Determinants of Fallow Land in Different Districts of Madhya Pradesh

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Authors' contributions

This work was carried out in collaboration among all authors. Author RJB designed the study, performed the statistical analysis. Author SST wrote the protocol and authors HOS and PRP managed the analyses of the study. Author VM wrote the first draft of the manuscript managed the literature searches. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

The research study based on time series secondary data (2001-02 to 2015-16) of 51 district which were related to net area sown, rainfall, total fallow land, area under non agricultural uses and net irrigated area. The whole Madhya Pradesh was subdivided into two head i.e. major (14) and other fallow land (37) districts for the study. The area under fallow land showed decreasing trend by -19.26 percent from 601.90 thousand ha (The base year) to 485.99 thousand ha (The current year) with fluctuation of 9.94 percent (56.80 thousand ha) and magnitude of -8.97 thousand ha per year this also showed a negative compound growth of 0.98 percent per year during the period under study. The 1.00 per cent increase in net area irrigated to net area sown resulting highly significant decrease in share of total fallow land to total net sown area by 0.27 per cent. The aim of study was find out the fallow land in various districts of Madhya Pradesh.

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1. INTRODUCTION

The country level studies reported that there is tendency for land shift to the agricultural sector, there is also a positive growth trend in fallow lands which ultimately tend to move into cultivable wastes (Pandey and Tiwari, 1996). This has resulted in over exploitation of natural resources due to activities like deforestation, overgrazing, cultivation of marginal lands, mining and industrialization for meeting the increasing demand for food, fuel and fiber. The government estimates indicate diversion of 95003 ha forest land for mining between 1980 and 2005 while CSE puts it to 164,610 ha (CSE 2009; Greenpeace 2011).

Like any other resource land has two dimensions, viz, quality and quantity, and both of these crucial aspects are under serious threat due to the intensive and extensive use of land both for agricultural and non agricultural purposes. Intensive agriculture coupled with large scale irrigation projects without suitable drainage facilities has affected the land quality in many places thus leaving them under- utilized or unutilized. Dynamics of land use is a complex phenomenon which is affected by several socio-economic, agro-climatic and ecological variables. Both climatic and institutional factors are crucial in determining land use pattern.

Agricultural production is mainly dependent on natural resources e.g. land, after biodiversity (Plant, Animal and Microbial Genetic Resources), along with air and sunlight. Land is a basic input for agriculture and it occupies an important position among all the resources required for the modern economy [1]. Studied on dynamics of land use competition in India: perceptions and realities. The study showed that loss of prime agricultural land to non-agricultural uses is intensifying in the country but varied across different states. The area under non-agricultural uses increased by about 23 per cent (21.3 million ha to 26.3 million ha) during the last two decades [2,3].

Land use pattern includes types of land and how much land is being utilized under different uses for example, the area actually cultivated, forest, fallow land, pasture land and area under settlement and so on. At national scenario, alittle more than half of total land mass of 328.73 million hectare used for agriculture, which includes 140.02 million hectare net sown area under cultivation and 26.17 million ha for non-agricultural uses (GoI, 2013).

The fallow lands are generally divided into two major categories viz. "Old Fallow" which comprises of those lands that have been left uncultivated for more than 5 years and the "Current Fallow" which include lands that were not sown at the time of crop reporting, but were sown one year or two years before or left fallow either in one season or for one complete year to replenish the soil fertility. The destination of the term "Current Fallow" greatly differs in many part of the country [4]. Analyzed the dynamics and determinants of land change in India: Integrating satellite data with village socioeconomics. They also find positive association between fallow land and proportion of main female cultivators, indicating gender biased labour markets[5].

A study on an economic analysis of land use dynamics in Punjab. The compound growth rate analysis of land use pattern exhibited that area under forest has significantly increased over a period of time, which may be due to government policies for the plantation of trees, and shifting of barren land to forest land [6].

It was also found that Rainfall, gross irrigated area and cropping intensity were the factors were the factors which significantly reduced the area under fallow lands in some of the agro-climatic zones of Madhya Pradesh [7]. Analyzed the land use pattern in western uttar Pradesh and found out that there is an increasing trend in land under non-agricultural uses. The land use system is highly dynamic which undergoes significant change according to the socio-economic changes and natural environment [8].

This research paper deals with the share of fallow land to total Geographical area the base and current year of the study and the trend and growth of different parameters of land use pattern during the period of the study. Districts-wise trend and growth of different parameters of land use pattern were also carried out for major fallow land and other districts of Madhya Pradesh.

The specific objective of the research papers the trend and growth of different parameters of land use pattern in Madhya Pradesh.

