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Farm Business Income across Land-size Classes and Land Tenure Status: A Field Study in Assam Plains

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Abstract

Using farm level data from the plains of Assam, the paper has estimated farm business income across different land-size classes and land tenure status. The analysis has been carried out at the aggregate level as well as at disaggregate level for three specific crops, viz. winter paddy, summer paddy and winter vegetables. It has been found that sharecropping and fixed rent tenancy contracts have a negative and significant impact on farm business income. The lower level of farm business income on leased-in land, especially under sharecropping, can be attributed to payment of a significant amount as rent, which is higher than even that stipulated in the tenancy law. Accordingly, certain reforms in the existing tenancy law have been suggested. The study has suggested a shift in the cropping pattern from the presently predominant winter paddy to more remunerative crops such as vegetables, which is also desired for a healthy transition of Assam agriculture from subsistence cultivation to a profitable venture.

Key words: Farm business income, land-size, land tenure, sharecropping, fixed rent tenancy, paddy, Assam

JEL Classification: Q12, Q15

Introduction

The analysis of income generation through crops cultivation has important implications. The knowledge about differential levels of income from cultivation of different crops may help the farmers to utilize their often limited resources efficiently. This in turn may contribute to increase in income level and uplifting of living standard of the farmers. Moreover, understanding of the factors that contribute to variations in income levels across farm households may help the policy makers to design policies on improving the economic conditions of farmers in an effective manner. Against this backdrop, the present paper, based on data generated through a primary survey in the plains of Assam, has estimated farm business income generated through farming and from different crops individually. The paper has identified the factors that cause variations in income levels across farm households. Among the factors that may potentially affect income generation, two factors, viz. land-size and land tenancy, have been given more attention in this paper.

The study has been conducted in the state of Assam, the largest state in North-East India, where agriculture still contributes a substantial proportion (24.44% in 2009-10) to the gross state domestic product (GSDP) and more than 50 per cent of the workforce is engaged in agriculture (GoA, 2012). Considering the importance of the sector, the issue of what impacts the income generation in crops cultivation and thereby the lives of more than half of the workforce, becomes very pertinent. In this context, the role of various forms of land tenancy contracts and land-size is worth examining for the following reasons. Assam's agriculture is dominated by paddy cultivation and tenancy is widespread in the paddy production in the state

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(Bezbaruah, 1994; Lal Bahadur Shastri National Academy of Administration, 1994; Gautam, 1995; Kuri, 2003). The present study has found that about one-third of the sample area is under tenancy with sharecropping as the dominant form of tenancy contract. In terms of land-size, almost all the sample farmers are either marginal, small or at best medium farmers with the average size of operational holding of 1.34 ha. There is not a single farmer in the sample operating on more than 6 ha of land. In view of the widespread incidence of tenancy and predominance of smallholders farming, the study has analysed farm business income across the available land-size classes under different forms of tenancy contracts in Assam agriculture.

Data and Methodology

In Assam, about 81 per cent of the total geographical area comprising Brahmaputra Valley and Barak Valley is plain and the remaining 19 per cent constitutes hills. The hills and the plains are distinctively different in terms of both agricultural practices and institutions. While shifting cultivation is still predominant in the hills, settled cultivation is practised in the plains. On the other hand, land is owned privately in the plains, but the transition to individual ownership of land from community ownership is not yet complete in the hills. Hence, the present study was limited to the plains of Assam.

The study is based on the primary data collected using multi-stage sampling technique during 2011-12. At the first stage, four non-contiguous districts, three from Brahmaputra Valley and one from Barak Valley and then one development block from each of these districts, were selected purposively. These selected districts fall in four distinct agro-climatic zones, viz. Dibrugarh in Upper Brahmaputra Valley Zone, Morigaon in Central Brahmaputra Valley Zone, Nalbari in Lower Brahmaputra Valley Zone and Cachar in Barak Valley Zone. The development blocks selected from these districts were Borboruah, Mayang, Chamata and Narshimpur. Then three villages were selected from each block and finally 7-10 per cent of farm households from each village were selected randomly for the survey. In this way, a total of 221 farm households were selected for interview.

Line of Analysis

The paper has estimated two variants of farm business income, viz.

(i) Farm business income–1 (FBI-1) which denotes return over variable costs per hectare of land without considering cost of family labour, and

(ii) Farm business income–2 (FBI-2) which is return over variable costs plus the imputed costs of family labour per hectare of land.

The farm business income from the overall cultivation as well as from three individual crops, viz. winter paddy, summer paddy and winter vegetables, was analysed at two levels. At the first stage, FBI-1 and FBI-2 were analysed in terms of land-size classes and land tenure status through tabular analysis. Then, a multiple regression analysis was carried out to examine the effect of land tenure status and land size on FBI-1 and FBI-2 more rigorously by controlling for interferences of other factors. Both FBI-1 and FBI-2 were regressed on land-size and tenure status besides certain control variables. Since farm business income may depend on factors other than land-size and land tenure status of farmers, it is important that the effects of those variables are controlled for to isolate the effects of land-size and tenure status. The theoretical justifications for inclusion of these variables along with their definitions are given below.

