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Changes in land use pattern and factors responsible for variations in current fallow land in Bihar, India

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ABSTRACT

Endowment of fertile Gangetic alluvial soil and abundant water resources, particularly groundwater resources altogether constitute core components for development of agriculture in Bihar. Efforts have been made in this paper to analyze factors responsible for changes in land use pattern, especially increase in current fallows, shrinking net sown area and shifting of land for non-agricultural purposes in the state. A larger concentration of current fallow lands was accounted for in Gaya, Patna, Purnea, Munger, Jehanabad and Kishanganj districts. The rainfall and road length have significant impact on the level of current fallows. Erratic monsoon and labour scarcity during the study period of present century resulted in accumulation of current fallow lands. It was further observed that the non-agricultural use of land was identified as the dominant factor for changes in common lands as it affected the current fallows negatively. It is a challenging task for policy makers to maximize the income of farmers from a continuously declining in net sown area, deteriorating climatic conditions as well as labour scarce conditions, thereby resulting in aggregation of current fallows. In order to boost the production and enhance farmer's income, it is necessary to discourage the rising tendency in current fallows or to bring current fallows under cultivation.

Key words: Climatic condition, Current fallows, Endowment, Fallow lands, Profit.

INTRODUCTION

Bihar with a total population of about 116 million people is the most densely populated state in India and ranked third largest state of India with respect to population and seventh in terms of area. Bihar is endowed with various diversified natural gifts. Fertile Gangetic alluvial soil, abundant water resources, particularly groundwater resources together forms the core components for development of agriculture in Bihar. The state is considered as destination for second Green Revolution in the country. Several reports including the National Farmers' Commission have emphasized the need for accelerated development of agriculture in eastern India for securing food security of the country.

Change in land use pattern is a complex phenomenon, which is affected by several socio-economic, climatic conditions and institutional factors. Technological changes have also extended change in land use pattern. Intensive cultivation, resulting in changing marginal land into more productive agricultural lands through capital intensive cultivation, ignited by technological changes (Ramasamy *et al.* 2005) The importance of institutional factors leading to under utilization of agricultural lands, especially when the people employed in urban areas keep lands idle for using it after retirement or for speculative purposes (Nadkarni *et al.* 1979). However, this is not true in case of flood and drought prone areas, and state like Bihar, where farmers are financially weak and technological expansion is very limited. Despite this, the change in land use has taken place in conformity with shifting of land towards non-agricultural uses (Pandey and Tiwari 1987 and Singha and Swain 2016).

There was a general decreasing trend in area under permanent pastures (grazing land) and barren and uncultivable land. Increase in land under non agricultural uses has been due to shifting of area from the land under cultivable waste, current fallows and fallow lands other than current fallow (Sharma and Pandey 1992, Subramanian *et al.* 1994) and (Kumar and Chand 2012). In Bihar, area under current fallow has been found stepping up over the time, thereby reducing the net sown area (Singh and Vashisth 1997). For the state as a whole, the current fallows rose to 8.61% during the seventies(70s) to 9.40% in eighties (80s) and thereafter, it showed declining at 7.58% and 6.53% during 90s and 2000s, respectively and further, turned out to be up by 7.42% during 2003-13. Shifting of land towards non-agricultural uses and declining net sown area are of great concern for food and nutritional security. Competition between agricultural and non-agricultural sectors for land is intensifying due to growing population pressure on land for

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food production, shelter and industrial growth. In 1970-71, net sown area was 62.68%, which reduced to only 58.46% in 2013-14, whereas land put to non-agricultural uses jumped up from merely 11.77% in 1970-71 to 17.85% in 2013-14. However, the shrinkage in net sown area is not being compensated by increased productivity of crops so as to provide fillip to higher production. Decadal growth performance of fallow lands were found negative in the decades of 70s, 80s and 90s, indicating reduction in fallow lands or conversion of fallow lands to agricultural production purposes as well as for non agricultural purposes like establishment of industries, construction of residential buildings, construction of roads and other infrastructural bases (Maalik, 2012, Premakumara 2013), (Sangha 2014 and Sinha *et al.* 2016). But in the decades of 2000s and 2003-13, compound growth rates were found positive i.e. 1.49 and 2.21%. In spite of increasing pressure on land, there is also tendency to keep land fallow due to factors like uncertainty of monsoon, poor irrigation facilities, very costly irrigation through diesel pump sets, labour scarcity etc, reminding that all is not well with land management in the state.

