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RESEARCH PAPER

Socio-environment factors on willingness of agricultural land conversion - Micro level approach

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ABSTRACT

Land is a finite natural national resource, directly link with all economic development activities and especially agricultural production highly depends upon large scale of land due to inefficiency in production. India is a land scarce country where per capita cultivated land is only around 0.15 ha (Planning Commission 2011). Agricultural land conversion is a process by which land is changed from agricultural purposes to urban and industrial uses. The study was conducted to identify the factors influencing the willingness of conversion among the farm households in Western zone of Tamil Nadu. From the results it was observed that the market value of land positively influenced the willingness of land conversion and farm productive value and assurance of irrigation reduced the willingness of land conversion.

KEY WORDS : Agricultural land conversion, influencing factors, Socio-environment

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Land is a finite natural national resource, directly link with all economic development activities and especially agricultural production highly depends upon large scale of land due to inefficiency in production. India is a land scarce country where per capita cultivated land is only around 0.15 ha (Planning Commission, 2011). Agricultural Land conversion is a process by which land is changed from agricultural purposes to urban and industrial uses. These are two main drivers of agricultural land conversion in India resulting in loss of productive arable lands. Resource shortage, labour shortage, institutional limitations and environmental degradation are grass root constraints which affect the farm household's profitability. Another side the value of agricultural land got appreciation due to industrialization and urbanization. Keeping this view, the study was conducted to identify the determinant factors of willing to convert the land among the farm households in western zone of Tamilnadu comprising Coimbatore, Tirupur and Erode districts are one of the industrial and urbanized zones in Tamil Nadu state.

Shunji and Ruth Kattumuri (2010) studied the cultivated land conversion in China and the potential for food security and sustainability in China. They investigated the relationship between cultivated land, environment, and food security in China; and seeks to identity the main challenges facing China in terms of arable land protection. It further discusses the concept and practical implications of land governance in relation to food and environmental security, and suggests that comprehensive, human-centred and sustainable land governance is required to enhance China's food security and environmental sustainability.

Quasem (2011) revealed that, the total land owned by a household, near to urban area and the area under homestead and non-agricultural occupation of the household heads also encourages land conversion in Bangladesh. The main non-agricultural uses of converted land were identified to be

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housing, road construction, business establishment and educational and health organizations occupying 55,10,8 and 3 per cent of the converted land, respectively.

The main objectives of the study were

- To study crop wise returns of agriculture in the land conversion zone.
- To study the factors influencing in creating the willingness to convert the land among the farm households.
- To ranks the demand of the farm households for continuing agriculture.

METHODOLOGY

The Western zone of Tamil Nadu comprises Coimbatore, Tirupur and Erode districts which were purposively selected for the study as on one of the industrial and urbanized zones which is relatively higher than other districts of Tamil Nadu. From the selected districts, two blocks from each district were selected which is nearer to city. The villages formed the basis on the locality. From the selected villages, 72 farm households were identified and data were collected from farm households with pretested interview schedule.

Data analysis :

Factors influencing household willingness of conversion **:**

Logistic regression analysis was carried out to quantify the relative importance of factors influencing farmers' decision to sell of farm land. In logistic regression analysis, the farm land willing converters and non-willing converters were included, as farmers were only indulged land sale activity. In farmland sale decision selling of farm land was a dichotomous-dependent variable. Its determinants were assessed using logit model based on logistic cumulative distribution function. This technique has been found useful in situations where we either did not have enough information to study how the actual decisions were made or was just interested in understanding the relative role of factors likely to affect such decisions in a probabilistic sense. The logit technique allowed examination of the effects of a number of variables on the underlying probability of selling farm lands.

The behavioural model used to examine the factors influencing in selling of farmland was

$$Y_i = g(Z_i) \quad \text{.....(1)}$$

$$Z_i = a + \sum b_k X_{ki} \quad \text{.....(2)}$$

where,

Yi = The observed response of the i^{th} respondent (*i.e.* the binary variable $Y_1 = 1$ agricultural land converter and $Y_2 = 0$ for a non-converter)

Zi = An underlying and unobserved index for the i^{th} respondent (when Z exceeded some threshold Z*, the farmer was observed to be agricultural land converter; otherwise non-converter)

X_{ki} = The k^{th} explanatory variable of i^{th} respondent, i = 1, 2, ……, N, where, N was the number of respondents k = 1, 2, …….. M