The independent and control variables considered in the regression analysis were broadly divided into five categories, viz., farmer's characteristics, tenure status, input intensity, enabling factors and locational dummy. The farmer's characteristics included his age (AGE), education level[1] (EDU) and land size in hectare (FS). Since the age of a farmer reflects his experience, it was expected to contribute positively to farm business income. Likewise, education should also have a positive impact. The land size could have either a positive or negative effect[2] (Goswami, 2012). The tenure status included two variables, viz., area under sharecropping as a percentage of operational holding (ASC) and area under fixed rent as a percentage of operational holding (AFR)[3]. Sharecropping is expected to have a negative effect on income generation (Marshall, 1920). However, the effect of fixed rent contract on farm business income might be either positive or negative — positive as it might contribute

to productivity yield[4] and negative if the tenants needed to pay a higher rent and had higher input intensity. The input intensity included the following five variables: labour cost per hectare of operational holding (LAB)[5], tilling cost per hectare of operational holding (TILL), area under irrigation as a percentage of operational holding (IRRI), area under HYVs as percentage of operational holding (HYV) and fertiliser consumption measured in terms of NPK per hectare of operational holding (NPK).

It was assumed that the farmer was rational and given his experience in farming, he would apply inputs till the level where the contribution of the inputs to income is positive. The enabling factors included access to extension service (EXT) and access to credit (CREDIT). While access to credit should enable the farmers to apply productivity-enhancing inputs, the access to extension services should enable the farmers to apply these inputs in a scientific way. Besides, farmers having access to extension service might also have access to market information. Thus, these two factors were expected to influence farm business income positively. Access to extension has been used as a dummy variable, where D = 1 if the i-th farmer had received any direct benefits from the government's extension service network; D = 0, otherwise[6]. Similarly, access to credit is also a dummy variable, where, D = 1, if the i-th farmer had access to institutional credit and otherwise D = 0. Finally, since the data used in the regression analysis came from a sample of households covering four different agro-climatic zones, three locational dummies have been introduced to control for the impact of agro-climatic variations and differences in cropping pattern and soil quality on farm business income. Thus, taking Dibrugarh as the reference category, the three dummies used were: D_1, D_2 and D_3, where D_1 = 1 for Morigaon, 0 otherwise; D_2 = 1 for Nalbari, 0 otherwise; and D_3 = 1 for Cachar, 0 otherwise. *A-priori*, it was not possible to predict as to what signs the coefficients of these locational dummies would take. In addition, the regression of farm business income had another variable which was cropping intensity (CI). The higher level of cropping intensity would mean higher farm business income, implying that the variable would have a positive impact on farm business income.

Thus, after incorporating the variables mentioned above, the following two linear multiple regression equations were arrived at for estimation.

$$\text{FBI-1}_i = \beta_0 + \beta_1 AGE_i + \beta_2 EDU_i + \beta_3 FS_i + \beta_4 ASC_i + \beta_5 AFR_i + \beta_6 LAB_i + \beta_7 TILL_i + \beta_8 IRRI_i + \beta_9 HYV_i + \beta_{10} NPK_i + \beta_{11} EXT_i + \beta_{12} CRE_i + \beta_{13} CI_i + \beta_{14} D_{1i} + \beta_{15} D_{2i} + \beta_{16} D_{3i} + U_i \quad \ldots(1)$$

$$\text{FBI-2}_i = \beta_0 + \beta_1 AGE_i + \beta_2 EDU_i + \beta_3 FS_i + \beta_4 ASC_i + \beta_5 AFR_i + \beta_6 LAB_i + \beta_7 TILL_i + \beta_8 IRRI_i + \beta_9 HYV_i + \beta_{10} NPK_i + \beta_{11} EXT_i + \beta_{12} CRE_i + \beta_{13} CI_i + \beta_{14} D_{1i} + \beta_{15} D_{2i} + \beta_{16} D_{3i} + U_i \quad \ldots(2)$$

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

The estimates of the parameters were obtained using software STATA 10.0.

Since the data used in this exercise came from a cross-section of farmers, before estimating the model, the Breusch-Pagan/Cook-Weisberg test was applied to check for the presence of heteroskedasticity in the data set. The result of the test showed the presence of heteroskedasticity and consequently, the robust standard error was estimated.

Profile of Sample Farmers in Assam

Table 1 shows the distribution of the sample farm households and areas under different size classes of operational holding. Table 1 reveals that in terms of both number and area, most of the sample farmers were marginal (<1 ha) or small (1-2 ha) farmers.