Hence, the present investigation is an attempt to study the factors causing changes in land use pattern especially increasing fallow lands, shrinking net sown area and shifting of lands for non-agricultural purposes in the state.

MATERIALS AND METHODS

The present investigation is based on analysis of secondary data on land use pattern at the district and state level. The time series data on land use pattern in all the districts of divided Bihar were compiled from various issues of Bihar through figures and Economic Survey of Bihar published by Government of Bihar, Patna for the period 1970-71 to 2012-13.The dynamics of land use change pattern in various undivided districts of Bihar were analyzed as the time series data over this period was not available for newly created districts. The data for composite districts were compiled by summing up the data for newly carved out districts, which were the parts of old districts i.e. undivided districts of Bihar.

Growth rate estimation: Compound growth rates for different land use categories for the state were worked out using the log-linear regression equation.

Estimation of instability index: Analysis of instability index is carried out to know the fluctuations or instability in any time series data. First we estimate the parameters of log linear trend line for the variable (Yt) for which instability is to be estimated. If the estimated parameter is statistically significant, the instability index is defined as:

$$\text{Instability index} = CV \times \sqrt{1-R^2}$$

Where, CV= Coefficient of variation for time series data and is estimated as:

$$CV = \frac{SD}{Mean} \times 100$$

Where, SD= standard deviation

If the estimated parameter of regression equation is not significant, then the CV itself is considered as instability index.

Estimation of location coefficient (L): Location coefficient (L) is useful to identify the pattern of distribution of a given categories of land across different regions of the state.

Location co-efficient (L) is estimated as:

$$L = \frac{L_{ij} / L_i}{L_j / L_s}$$

Where, L_{ij} = area of j^{th} category of land in i^{th} district
L_i = area of all categories of land in the district
L_j = area of j^{th} categories of land in the state
L_s = area of all categories of land in the state

A higher value for location coefficient for the district indicates the higher concentration of that particular category of land in that district.

RESULTS AND DISCUSSION

Changing land use pattern: Perusal of the Table 1 revealed that marginal increase in forest land from 6.32 to 6.64 % has been noticed in first four decades i.e. 70s, 80s, 90s and 2000s, after that it was almost constant; the rise in forest land in earlier decades may be due to the aforestation of land on large scale to maintain the ecological balance. Other categories of lands such as barren land, culturable waste land and permanent pastures and grazing land have shown decreasing trend. The decreasing trend in these types of land may be on account of fast rise in area under non-agricultural uses, area under tree crops and groves as well as area under fallow lands. Construction of buildings, institutions and set up of factories on large scale are responsible for shift of land towards non-agricultural uses, as this category registered increase over decades i.e. 11.77% in 70s to 17.85% in the recent decade (2003-13). In other words, almost 5% growth in non-agricultural lands has been observed most probably due to developmental activities such as industrialization, infrastructures (road) and dwelling houses for shelter of ever rising population. Land under miscellaneous tree crops and groves revealed rising trend, it's reason may be owing to effort for sensitizing the people towards participation in trees plantation movement by the government/NGOs etc. Further, it was also emphasized through the worldwide consensus of the people regarding climate change, causing erratic rainfall

Table 1: Share of different land use categories to total geographical area in Bihar.
(Averages for the respective decades)

(Area '000 ha)

Sl. No.	Particulars	1970s	1980s	1990s	2000s	2003-13
1.	Reporting area	9359.76(100.00)	9359.76(100.00)	9359.76(100.00)	(9359.76)(100.00)	(9359.76)(100.00)
2.	Forest area	591.75(6.32)	607.85(6.49)	616.45(6.59)	621.12(6.64)	621.64(6.64)
3.	Barren and unculturable area	455.21(4.86)	439.04(4.69)	437.34(4.67)	434.97(4.65)	433.54(4.63)
4.	Land put to non-agricultural uses	1101.71(11.77)	1335.91(14.27)	1539.19(16.44)	1651.98(17.65)	1670.71(17.85)
(a)	Land area	870.35(9.30)	1056.83(11.29)	1217.41(13.01)	1291.42(13.80)	1311.76(14.01)
(b)	Permanent water area	156.77(1.67)	179.78(1.92)	196.92(2.10)	207.39(2.22)	207.39(2.22)
(c)	Temporary water area	74.58(0.80)	99.30(1.06)	124.86(1.33)	153.16(1.64)	151.46(1.62)
5.	Culturable waste land	107.50(1.15)	77.75(0.83)	59.30(0.63)	45.81(0.49)	45.48(0.49)
6.	Permanent pastures and grazing land	41.57(0.44)	33.80(0.36)	22.14(0.24)	17.12(0.18)	16.49(0.18)
7.	Land under misc. tree crops and groves	182.13(1.95)	167.39(1.79)	226.19(2.42)	238.86(2.55)	242.13(2.59)
8.	Fallow land other than current fallow	206.60(2.21)	205.29(2.19)	167.56(1.79)	127.87(1.37)	124.08(1.33)
9.	Current fallow	806.19(8.61)	880.20(9.40)	709.81(7.58)	611.26(6.53)	694.32(7.42)
10.	Total unculturable land (2 to 9)	3492.66(37.32)	3557.23(40.04)	3777.98(40.36)	3788.48(40.48)	3887.90(41.54)
11.	Net area sown	5867.10(62.68)	5612.50(59.96)	5576.99(59.58)	5571.08(59.52)	5471.67(58.46)