M was the total number of explanatory variables a = Constant, and b = Vector of co-efficients. The logit model postulated that Pi, the probability that i^{th} respondent selling of, was a function of an index variable Zi summarizing a set of the explanatory variables. In fact, Zi was equal to the logarithm of the odds ratio, *i.e.* the ratio of probability that the respondent selling of farmland to the probability that he do not selling farm land and it could be estimated as a linear function of explanatory variable (Xki). This could be mathematically expressed as :

$$Z_i = \ln\left[\frac{P_1}{1-p_i}\right] = a + \sum_{k=1}^{M} b_k X_{ki} \quad \text{..... (3)}$$

Equation (3) was the logit model (Pindyck and Rubinfeld, 1981), and once this equation was estimated, Pi could be calculated :

$$P_i = f(Z_i) = f(a + \sum b x_i) = \frac{1}{1 + e^{-zi}} \quad \text{..... (4)}$$

$$= \frac{1}{1 + e^{-(a + \sum b_k X_{ki})}} \quad \text{..... (5)}$$

where, 'e' represents base of the natural logarithms and approximately equals to 2.718

The goodness of fit of the model was tested by three approaches.

Firstly, predictions were compared with the observed outcomes and expressed in percentage of correctly predicted.

Secondly, 2-times the log of the likelihood (-2LL) estimate was used as a measure of how well the estimated model fitted the data. A good model was one that resulted in a high likelihood of the observed results.

Emprical model :

The empirical model was applied to identify for factors influencing in willingness to convert of agricultural lands among the farmers :

$Z_i = a + b_1$age + $b_2$education + b_3 fragment + b_4Total land holding + $b_5$nfal + $b_6$cmv + + b_7Annual farm productive value + $b_8$occupation of progeny + b_9 AAAI + Ui

Age :

This is a continuous independent variable indicating the age of the respondents in years. Farming requires lot of physical work and aged respondents face difficulty to manage the farming.

Education :

Education increases the ability of respondent to interpret, understand and modify new information. Thus, it was treated as a proxy for farmer's managerial ability.

Fragment :

Selling of agricultural land was crucially dependent on the degree of fragmentation of farm-holding. With dispersed holding, it was presumed to be more difficult to manage all the land of a farmer than if the land was in a consolidated parcel.

TLHS :

Farm size is expected to influence in willingness to convert. Increase land holding increases the profitable farming. Therefore, *a priori* expectation was that the willingness of selling agricultural land was inversely related to size of farm.

No. of family labour :

It reduces the dependency of outside labour and assures the functions of timely operation of farm activities ; Therefore, *a-priori* expectation was that the willingness of selling agricultural land was inversely related to availability of family labour.

Current market value :

It increases the willingness of land conversion due to increasing in rising of land prices. Therefore, *a-priori* expectation was that the willingness of selling agricultural land was positively related to current market value of land.

Annual farm productive value :

It reduces the willingness of land conversion while the returns is higher. Therefore, *a-priori* expectation was that the willingness of selling agricultural land was inversely related farm productive value.

Progeny occupation :

Most of the farmer's progeny were unwilling to continue the farming due to various social factors. Therefore, *a-priori* expectation was willingness to convert agricultural land was directly related to the progeny occupation.

AAAI (Access to assured and adequate irrigation) :

Highly assured =3;Moderately assured = 2 Low assurance= 1, Rainfed =0). Access to assured and adequate irrigation help to better farming practices and adopt more commercial crops and maintain subsistence farming. Therefore, *a-priori* expectation willingness of land conversion was inversely related to the access to assured and adequate irrigation.

Garrett's ranking technique :

Garrett's ranking technique was adopted to find the relative importance of various factors as revealed by the respondents for non – conversion of agricultural lands to remain in agriculture. Garrett and Wood Worth (1971) have elucidated a scoring procedure for converting the ranks into scores when the number of items ranked differed from respondent to respondent. The conversion method used was as follows. As a first step, the per cent position of each rank was found out by the following formula:

$$\text{Per cent position} = \frac{100(R_{ij} - 0.5)}{N_j}$$

where R_{ij} = Rank given for i^{th} items by the j^{th} individual , N_j = Number of items ranked by j^{th} individual

The respondents were requested to rank the opinions/ reasons relevant to them according to the degree of importance. The ranks given by each of the respondents was converted into scores. Then for each reason, the scores of individual respondents were added together and divided by the total number of respondents.

ANALYSIS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

General characters of sample farm households :

Table 1 reveals that medium farmers accounted 33.33 per cent followed by semi-medium farmers with 31.94 per cent; 44.33 per cent of the farmers had more than 20 years in farming 33.33 per cent of farmers had 10-20 years experience of farming.