There are four categories of households in the sample in terms of their tenure status. Of all, the owner-

Table 1. Percentage distribution of farm households and areas under different size classes of operational holdings

Operational holdings (in ha)	Sample households (%)	Sample areas (%)
0-1	38.01	16.59
1-2	38.46	36.27
2-3	16.30	26.78
3-4	3.62	8.64
4-5	2.71	8.48
5-6	0.90	3.24

Source: Author's calculations based on field survey data

Table 2. Tenure status-wise cropping pattern in Assam

(in per cent)

Tenure status	Winter-paddy	Summer-paddy	Winter vegetables	Rapeseed & mustard	Potato	Jute
Owner Operator	**58.35**	**21.67**	9.15	7.72	2.21	0.90
Sharecropping	**88.37**	9.40	-	1.31	0.48	0.44
Fixed rent	22.12	**39.36**	21.54	16.20	0.39	0.39
Overall	**58.18**	**22.09**	9.37	7.78	1.74	0.84

Note: (i) The figures represent the percentage shares of the crops in the total cropped area;
(ii) '-' means no farmer was available in that size class.

Source: Author's computation

operator-cum tenant is the predominant category (37.10 %), followed by owner operator (33.48 %), pure tenant (16.30 %) and owner operator-cum-lessor (13.12 %). It may be mentioned that for analysis of income generation in terms of tenure status, we have considered mainly three categories of operational holdings. Operational holdings of the owner operators and the owner operator-cum-lessor and the owned land portion of the owner operator-cum-tenant have been considered as 'owned land'. On the other hand, the operational holdings with pure tenants and the leased-in portion of the owner operator-cum- tenant have been considered as 'leased-in land'. Again, within leased-in operational holding, we have taken following two categories: land under sharecropping and land under fixed rent.

Table 2 presents the cropping pattern of three categories of farmers. The major crops that the owner operators grew were: winter paddy (58.35 %), followed by summer paddy (21.67 %) and winter vegetables (9.15 %). The sharecroppers, however, predominantly grew winter paddy (88.37)[7]. On the other hand, the fixed rent tenants mainly grew the following crops: summer paddy (39.36 %), winter paddy (22.12 %), winter vegetables (21.54 %) and rape and mustard (16.20 %).

Farm Business Income of Sample Households in Assam

FBI-1 and FBI-2 from Overall Cultivation

Table 3 presents farm business income from all crops grown during one year by farm households across different size-classes of operational holdings under different tenure status. The figures in Table 3 can be been compared in the following two ways: (i) FBI-1 and FBI-2 in a land-size class across tenure status, and (ii) FBI-1 and FBI-2 by a particular group of farmers across size-classes of operational holding.

While farm business income (both FBI-1 and FBI-2) under fixed rent in the land-size classes of 0-1 ha and 1-2 ha was lower as compared to that on owned land, reverse was the case in the subsequent land-size

Table 3. FBI-1 and FBI-2 under different tenure statuses across different size-classes of operational holdings

(₹/ha)

Income type	Tenure status	Land-size classes (in ha)					
		0-1	1-2	2-3	3-4	4-5	5-6
FBI-1	Owner	28414	20281	19712	19244	13880	33002
	Sharecropper	4377	3382	-	-1568	-	-
	Fixed rent	27041	10081	21570	41019	-	-
FBI-2	Owner	25530	17884	17323	16948	11975	32278
	Sharecropper	575	104	-	-2447	-	-
	Fixed rent	23311	7002	20338	40033	-	-

Source: Author's Computation

classes. On the other hand, farm business income, especially the FBI-2 of the sharecroppers was negligible in comparison to other two groups of farmers across all land-size classes. In fact, the sharecroppers in land-size class of 3-4 ha incurred losses. The reasons behind such a meagre income of sharecroppers as compared to other two groups of farmers are: (i) they cultivate only winter paddy (Table 2) and hence their cropping pattern is less diversified, and (ii) they have to pay half of the produce as rent.

The study has also revealed that yield and input intensities on sharecropped land in all size-classes are the lowest as compared to the owner operators and the fixed rent tenants (Appendix Table 1). This could be one of the reasons for the small farm business income under sharecropping. However, this reasoning does not hold good in the case of farm business income on owned land and land under fixed rent tenancy. While farm business income under fixed rent in the land-size classes of 0-1 ha and 1-2 ha is lower vis-a-vis owned land and opposite is the case in the subsequent land-size classes, yield and input intensities on the land under fixed rent tenancy in all size-classes are higher than those on owned land (Appendix Table 1).

One reason as to why the farm business income in the lower land-size classes is less under fixed rent tenancy relative to owned land, in spite of higher input intensity and yield, may be payment of a substantial amount as rent which the owner operators do not incur. Nevertheless, some fixed rent tenants (especially in higher land-size classes with better resources) may generate more income if yield gains from intensive application of better quality inputs outweigh the higher overall cost of production as compared to the owner operators. The information provided in Appendix Table 1 shows that though yield is higher on land under fixed rent than owned land in all size-classes, the difference is much larger in the higher land-size classes.

