-	-	-
0 – 1	18	30.5	8.8	9.6	0.5	13	22.0	9.2	9.2	0.7
1 – 2	18	30.5	28.3	30.9	1.6	22	37.3	30.9	30.9	1.4
2 – 3	5	8.5	11.9	12.9	2.4	12	20.3	30.3	30.2	2.5
3 – 4	6	10.2	20.9	22.7	3.5	3	5.1	10.6	10.6	3.5
4 – 5	5	8.5	21.8	23.8	4.4	3	5.1	14.1	14.0	4.7
5 & above	-	-	-	-	-	1	1.7	5.1	5.1	5.1
All	59	100.0	91.8	100.0	1.6	59	100.0	100.3	100.0	1.7

Note: *These households are pure tenants; ** These households are pure lessors.

Table A.2: Land Distribution Pattern of Sample Households by Farm Size Category and Average Size of Land in each Category in Morigaon

Farm Size Category (Operational/ Ownership)* (in Hectare)	Owned land					Operated land				
	No. of Farm House holds	% of Farm House holds	Amount of Land	% of Land	Average Farm Size	No. of Farm House holds	% of Farm House holds	Amount of Land	% of Land	Average Farm Size
(1)	(2)	(3)	(4)	(5)	(6) =(4)/(2)	(7)	(8)	(9)	(10)	(11) =(9)/(7)
NIL	10*	15.4	-	-	-	5**	7.7	-	-	-
0 – 1	26	40.0	14.0	16.9	0.5	28	43.1	15.9	19.3	0.6
1 – 2	15	23.1	21.0	25.4	1.4	19	29.2	26.2	31.9	1.4
2 – 3	6	9.2	12.9	15.7	2.2	7	10.8	15.9	19.4	2.3
3 – 4	2	3.1	6.4	7.7	3.2	4	6.2	13.9	16.9	3.5
4 – 5	4	6.2	17.7	21.3	4.4	1	1.5	4.9	6.0	4.9
5 & above	2	3.1	10.7	12.9	5.4	1	1.5	5.4	6.5	5.4
All	65	100.0	82.8	100.0	1.3	65	100.0	82.3	100.0	1.3

Note: *These households are pure tenants; ** These households are pure lessors.

Table A.3: Land Distribution Pattern of Sample Households by Farm Size Category and Average Size of Land in each Category in Nalbari

Farm Size Category (Operational/ Ownership)* (in Hectare)	Owned Land					Operated Land				
	No. of Farm House holds	% of Farm House holds	Amount of Land	% of Land	Average Farm Size	No. of Farm House holds	% of Farm House holds	Amount of Land	% of Land	Average Farm Size
(1)	(2)	(3)	(4)	(5)	(6) =(4)/(2)	(7)	(8)	(9)	(10)	(11) =(9)/(7)
NIL	10*	18.9	-	-	-	4**	7.6	-	-	-
0 – 1	20	37.7	11.2	23.1	0.6	17	32.1	11.5	16.1	0.7
1 – 2	19	35.9	26.1	53.9	1.4	21	39.6	29.1	40.9	1.4
2 – 3	3	5.7	7.1	14.7	2.4	8	15.1	18.9	26.9	2.4
3 – 4	-	-	-	-	-	1	1.9	3.4	4.7	3.4
4 – 5	1	1.9	4.0	8.3	4.0	2	3.8	8.3	11.7	4.2
5 & above	-	-	-	-	-	-	-	-	-	-
All	53	100.0	48.4	100.0	0.9	53	100.0	71.0	100.0	1.3

Note:*These households are pure tenants; ** These households are pure lessors.

Table A.4: Land Distribution Pattern of Sample Households by Farm Size Category and Average Size of Land in each Category in Cachar

Farm Size Category (Operational/ Ownership)* (in Hectare)	Owned Land					Operated Land				
	No. of Farm House holds	% of Farm House holds	Amount of Land	% of Land	Average Farm Size	No. of Farm House holds	% of Farm House holds	Amount of Land	% of Land	Average Farm Size
(1)	(2)	(3)	(4)	(5)	(6) =(4)/(2)	(7)	(8)	(9)	(10)	(11) =(9)/(7)
NIL	9*	14.3	-	-	-	5**	7.9	-	-	-
0 – 1	26	41.3	12.9	17.2	0.5	26	41.3	16.8	24.6	0.6
1 – 2	14	22.2	21.2	28.3	1.5	23	36.5	30.6	44.6	1.3
2 – 3	8	12.7	18.1	24.2	2.3	9	14.3	21.2	30.8	2.4
3 – 4	4	6.4	13.5	18.1	3.4	-	-	-	-	-
4 – 5	2	3.2	9.1	12.2	4.6	-	-	-	-	-
5 & above	-	-	-	-	-	-	-	-	-	-
All	63	100.0	74.7	100.0	1.2	63	100.0	68.6	100.0	1.1

Note: *These households are pure tenants; ** These households are pure lessors.

APPENDIX B

Figure A.1: **Comparative Trends in the Yield Rate of Rice in Nalbari, Morigaon and Dibrugarh**

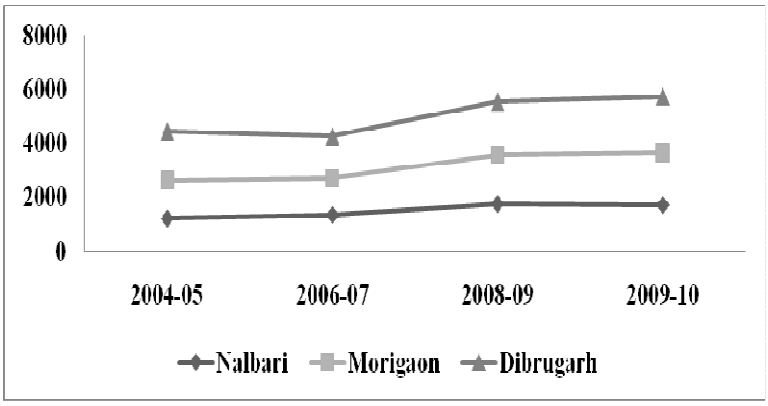


Figure A.2: **Comparison of the Average Amount of NPK per Hectare Applied by the Farms under Different Tenure Status**

Fig. A2.a: Owner Operator and Pure Tenant (in kg)

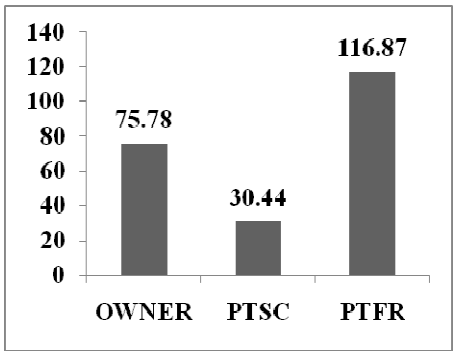
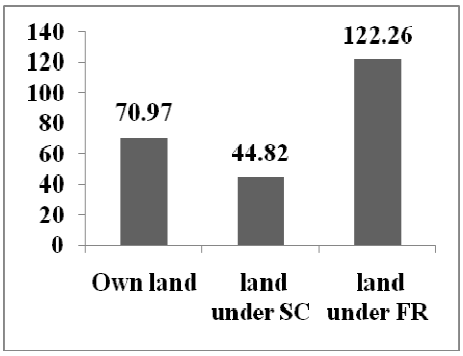


Fig. A2.b: Owner Operator Cum Tenant (in kg)



Note: PTSC: pure tenant sharecropper, PTFR: pure tenant fixed rent, SC: Sharecropping and FR: Fixed rent.