Table 1 : General characters of sample farm households

General particulars		No. of households
Area owned (ha)	1 to 2 (Small)	13 (18.06)
	2 to 4 (Semi-medium)	23 (31.94)
	4 to 10 (Medium)	24 (33.33)
	> 10 (Large)	12 (16.67)
Farming experience (in years)	Upto 10 years	4 (5.56)
	10 to 20 years	24 (33.33)
	20- 30 years	32 (44.44)
	More than30 years	12 (16.67)
Total		72 (100)

Cost and returns for major crops :

The return from farming is major factor to influence the decision of land sale. The profitability of major crops was done to assess the viable of agriculture in the area. Farmers grew different crops in their farms and per ha cost and returns for the crops grown are presented in Tables 2 and 3.Return from farming highly depends on price of commodity. So, the crops were classified into two categories *viz.,* low price volatility and high price volatility.

The average productivity recorded of paddy was 4356 kg/ha, maize 4705 and it concluded that it was better than state average. The other crops like cholam (292 kg/ha) groundnut (1410 kg/ha), pulses (515 kg/ha) and sugarcane (114.5 tonnes/ ha) productivity also indicated better productivity in the region. The gross return per hectare for paddy (Rs. 50094) but nearly 72 per cent spent for cost of cultivation. The net return from one hectare of paddy was 13636 rupees. The same observed in sugarcane nearly 66 per cent of returns spent for cost of cultivation. It is an annual crop and net a return from sugarcane was around Rs. 58551 per hectare. In case of maize, the return

Table 2 : Cost and returns for low price volatility crops

Sr. No.	Crop	Paddy	Maize	Cholam	Pulses	Groundnut	Sugarcane
1.	Average productivity (kg/ha)	4356	4705	292	515	1410	114.5
2.	Average total cost of cultivation per ha (in Rs.)	36458	22450	2460	5500	12800	117779
3.	Cost of production for per kg (in Rs.)	8.36	4.78	8.42	10.67	9.07	1146
4.	Average price Rs. / kg	11.5	10.25	18	35	21	1540
5.	Gross return per ha (in Rs.)	50094	48226	5256	18025	29610	176330
6.	Cost cultivation to gross return (in per cent)	72.78	46.55	46.80	30.51	43.23	66.79
7.	Net return per ha (in Rs.)	13636	25776	2796	12525	16810	58551
8.	Profit per kg of output (in Rs.)	3.14	5.47	9.58	24.33	11.92	394

Table 3 : Cost and returns for high price volatility crops

Sr. No.	Crop	Turmeric	Bananan	Tapioca	Onion	Tomato
1.	Average productivity (kg/ha)	5725	16850	35600	10500	12500
2.	Average total cost of cultivation per ha (in Rs.)	173181	134800	36440	75000	28000
3.	Cost of production for per kg (in Rs.)	30.25	8	1.02	7.15	2.24
4.	Average price Rs. / kg	47.5	12	35	15	7.5
5.	Gross return per ha (in Rs.)	63.68	66.73	28.57	47.62	29.87
6.	Cost cultivation to gross return (in per cent)	271937.5	202000	124600	157500	93750
7.	Net return per ha (in Rs.)	98765.5	67400	89000	82500	65750
8.	Profit per kg of output (in Rs.)	17.25	4	33.98	7.85	5.01

Table 4 : Logit analysis to identify the factors influence on conversion *Willingness to Convert – 1 Non Willingness to convert -0*

Sr. No.	Variable	Coefficient	Standard error	T ratio	Odds ratio	Probability
1.	Intercept	4.470	4.855	0.921	0.987	49.67
2.	Age	0.013	0.035	0.374	0.939	18.42
3.	Education	-0.0623	0.099	-0.641	1.247	55.49
4.	No. of land fragmentation	0.221	0.250	0.884	0.765	43.34
5.	Total land holding	0.268	0.206	1.298	1.131	53.07
6.	No. of family labors	-0.123	0.209	-0.589	0.987	49.60
7.	Current market value of land	0.12	0.065	1.85	0.908	47.58
8.	Annual land productive value	-0.1099	0.058	-1.90	0.67	40.11
9.	Occupation status of progeny	0.4001	0.571	0.700	0.175	14.89
10.	Assurance of irrigation	-2.809	1.343	-2.09	2.297	69.66
11.	McFadden rho squared		-	0.190		
12.	-2 Log likelihood		-	39.337		
13.	No of samples		-	72		

was better than paddy, which accounted only 46 per cent of gross to cost of cultivation. In these areas groundnut and cholam are mostly cultivated rainfed condition. Net returns from groundnut were more or less equal to paddy (Table 2).