The study has found that farm business income of owner operators falls as land-size increases, except for the largest land-size of 5-6 ha. On the other hand, the cost of cultivation first falls from ₹ 20443/ha in land-size class of 0-1 ha to ₹ 16929/ha in land-size class of 1-2 ha (Appendix Table 1) and then increases in all the subsequent land-size classes. Thus, the fall in farm business income in the higher land-size classes may, at least partly, be attributed to the increase in costs of cultivation[8]. The jump in farm business income of owner operators in the largest land-size class (5-6 ha) may be due to higher yield realized by these farmers due to economies of scale. It can be observed from Appendix Table 1 that while the increase in per hectare cost of cultivation between land-size classes of 4-5 ha and 5-6 ha is ₹ 4664, the corresponding increase in yield is ₹ 24,967. Here, the higher yield might have outweighed the increase in cultivation cost sufficiently to result in higher income in that land-size class.

In the case of sharecroppers, an inverse relationship has been observed between land-size and income; both FBI-1 and FBI-2 decreased as land-size increased. In fact, the sharecroppers in the land-size class of 3-4 ha (the largest for sharecroppers) incurred a loss. Although cultivation cost in this land-size class is lower, the fall in yield is much bigger vis-à-vis in the smaller land-size classes, causing the sharecroppers in this land-size class to incur loss. On the other hand, the relationship between the land size and farm business income for the fixed rent tenants is not clear. While the pattern of farm business income on various land-size classes does not match with that of cost of cultivation, it is similar with that of yield (Appendix Table 1). This suggests that farm business income for the fixed rent tenants may be influenced more by yield than by cost of cultivation.

The above analysis being at the aggregate level, may not reveal certain crop-specific information. Hence, we conducted crop-specific analysis of farm business income by selecting three important crops, viz. winter paddy, summer paddy and winter vegetables.

Farm Business Income from Selected Crops

Analysis of FBI-1 and FBI-2 from Winter Paddy

Table 4 presents land-size-wise farm business income from cultivation of winter paddy by owner operators and sharecroppers. Though winter paddy is grown on 22.12 per cent of the cropped area under fixed rent, but the number of farmers growing the crop was small (only 15), and hence this group of farmers was not been included in the analysis. Except for the land-size class of 0-1 ha, the FBI-1 was more on the owned land than the sharecropped land. In fact, when family labour was accounted for in FBI-2, the figures in all land-size classes turned negative for the sharecropped land. The reason for this could be

Table 4. Tenure status-wise FBI-1 and FBI-2 from cultivation of winter paddy in different land-size classes

(₹/ha)

Income type	Tenure status	Land-size classes (in ha)				
		0-1	1-2	2-3	3-4	4-5
FBI-1	Owner	2227	4243	1322	10385	-5196
	Sharecropper	3088	2719	-	-1334	-
FBI-2	Owner	377	2641	-172	8282	-5860
	Sharecropper	-195	-271	-	-2081	-

Source: Author's computation

payment of 50 per cent of produce as rent. From the study, the relation between land-size and farm business income on the owned land is not clear. However, a comparison of farm business income and yield and costs of cultivation (Appendix Table 2) on owned land suggests that variations in farm business income across land-size classes are probably influenced more by the variations in yield than in cost of cultivation. For example, the owner operators in the land-size class of 4-5 ha in which they incurred loss, experienced a fall in yield of ₹ 10,985/ha and an increase in cultivation cost of only ₹ 3,157/ha, as compared to those in the land-size class of 3-4 ha. On the other hand, FBI-1 is more in the lower land-size classes under sharecropping, the reason for which is the use of more family labour in the small plots (see Appendix Table 2).

The losses incurred in terms of FBI-2 on the sharecropped land (in fact, FBI-1 also became negative in the land-size class of 3-4 ha) increased as land-size increased which could be due to the problems associated with the management of a bigger farm. In the sharecropped land, no clear association of farm business income across land-size classes with costs of cultivation and yield was observed. However, it may be pointed out that the fall in yield was substantial as compared to the fall in costs of cultivation in the land-size class of 3-4 ha (where the loss for sharecroppers was highest) vis-à-vis 1-2 ha (Appendix Table 2).

One point that needs to be mentioned at this juncture is that not only the farm business income from winter paddy cultivation is negative on the sharecropped land, the farm business income on owned land is also negligible. Yet, winter paddy is the predominant crop grown on the sharecropped and owned lands[9]. One would wonder as to why a rational farmer should grow a crop when he incurs a loss or cannot have enough income from it. One plausible explanation is that it is grown basically for self-consumption.

Analysis of FBI-1 and FBI-2 from Summer Paddy

Table 5 presents farm business income from cultivation of summer paddy on owned land and land under fixed rent. Both FBI-1 and FBI-2 were found considerably higher on owned land relative to the land under fixed rent. Both FBI-1 and FBI-2 on land under fixed rent in the land-size class of 1-2 ha were negative. It may be due to the higher costs of production on land under fixed rent than on owned land (see Appendix Table 3) besides the rent that the tenants had to pay additionally. On the other hand, no clear association between land-size and farm business income could be found for the owned land and for the land under fixed rent. However, a comparison of farm business income with cultivation cost and yield on owned land suggests that variations in farm business income across land-size classes may be influenced more by variations in yield than in costs of cultivation. In the case of land under fixed rent, variations in both cost of cultivation and yield might have contributed to the variations in farm business income across land-size classes as it has been observed that an increase (decrease) in farm business income is associated with increase (decrease) in yield and a fall (increase) in cost of cultivation.