Figures in parentheses indicate percentage value

and deterioration in water table. Decreasing trend in other fallow lands and net sown area has also been noticed. Current fallows declined since 70s to 2000s, however the striking feature is that it began to rise since 2000s afterwards. The reasons behind these changes in land categories may be the uncertainty of monsoon, expensive diesel irrigation facilities and fragmentation of lands (motto being nuclear type of families) these all are making cultivation costlier. Now, it is very challenging task for policy makers to maximize the income of farming community through continuous declining net sown area.

Growth rate: Compound growth rates for different categories of land use in the state of Bihar have been worked out decade-wise since 1970 to 2013 as well as for the period as a whole (Overall period i.e. 2003-13) and presented in Table 2.

From decadal growth rate analysis of different categories of land, it was observed that net sown area has thoroughly declined at -0.08 % per annum. Some categories of land such as barren and unculturable land, culturable waste land, permanent pastures and grazing land as well as fallow land other than current fallow have shown declining trend throughout the study period(1970-2013). These categories of lands may probably have shifted to non-agricultural purposes on one hand and also put and converted to cultivation purposes on the other. As the growth of land use

Table 2: Compound growth rate of different land use categories in Bihar.

(Decadal compound growth rate)

Sl No.	Particulars	1970s	1980s	1990s	2000s	2003-13	1970-2013
1.	Reporting area	-	-	-	-	-	-
2.	Forest land	-0.15	0.08	0.00	0.02	0.00*	0.06*
3.	Barren unculturable land	-0.37**	0.06	-0.02	-0.06*	-0.06*	-0.06*
4.	Land put to non-agricultural uses	0.48*	1.26*	0.69*	0.11*	0.20*	0.56*
(a)	Land area	0.48*	1.28*	0.51*	0.16*	0.27*	0.55*
(b)	Permanent water area	0.48*	1.27*	0.65*	0.00	0.00*	0.38*
(c)	Temporary water area	0.49*	0.94*	2.56*	-0.15*	-0.18*	0.96*
5.	Culturable waste land	0.10	-1.13	-1.41*	-0.10*	-0.09*	-1.13*
6.	Permanent pastures and grazing land	-1.38*	-3.79	-2.07*	-0.61*	-0.66*	-1.26*
7.	Land under Misc. trees and groves	-0.86*	-0.55	0.69*	0.22*	0.16*	0.45*
8.	Fallow land other than current fallow	-0.53	0.24	-1.70*	-0.63*	-0.43*	-0.71*
9.	Current fallow	-0.22	-1.38**	-1.23	1.49**	2.21*	-0.33*
10.	Total unculturable land (2 to 9)	-0.06	0.09	-0.02	0.37*	0.41*	0.12*
11.	Net area sown	0.03	-0.06	0.03	-0.26*	-0.29*	-0.08*

* and** significant at 1% and 5% probability level

statistics also pointed out the fact that the area under non-agricultural uses has increased constantly throughout the study period at 0.56 % growth rate per annum (1970-2013). The land under miscellaneous tree crops and groves indicated negative growth in its area during the period of 70s and 80s but its growth turned out to be positive (0.69 %) during 1990s and it occupied further positive growth during 2000s (0.22%) and 2003-13 (0.16%). Thus, the area under this category scaled up at overall growth rate (0.045%) per annum during overall period (1970-2013). The cultivators may have tempted to diversify their farming, putting more area under high valued crops on one side and also prefer to minimize the risk situation emerging due to climatic change unleashing erratic rainfall and consequently costly diesel irrigation, engulfing the margin of profits in raising season's crops.