Cost and returns for major crops :

Most of the horticultural crops have price instability. So the net returns highly depend on sale price of the commodity. The cultivators are facing high price risk for these crops. Here, price was taken for analysis surveyed during selling period of commodity. For turmeric and banana, the cost cultivation was higher. According to present price privilege the net returns from turmeric was around Rs. 98765.5 per hectare and for banana Rs. 67400 per hectare. Moreover, the two crops required high farm investment. The profit may be reduced while price becomes low. The gross return from tapioca was better return than other crops. The net return was around Rs. 89000 per hectare but demand for tapioca is limited. In case of onion and tomato, net returns were Rs. 82500 and Rs. 65750 per hectare respectively but compared to other crops, these vegetable crops have high price volatility in nature (Table 3).

From Table 2 and 3, net profit earned from field crops was comparatively low. In contrary, net profit from horticultural crops was better than field crops but the profit is not assured. If the problem is not solved and the farmers are likely not willing to continue in agriculture. This pushes the famers to convert their agricultural lands. So, better marketing environment should be created with assured profit for their commodities to reduce the willingness of agricultural land conversion among the farm households.

Factors influencing the willingness of land conversion :

The willingness to convert the agricultural land among the farm households depends on the socio-economic condition. The relative importance of these factors was quantified by using a logit regression as willingness to convert was a binary variable. The important variables selected and maximum likelihood estimates of the co-efficients of logistic regression analysis are presented in Table 4.

The results of the logistic regression analysis suggested that the most significant factors affecting the farmer's willingness to convert decision of land was current market value of land positively and annual land productive value and assurance of irrigation negatively. Except total land holding size, the estimation yielded the expected signs for the independent variables according to the *a priori* expectation.

From the results of logistic regression analysis (Table 4) it could be inferred that one unit increase in land value the probability of converting agricultural among the farmers was increased to 47.5 per cent. Higher productive value from the land reduces the willingness of converting agricultural land. The probability of converting agricultural land has reduced to 40 per cent with one unit increase in productive value of land. In other words, the farmers earn good returns from agriculture chance of leaving the decision of selling agricultural land. Assurance of irrigation had highly negative impact of the decision of the farmers to converting the land. In the model assurance of irrigation taken as dummy, the results showed that if the assurance level increases the chances of willingness of converting agricultural land was reduced by about 69.66 per cent.

Factors like age of the respondents (18%), land fragmentation(43 %), total land holding size(53%) and occupation status of progeny (14%) had positive effects on converting agricultural lands though these co-efficients turned out to be non-significant. This implied that the farmer's age, land fragmentation, total land holding size and occupational status of progeny had increased the probability of willingness of agricultural land conversion. Family labour and education reduced the probability of willingness of agricultural land conversion.

Measures taken to avoid agricultural land conversion ranked by the farmers :

Demand of the farm households was asked from the sample respondents and based on their opinion; those requirements were ranked using the Garret score as presented in Table 5.

It is evident from Table 5 that irrigation infrastructure was the major demand followed by solution to labour

Table 5 : Results of garret ranking

Sr. No.	Particulars	Garret Score	Rank
1.	Irrigation infrastructure facilities	70.34	I
2.	Solution to labour scarcity	68.75	II
3.	Help to reclaim of degraded land	34.17	VIII
4.	Widening market opportunities and infrastructure	64.25	III
5.	Adequate farm credit on time	43.92	IV
6.	Renovate the local water bodies	36.15	VII
7.	Safeguard from externalities	41.68	VI
8.	Creating interest on agriculture among the youngsters	42.75	V

scarcity. The Garret scores indicated the relative importance of these demand. Third rank was given to widening market opportunities for the commodities. In the earlier Table 4, the level of profit had access to study the viability of farming and found the low profitability. The demand is of relative importance to raise the profit levels**.** Fourth rank was given to adequate farm credit on time. Even though government increases the target of farm credit year by year but access of farm finance is still an issue. So, institution measure is to be taken to assure the widening of farm credit rather than deepening. Creating interest on agriculture among the youths ranked as fifth by the respondents followed by safeguard from external problems. Renovate the local water bodies ranked seventh and last demand was help to reclaim the degraded land.

Conclusion :

Based on the findings of the study, the net returns from agriculture in the zone were comparative low. The low returns increased the willingness of conversion among the farmers. From the logit analysis, market value of land positively influenced the willingness of land conversion and farm productive value and assurance of irrigation reduced the willingness of land conversion. So, institutional promotion should be taken in marketing and irrigation aspects in the area to reduce the land conversion in the area. Appreciation in market value of land increased the agricultural land conversion. So, regulative measures in land market are to be taken to reduce the agricultural land conversion.

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