Analysis of FBI-1 and FBI-2 from Winter Vegetables

Table 6 reveals that farm business income from cultivation of winter vegetables on land-size class of 0-1 ha is more on owned land as compared to on land under fixed rent; the opposite is the case in the land-

Table 5. Tenure status-wise FBI-1 and FBI-2 from cultivation of summer paddy in different land-size classes

(₹/ha)

Income type	Tenure status	Land-size classes (in ha)				
		0-1	1-2	2-3	3-4	4-5
FBI-1	Owner	32013	20961	57359	16740	39759
	Fixed rent	18562	-7237	21570	-	-
FBI-2	Owner	29606	19661	54112	16740	39147
	Fixed rent	15958	-8681	20338	-	-

Source: Author's computation

Table 6. Tenure status wise FBI-1 and FBI-2 from cultivation of winter vegetables in different land-size classes

(₹/ha)

Income type	Tenure status	Land-size classes (in ha)			
		0-1	1-2	2-3	3-4
FBI-1	Owner	75894	41297	-	-
	Fixed rent	43475	54562	18413	78815
FBI-2	Owner	67145	37797	-	-
	Fixed rent	39871	44702	18413	76843

Source: Author's computation

size class of 1-2 ha. The higher farm business income on owned land in the size class of 0-1 ha could be due to use of more family labour by the owner operators in this land-size class as compared to the fixed rent tenants (see Appendix Table 4). In the case of winter vegetables also, the relation of land-size with farm business income is not clear. However, comparing incomes, yields and costs of cultivation, it can be observed that the fall in income from ₹ 75894/ha in 0-1 ha category to ₹ 41297/ ha in 1-2 ha category on owned land could be due to the fall in yield and increase in costs of cultivation. On the other hand, the variations in farm business income across land-size classes on the lands under fixed rent seem to have more to do with variations in yield than in cost of cultivation (see Appendix Table 4)

Thus, the analysis at the aggregate level shows that while farm business income on land under fixed rent in the smaller land-size classes is lower as compared to that on owned land, the reverse is the case in the subsequent land-size classes. The farm business income on the sharecropped land, however, is the lowest relative to owned land and land under fixed rent tenancy. In terms of land-size, while in case of the fixed rent tenants, the relationship between the land-size and farm business income is not clear, the performances of the owner operators and the sharecroppers reveal a unambiguous inverse relationship if the land-size class of 5-6 ha in case of the owner operators is ignored.

On the other hand, the dis-aggregate level analysis carried out for three selected crops reveals as follows. In the case of winter paddy, except for the land-size class of 0-1 ha, the FBI-1 is higher on the owned land relative to the sharecropped land. In fact, after accounting for the cost of family labour, farm business income accruing to households becomes negative in all land-size classes for the sharecropped land.

In the summer paddy, both FBI-1 and FBI-2 are higher on owned land relative to the land under fixed rent. Lastly, it has been found in case of winter vegetables that farm business income is more on owned land in the land-size class of 0-1 ha as compared to the land under fixed rent; it is the opposite is the case of land- size class of 1-2 ha. No clear association between land-size and farm business income, except for the sharecroppers in case of winter paddy, could be observed at the dis-aggregate level. Thus, the facts that

emerge from this analysis are: (i) At the aggregate level sharecroppers have the lowest income and there is an inverse relationship between land- size and farm business income on sharecropped land, and (ii) FBI-2 on sharecropped land is lower than on owned land in the case of winter paddy and both FBI-1 and FBI-2 are higher on owned land than on land under fixed rent tenancy in the case of summer paddy.

Econometric Analysis

To get a deeper insight into the relation of land-size and tenure status with farm business income, regression analysis was carried out. Though the regression analysis has been done at the aggregate level, the possibility of crop-specific information distorting the results was very minimum for the following two reasons: (1) the technology used for cultivating a specific crop by a farmer, irrespective of his land tenure status, is more or less same, and (ii) incorporation of certain variables either as independent or control variables would indirectly represent the impact of crops grown. As for example, incorporation of area under sharecropping as a proportion of the total operational holding of a household, area under HYVs as a proportion of total operational holding and per hectare fertilizer consumption by a household as either independent or control variables should be sufficient to account for the impact of the cultivation of winter paddy (On one hand, winter paddy is the predominant crop grown on sharecropped land, use of HYVs and fertilizer in the cultivation of this crop is very minimum irrespective of the tenure status of the farmers on the other hand) by a household on the productivity of operational holding and income generation of that household. The results of regression analysis are summarized in Table 7.