The analysis also indicated that the current fallow lands have swollen since the period 2000s, evidenced by 1.49 % (2000s) and 2.21 % growth rate per annum. Keeping the land as current fallow may be assigned to the sum total effect of different factors like climatic change resulting in erratic rainfall, deteriorating water table, costly diesel irrigation, costly seeds and fertilizers, application of fertilizes irrespective of soil test, defective implementation of MSP, lack of accessibility to markets, thus finally result in marginal profit in cultivation of crops (paddy and wheat) and also putting the land fallow for the purpose of restoring its capacity/strength in form of soil fertility.

Instability index: Instability is a measure of extent of variability or the absence of stability in time series data and thus, the instability indices for various land use categories were worked out and is presented in Table 3. The table explained the fact that the instability index during overall period 1970-71 to 2012-13 was found the highest (28.7%) for permanent pastures and grazing land, followed by culturable waste land (24.7%), current fallow land (17.0%) and land under miscellaneous tree and groves (14.1%). The decadal instability was found to be comparatively large in permanent pastures and grazing land (66.03%), followed by culturable waste land (48.78%), land under miscellaneous tree crops and groves (21.89%), current fallow land (17.64%) and fallow land other than current fallow (12.5%) during the periods of 80s, 90s and 2000s. However, the instability or variability index during the decades 2002-03 to 2012-13 was observed highest in current fallow category of land (11.8%), followed by fallow land other than current fallow (2.7%). The largest instability consistent in current fallow land during the first decade of the present century was probably due to climate change/global warming causing erratic rainfall. The instability associated with net sown area remained constant throughout the study period.

Spatial distribution of current fallow lands in Bihar: Location coefficients were estimated to examine the spatial dynamics of current fallow lands over the last 32 years across the different districts of the state. The results from the analysis as presented in Table 4 indicated that there has been a sharp increase in the concentration of current fallow lands in Gaya, Patna, Purnea, Munger, Jehanabad and Kishanganj districts and so on, this may probably be due to erratic rainfall and decline in water table in these areas. On the other hand, there has been a reduction in concentration of fallow lands in the districts such as Rohtas, West Champaran, Bhojpur, Saharsa, Madhubani, Muzaffarpur, Katihar, Araria, Sitamarhi, Siwan, Madhepura and Khagaria and so on; where ground water irrigation facilities have improved.

Common lands include barren and unculturable land, culturable waste land, permanent pastures and grazing land and land under miscellaneous trees and groves. The concentration of common land has been witnessed in certain districts like Vaishali, Bhaglpur, Khagaria, Katihar, Begusarai, Saharsa and Munger etc; thus it provides scope for redistribution of common lands to landless poor people so as to enable them to put these lands under efficient use.

Here it may be suggested that there is need of development of groundwater irrigation in the areas where

Table 3: Instability index for land use pattern in Bihar.

Sl. No.	Particulars	1970-71 to 1979-80	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2009-10	2002-03 to 2012-13	1970-71 to 2012-13
1.	Reporting area	-	-	-	-	-	-
2.	Forest land	1.8	1.09	0	0.26	0.0	1.3
3.	Barren unculturable land	2.7	1.74	0.42	0.3	0.2	2.1
4.	Land put to non-agricultural uses	1.3	2.4	1.0	0.5	0.6	4.5
(a)	Land area	1.2	2.2	1.2	0.7	0.7	4.4
(b)	Permanent water area	1.3	3.2	1.9	0	0.0	4.5
(c)	Temporary water area	1.3	3.7	5.4	0.6	0.6	8.3
5.	Culturable waste land	2.8	48.78	7.8	0.1	0.1	24.7
6.	Permanent pastures and grazing land	3.3	66.03	10.2	1.9	1.8	28.7
7.	Land under misc. tree crops and groves	2.0	21.89	2.8	0.5	0.2	14.1
8.	Fallow land other than current fallow	6.68	12.5	3.4	2.3	2.7	9.9
9.	Current fallow land	11.39	10.9	17.64	12.8	11.8	17.0
10.	Total unculturable land(2 to 9)	3.2	2.85	3.08	2.2	2.3	3.4
11.	Net area sown	1.9	1.91	1.98	1.5	1.7	2.3

Table 4: Dynamics of spatial distribution of current fallow lands and common lands in Bihar.