It has been found that the coefficients of area under sharecropping and area under fixed rent are negative and significant in the regression equations of both FBI-1 and FBI-2. While the coefficient of area under sharecropping is significant at 1 per cent level of significance, the coefficient of area under fixed rent is significant at 10 per cent level of significance. Thus, these results imply that if the leased-in area constitutes a larger proportion of the total operational holding of a household, especially if leased-in under sharecropping, the household would have relatively lower farm business income. The reason for lower

Table 7. Results of regression analysis for FBI-1 and FBI-2

Test of heteroskedasticity	BP/CW test Chi^2 [1] = 64.28 Prob. = 0.0000	BP/CW test Chi^2 [1] = 69.76 Prob. =0.0000
Dependent variables	FBI-1	FBI-2
Independent variables /constant	Estimates of coefficients/values	
AGE	76.51	84.22
	(102.41)	(99.81)
EDU	1729.62	1895.05
	(1304.39)	(1247.87)
FS	-2067.69	-1624.27
	(1581.06)	(1561.45)
ASC	-150.94***	-159.52***
	(28.17)	(27.96)
AFR	-97.66*	-105.83*
	(58.01)	(55.09)
IRRI	85.29	90.38
	(57.09)	(56.21)
LAB	0.04	-0.11
	(0.52)	(0.48)
TILL	-0.03	-0.20
	(0.93)	(0.90)
HYV	159.12***	161.55***
	(53.02)	(52.23)
NPK	2.06	3.49
	(22.81)	(22.36)
EXT	10450.39	11541.93
	(13472.5)	(13804.16)
CREDIT	1285.80	1813.08
	(4072.06)	(4003.23)
CI	159.52**	152.57**
	(64.11)	(63.68)
D_1	-13171.28**	-10464.19*
	(5790.90)	(5736.15)
D_2	-16738.16***	-14997.76***
	(4991.28)	(4955.59)
D_3	-4547.38	-3270.65
	(3832.89)	(3752.752)
CONSTANT	-3969.44	-7230.30
	(7274.05)	(7211.68)
R^2	0.35	0.37
F	6.73***	7.18***
	[16, 197]	[16, 197]

Notes: The figures within ( ) and [ ] are heteroskedasticity consistent robust standard error and degrees of freedom, respectively.

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

income on the land under sharecropping and fixed rent is the payment of a substantial amount as rent to the lessors. It was interesting to note that the coefficient of land size did not appear to be significant in any of the two regression equations.[10]

Two other variables that contribute positively to farm business income are area under HYVs and cropping intensity. The area under HYVs has a coefficient which is significant at 1 per cent level of significance in the regression equations for both FBI-1 and FBI-2, whereas the coefficient of cropping intensity is significant at 5 per cent level of significance in both the equations. Among the locational dummies, the coefficients of D_1 and D_2 are negative and significant in the regression equations of FBI-1 and FBI-2.

Conclusions and Policy Implications

The study has found that sharecropping and fixed rent tenancy contracts have adverse impact on farm business income in Assam. The lower level of farm business income on leased-in land, especially on sharecropped land, can be attributed to high amount (50% of produce in case of sharecropping) of rent being paid by the tenants. The implementation of tenancy law prevailing in the state with provisions for regulation of land rents has never been much effective. In fact, informal or concealed tenancy has made the law redundant. All the tenancy contracts in our study were informal. The emergence of concealed tenancy may be attributed to a restrictive provision in the tenancy law. The existing law has the provision of a tenant becoming an occupancy tenant and ultimately the owner of the land if he holds the land continuously for three years. Owing to this stringent condition, the lessors do not want the tenancy contracts to be recorded making it impossible for the tenants to realise the benefits of the law. Hence, if the tenants are to be protected from the burden of exorbitant rent, the first step would be to reform this stringent provision in the tenancy law and record the tenancy contracts.

It has been observed that cropping intensity has a positive impact on farm business income. In the present study, however, the cropping intensity has been found to be very low. The cropping intensity of owner operators, sharecroppers and fixed rent tenants has been found as 131 per cent, 112 per cent and 120 per cent, respectively. Even at the state level, the cropping intensity is much lower (148% in 2010-11), implying that there is a potential for improvement. In fact, the Ministry of Agriculture of Government of Assam has targeted an increase of cropping intensity for the state of Assam from 148 in 2010-11 to 174 by 2016-17. However, given the dominance of winter paddy in the cropping pattern, it remains doubtful whether the target would be achieved since winter paddy can be cultivated during one particular season only.

The people of Assam being predominantly rice consumers; rice is the major crop with more than 70 per cent of the gross cropped area under it. Again within rice, winter paddy is the main crop since this is largely grown for self-consumption. In fact, as the present study has shown, in spite of not generating sufficient income (the sharecroppers actually incur losses), the farmers continue to grow winter paddy for self-consumption and in recent times, the area under winter paddy has continued to increase. On the other hand, increment in the area under summer paddy, vegetables and other horticultural crops has been very minimal, though incomes from these crops are relatively more. Hence, a shift in the cropping pattern from winter paddy to summer paddy and vegetables is required[11]. These should help in increasing the cropping intensity also as mostly short-duration HYVs are used while cultivating these crops.