Districts	Location coefficient for current fallow land			Location coefficient for common land		
	1990-91	1999-2000	2012-13	1990-91	1999-2000	2012-13
Rohtas	0.66	0.46	0.34	0.70	0.72	0.74
Munger	**1.34**	**2.70**	**2.03**	1.39	**1.44**	**1.30**
Bhagalpur	1.17	0.42	1.06	**2.00**	**2.05**	**2.07**
Gaya	2.04	3.14	3.09	0.93	0.93	0.94
West Champaran	0.55	0.21	0.09	0.86	0.31	0.31
East Champaran	0.64	0.36	1.22	0.84	1.03	1.05
Bhojpur	0.84	0.49	0.41	0.36	0.39	0.41
Saharsa	0.65	0.23	0.21	**1.65**	**1.29**	**1.31**
Madhubani	1.00	1.42	0.28	0.65	0.95	1.00
Aurangabad	**2.25**	**2.66**	**1.59**	0.73	0.74	0.75
Patna	**1.22**	**0.47**	**2.51**	0.64	0.58	0.57
Muzaffarpur	0.77	1.14	0.33	0.79	0.89	0.93
Purnea	**1.73**	**2.15**	**2.32**	0.94	0.90	0.90
Kathihar	1.60	1.66	0.35	1.37	**1.81**	**1.48**
Araria	1.22	0.64	0.31	0.80	1.13	1.16
Sitamarhi	0.80	0.61	0.15	0.74	0.90	1.01
Saran	1.03	0.46	1.54	1.33	**1.26**	**1.28**
Samastipur	0.44	0.17	0.59	0.89	0.57	0.59
Dahrbhanga	1.43	0.45	1.03	0.73	0.67	0.70
Nawada	0.40	0.74	1.24	0.76	0.69	0.71
Nalanda	0.19	0.39	1.45	0.12	0.13	0.14
Siwan	0.31	0.57	0.04	0.83	1.01	1.04
Gopalganj	0.07	0.23	0.31	0.90	0.88	0.91
Vaishali	0.50	0.79	0.17	**2.14**	**2.12**	**2.16**
Kishanganj	**1.23**	**0.95**	**1.60**	1.27	1.17	1.20
Begusarai	0.37	0.63	0.44	**1.49**	**1.43**	**1.46**
Madhepura	1.10	0.18	0.36	0.73	0.75	0.78
Jehanabad	**0.52**	**1.69**	**1.92**	0.58	0.64	0.61
Khagaria	1.87	0.73	0.53	**1.53**	1.45	**1.49**

larger concentration of current fallow lands exist so as to enable the cultivators to put their fallow lands under proper cultivation.

Analysis of factors affecting current fallow lands in Bihar: Over and again, relooking/analyzing the factual situation, one finds existence of several factors, which are responsible for increase in fallow lands. One of the major factors is erratic rainfall, which affect the net sown area thus having a direct bearing on the area under current fallows and other fallows. The other factor may be envisaged as rising labour scarcity and consequently the hike in wage rates thus making cultivation of crop less profitable. It is further contemplated that increase in urban wage rates, expansion in non-farm opportunities and implementation of MNREGA may also result in the transfer of farm labour from agriculture sector, thereby pushing the accumulation of fallow lands. Inadequate capital and non-availability of timely credit facilities may also result in fallowing of lands.

Multiple linear regression analysis was carried out in order to identify the factors affecting the extent of current fallow lands by using secondary data for the period from 1970-71 to 2013-14 for Bihar state and thus, the results of the analysis are presented in Table 5.

The value of R^2 was estimated to be 0.45 as it refers to goodness of fit of the model. The regression coefficient of independent variable, non-agricultural uses of lands was estimated to be negative (0.483) and non significant. This indicates that there is inverse relation between current fallow lands and land under non-agricultural uses such as buildings, factories, recreation grounds etc. Further, the relation between rainfall and current fallow land was found to be negative and significant. The increase in rainfall reduces the current fallow lands significantly. However, from 2001-02 to 2013-14, the trend of monsoon (rainfall) has been found to be erratic, as a result the irrigation has become costly input probably due to more use of diesel operated pump sets. Thus the fact may be pointed out here that the putting more lands under current fallows by cultivators may be due to a very low profit margins in cultivation on account of costly irrigation emanating from erratic rainfall and higher wages of labour arising out of labour scarce situation. Actually the scarcity of labour is owing to diversion of labour to MNREGA scheme and for better employment opportunities

Table 5: Regression analysis of factors affecting Current fallow land in Bihar.

Independent variables	Regression coefficients	Standard Error	t-value
Intercept	1335.939***	251.887	5.304
Non agricultural use lands(X_1)	-0.483	0.546	-0.885
Rainfall (mm) (X_2)	-0.175**	0.095	-1.830
Road length per square km of geographical area (X_3)	0.369**	0.167	2.207
Percentage of GIA to GCA (X_4)	11.225	8.530	0.862
Population density (X_5)	-0.752	0.492	-1.527
Ratio of urban population to total population (X_6)	-165.323	1843.156	-0.090

R^2 = 0.45, F=4.913, N=43 (1970-71 to 2013-14)
*** Significant at 1% level of probability
** Significant at 5% level of probability
GIA: Gross Irrigated area, GCA: Gross Cropped Area

in urban areas. Due to the above factors/constraints, the road length led to positive relation with current fallow lands.

Factors affecting common lands: The common lands comprise of barren and unculturable lands, culturable waste lands, permanent pastures and grazing land and land under miscellaneous trees and groves. An effort has been made to examine the factors responsible for changes in common lands by using regression analysis with the help of 43 years time series data (from 1970-71 to 2013-14) on common lands and related factors and henceforth the results of the analysis is presented in Table 6.

Out of four independent variables, the regression coefficient of two variables *viz.* land under non-agricultural uses (X_1) and road density (X_3) turned out to be negative and significant for non-agricultural uses and non-significant for road density per thousand populations. This reveals that rise in non-agricultural uses of lands has diminution effect on common lands, while road density did not exert significant impact on common lands. Further, it was interesting to mention here that net sown area and common land showed positive relation, the reason for this may probably be assigned to constant/regular increase in area under tree crops and groves (part of common land) cumulating for want of rainfall/ erratic monsoon as well as scarcity of labours, thus resulting/ leading to larger cost of production. On the other hand, the population density (X_4) also emphasized the positive and significant impact on common lands. It may be opined here that a sizeable proportion of population are migrating/ marching to different distant towns metropolitan cities or elsewhere for getting better employment opportunities and thus, owing to this fact that both population density and common lands ascertained positive relation despite increase in population density.

CONCLUSION

The ongoing discussion revealed that the net sown area in the state has continuously declined over the period under study. For further raising the income of cultivators, the only option is to raise the cropping intensity. In other words, it is possible through proper utilization of decreasing land availability. Rapid growth in area under non-agricultural uses has been observed for the purpose of settlement of ever-rising population and developmental activities. The most striking feature concerning the land use pattern in the state is that the current fallow land has escalated during the first study period of the present century (2001 to 2013-14). The reason for escalation in the current fallows may probably be given to a very low profit margin accruing in the cultivation of crops, probably due to erratic rainfall, higher wages of labour arising out of diversion of labour to MNREGA and for better employment opportunities in urban areas.

The rainfall has been found to be the most important determinant for current fallow lands, however, during the recent period (present century) the current fallow land registered increasing trend probably on account of erratic rainfall. On the other hand, the hypothesis is that the road length should have negative relation with current fallow but

Table 6: Factors affecting common lands in Bihar.

Independent variables	Regression coefficients	Standard Error	t-value
Intercept	797.029***	245.365	3.248
Non-agricultural uses of land (X_1)	-0.266***	0.068	-3.893
Net sown area (X_2)	0.042	0.034	1.210
Road density per 1000 population (X_3)	-49.517	35.466	-1.396
Population density (X_4)	0.208***	0.061	3.398

R^2 =0.441, F=7.497, N=43(1970-71 to 2013-14)
*** Significant at 1% level of probability
** Significant at 5% level of probability
Note: Common lands include barren and unculturable land, culturable waste land, permanent pastures and grazing land and land under miscellaneous tree crops and groves

surprisingly the current fallows have developed positive and significant relation with road length, despite the increase in road length in the state this may probably be due to poor marketing facilities for the produce as well as migration of labour from the state to other states. The most important factor affecting the common lands has been identified as non-agricultural uses of land. The other factor population density showed positive and significant impact on common lands; it is perhaps due to migration of sizeable proportion of population to the other distant metropolitan cities and towns in the quest of better employment/ jobs.

It may be matter of policy implications that the currently rising tenancy of current fallow lands may be discouraged or reduced or in other words, it may be put under best use i.e. for profitable cultivation through use of comparatively cheap source of irrigation i.e. electric or solar energy operated pump sets in lieu of diesel operated pumping system (more costly). It warrants some changes in policy that diversion of labour to MNREGA may be utilized in agriculture i.e. for cultivation purposes so that the higher wages created by shortage of labour may be neutralized and thus as a result, it may help to reduce the cost of production of growing crops.

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