If food security of the farmers could be ensured through proper execution of the public distribution system or through direct cash transfer, one may expect that there would be a shift in cropping pattern and increase in cropping intensity. Given the access to subsidised food grains, the rational choice of farmers would be not to produce those crops if their cultivation is not profitable. In the context of Assam, given the fact that winter paddy is a subsistence crop, we can therefore expect a shift from winter paddy to summer paddy and other horticultural crops. Such a change will however get materialized only when it is complemented with the supporting infrastructure such as irrigation facilities, credit, cold storage, transportation and marketing facilities. Ignoring these needs will unfold a serious crisis in Assam's agrarian sector. This comprehensive change is also inevitable for ensuring that the Government of Assam is able to attain its target for achieving the targeted increase in the cropping intensity. The change in cropping pattern and associated

increase in cropping intensity will in turn ensure that the agriculture sector in Assam makes a healthy transition from its current subsistence level to a profitable venture.

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End-Notes

[1] In terms of education level of a farmer, there are five categories, viz., illiterate, below primary, primary to high school, matriculates and undergraduates and graduates and above. In the regression analysis these five categories have been assigned values from 0-4, respectively.

[2] While, on one hand, the small farms may have the advantage of abundant labour which helps in raising many crops and consequently income, they may face the constraints on financial resource on the other hand. The big farms usually do not have the financial constraint but may confront managerial problems. Hence the sign of the coefficient of this variable cannot be anticipated *a-priori*.

[3] Operational holdings were divided into three parts and not necessarily all parts occurred in each observation. These were the parts under sharecropping, fixed rent tenancy and owner operated. In the regression analysis it is neither possible nor necessary to include these three parts as separate independent variables. If all the three parts are included, they add up to 100 per cent in each observation, resulting in perfect multi-collinearity situation. In view of the focus of the paper, the two independent variables included were percentages of operational holdings under sharecropping and under fixed rent tenancy. Indeed given other control variables, the effect on the dependent variable of owner operated part of the operational holding was captured by the constant term in the respective regression equations.

[4] Unlike the sharecroppers, the fixed rent tenants don't suffer from the incentive problem and supply adequate efforts so as to maximize economic surplus.

[5] The cost of labour has been expressed in value (monetary) terms. Although not substantial, there are variations in the wage rates prevailing across field study locations. We have taken the average of the existing wage rates in the four field study locations and then multiplied the number of man days – both hired and family – by the average wage to obtain the total cost of labour.

[6] Six questions relating to the extension service while interviewing the farmers were asked. Farmers' responses to these questions indicated whether they had received any direct benefits from the extension service. On the basis of the farmers' responses to these questions, the variable D was assigned the value 0 or 1.

[7] Goswami and Bezbaruah (2013) have explained as to why the sharecroppers predominantly grow winter paddy in the following way: "Sharecropping is usually the preferred form of contract when the crop grown is the conventional winter paddy. Winter paddy is grown during the rainy season and harvested during winter. As a result, it is subjected to greater risk and uncertainty caused by weather conditions than crops grown in the other seasons. Since, under sharecropping, the risk associated with the crop is also shared along with the output, the tenants prefer sharecropping when they grow winter paddy".

[8] It can be observed from Appendix Table 1 that labour cost is the largest component of total costs of cultivations.

[9] For the state of Assam, while paddy is the main crop, within paddy winter paddy is the one which has the highest portion of rice acreage under it. In fact, area under winter paddy has increased over the time. Share of rice in total cropped area increased from 73.64 per cent in 2007-08 to 75.34 per cent in 2009-10 (Goswami, 2012). On the other hand, the share of winter paddy in total rice acreage increased from 67.16 per cent in 2000-01 to 72.94 per cent in 2012-13 (GoA, 2013). The area under summer paddy has also increased during the same period but only marginally (from 3.2 lakh ha in 2000-01 to 3.99 lakh ha in 2010-11).

[10] For a possible explanation as to why land size does not have any impact on productivity and income generation, one may need to look at two significant

changes which the organization of agricultural production has undergone. One of those changes is the emergence of various markets for the services of factors of productions. Among all such markets, the most crucial ones are the markets for the services of tractor/power tiller and that of the instruments for irrigation. The emergence of markets for the services of inputs has made cultivation much easier than before. The farmer does not have to possess the factors of productions; he can rent-in the services of the inputs from markets. The other change that has occurred is in the process of crop cultivation. A decade ago or so, the process of cultivation was such that the farmer would stand behind the plough by himself and perform each part of the cultivation process. He would, at best, hire a labourer to work alongside him during the time of transplantation and harvesting. Now-a-days, however, it has been observed that most of the farmers prefer to contract out almost all the parts of the cultivation process. Contracting out is preferred by the farmers as it minimizes the necessity to monitor to a large extent which otherwise would have been a costly affair had the labour been hired in a wage contract. Thus, the farmer's job has become less labour- intensive; in fact the farmer's role has got reduced to that of a manager only. Thus, on one hand, emergence of markets has allowed the farmers to hire the services of inputs and thereby it has made the resource constraint that the small farms usually face less binding. On the other hand, the possibility of contracting out parts of cultivation process has nullified the disadvantage of not having sufficient family labour which the big farms may face (Goswami, 2016).

[11] Another reason as to why a shift towards summer paddy and winter vegetables may help the farmers is that these crops involve little weather risk. This would induce the farmers to apply more of better quality and costly inputs like HYVs, fertilizers, pesticides, irrigation and so on. Application of these inputs though increases the costs of production; it minimizes production risk and increases the production, productivity and consequently, income. It is evident from our analysis (Tables 4, 5 and 6) that notwithstanding the loss incurred by the fixed rent tenants in the size class of 1-2 ha in the case of summer paddy, the farm business income in summer paddy is considerably higher, and more so in the case of winter vegetables as compared to winter paddy.

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Appendix Table 1: Land tenure status-wise expenditures on key inputs in overall cultivation in different land-size classes in Assam

(₹/ha)

Expenditure type	Land tenure status	Land-size class					
		0-1 ha	1-2 ha	2-3 ha	3-4 ha	4-5 ha	5-6 ha
Yield per hectare	Owner	45974	34812	34501	35056	36719	61686
	Sharecropper	31078	31746	-	21077	-	-
	Fixed rent	65858	50219	59759	83020	-	-
Labour	Owner	9303	7778	7679	7808	9058	12891
	Sharecropper	7925	8266	-	6499	-	-
	Fixed rent	12164	13626	15388	12158	-	-
% of family labour in total labour	Owner	34	37	31	40	26	7
	Sharecropper	49	42	-	14	-	-
	Fixed rent	37	26	8	12	-	-
Services of capital goods*	Owner	7043	5414	5621	6765	6924	9822
	Sharecropper	5318	5440	-	5673	-	-
	Fixed rent	13175	11139	8601	8523	-	-
Other purchased inputs	Owner	4097	3737	3877	3535	8763	6696
	Sharecropper	1720	2063	-	813	-	-
	Fixed rent	7333	8208	3481	12969	-	-
All inputs	Owner	20443	16929	17177	18108	24745	29409
	Sharecropper	14963	15769	-	12985	-	-
	Fixed rent	32672	32973	27470	33650	-	-

Note: *Expenditures on the services of capital goods include costs of hiring the services of power tiller, tractor and pump-set.

Appendix Table 2: Land tenure status-wise expenditures on key inputs in winter paddy in different land-size classes in Assam

(₹/ha)

Expenditure type	Land tenure status	Land-size class				
		0-1 ha	1-2 ha	2-3 ha	3-4 ha	4-5 ha
Yield per hectare	Owner	11748	12988	11209	20347	9362
	Sharecropper	24123	25591	-	17928	-
Labour	Owner	5022	4428	4924	4272	4084
	sharecropper	7022	6858	-	5528	-
% of family labour in total labour	Owner	30	28	24	34	16
	sharecropper	50	44	-	14	-
Services of capital goods	Owner	4181	4229	4698	6241	5423
	sharecropper	3906	4735	-	4826	-
Other purchased inputs	Owner	2167	1690	1760	1552	5715
	sharecropper	1328	1479	-	692	-
All inputs	Owner	11370	10347	11382	12065	15222
	sharecropper	12256	13072		11046	

Appendix Table 3: Land tenure status-wise expenditures on key inputs in summer paddy in different land-size classes in Assam

(₹/ha)

Expenditure type	Land tenure status	Land-size class				
		0-1 ha	1-2 ha	2-3 ha	3-4 ha	4-5 ha
Yield per hectare	Owner	55776	48202	83663	44820	74699
	Fixed rent	56455	45816	59759	-	-
Labour	Owner	10715	13341	14477	12602	17008
	Fixed rent	11366	17488	15388	-	-
% of family labour in total labour	Owner	27	12	22	0	4
	Fixed rent	29	8	8	-	-
Services of capital goods	Owner	12344	12158	11247	12378	13606
	Fixed rent	6908	7166	4400	-	-
Other purchased inputs	Owner	3110	3042	3827	3100	4938
	Fixed rent	11169	14405	7682	-	-
All inputs	Owner	26169	28541	29551	28080	35552
	Fixed rent	29443	39059	27470	-	-

Appendix Table 4: Land tenure status-wise expenditures on key inputs in winter vegetables in different land-size classes in Assam

(₹/ha)

Expenditure type	Land tenure status	Land-size class			
		0-1 ha	1-2 ha	2-3 ha	3-4 ha
Yield per hectare	Owner	109402	87253	-	-
	Fixed rent	90884	112049	77613	112049
Labour	Owner	15204	16859	-	-
	Fixed rent	11772	21065	22410	7948
% of family labour in total labour	Owner	53	24	-	-
	Fixed rent	31	47	0	25
Services of capital goods	Owner	7892	6815	-	-
	Fixed rent	6096	6235	4773	6588
Other purchased inputs	Owner	19162	25781	-	-
	Fixed rent	25395	35564	10540	16934
All inputs	Owner	42258	49455	-	-
	Fixed rent	43263	62864	37723	31470