2. MATERIALS AND METHODS

The research paper based on time series secondary data all the districts of Madhya Pradesh (2001-02 to 2015-16) (51 districts) these data were collected on net area sown, rainfall, total fallow land, area under non agricultural uses and net irrigated area from the published documents of Government of India, Government of Madhya Pradesh (Department of farmers Welfare and Agriculture Development). Agricultural Statistics of Madhya Pradesh and Agricultural Statistics at a glance, office of the land record, and the various websites viz; DACNET, MP KRISHI ect. The collected data were classified and tabulated in light of stated objectives, Absolute Change, Relative Change, Mean, Standard Deviation, Coefficient of Variation (CV), Trend and Compound Growth Rate of following form was the factors which are found to be affected the area of fallow land was considered only for Madhya Pradesh. The multiple regression analysis [9]was carried out to measures the change in share of total fallow land to be cultivated land in response of monsoon rainfall and percentage of net irrigated area to net areas sown in Madhya Pradesh during the period under study. The following equation was come out after analysis;

$$Y=a+b_1X_1+b_2X_2+SE$$

Where,

Y= share of total fallow land to total net area sown
a= Constant
$b_1 \& b_2$=Regression Coefficient of X_1 & X_2
X_1 = Monsoon Rainfall (mm)
X_2 =Percentage of Net Area Irrigated
SE = Standard Error
**=Highly Significant at 1% level of Probability

Multiple Regressions Linear Model was carried for analysis of data to draw conclusions. The whole Madhya Pradesh was subdivided into two head i.e. Major (14) and other fallow land(37) districts for the study. The Balaghat, Shahdol, Mandla, Dindori, Umariya, Rewa, Satna, Seoni, Katni, Sidhi, Chhattarpur, Tikamgarh, Betuland Chhindwara were considered under Major Fallow land districts. They covered about 73.54 per cent of total fallow land, while remaining districts (Jabalpur, Seoni, Narsingpur, Sagar, Damoh, Panna, Shahdol, Bhopal, Sehore, Raisen, Vidisha, Rajgarh, Indore, Dhar, Jhabua,Alirajpur, Khandwa, Khargon, Badwani, Burhanpur, Ujjain, Mandsour, Neemuch, Ratlam, Dewas, Shajapur, Agar, Morena, Bhind, Sheopur, Gwalior, Guna, Shivpuri, Ashoknagar, Datia, Hoshangabad and Harda) were other fallow land districts (26.46%) of Madhya Pradesh.

Table 1. The classification of selected (treated) districts under major fallow land

Districts	Area in 000'ha(TnAverage up to 2014-15)			% to State
	Fallow other than current fallow	Current fallow	Total fallow	
Balaghat	17655	11941	29596	3.62
Shahdol	22099	11074	33173	4.06
Mandla	26286	23067	49353	6.04
Dindori	28178	33198	61376	7.51
Umaria+ Anuppur	41340	36495	77835	9.52
Rewa	26510	23492	50002	6.12
Satna	16601	13821	30422	3.72
Seoni	19543	18729	38272	4.68
Katni	18934	13947	32881	4.02
Sidhi+singroli	29480	40954	70434	8.61
Chhattarpur	18126	16654	34780	4.25
Tikamgarh	20163	2381	22544	2.76
Betul	22922	7558	30480	3.73
Chhindwara	21663	18497	40160	4.91
(Major fallow land districts	329500	271808	601308	73.54
Other fallow land districts	138618	77692	216310	26.46
Madhya Pradesh)	468118	349500	817618	100.00

Fig. 1. Area undercurrent fallow land and fallow land, other than current fallow in different districts of M.P

3. RESULTS AND DISCUSSION

Trend & growth of different parameters of land use pattern in major and minor fallow land districts has been considered for the period under study.

3.1 The Trend and Growth

The trend and growth of different parameters of land use pattern viz. area under forest, non agricultural uses, barren and uncultivated land, under misc. tree crops & groves not included in net area, cultivated waste land, net area sown, other uncultivated land excluding fallow land, fallow land other than current fallow and current fallow were analyzed to determine the relationship of fallow land with other land use parameters in different Major (14) and Other Fallow Land (37) districts of the Madhya Pradesh.

3.1.1 Major fallow land districts

The area under non agricultural uses (08.24%), forest area (00.10%), net area sown (04.09%) and land under miscellaneous tree crops & groves not included in net area (03.98%) was found to be increased, while area under current fallow land (-26.55%), fallow land other than current fallow (-13.72%), Cultivable waste land (-7.11%), Permanent pasture other than grazing land (-4.76%) and barren & uncultivated land (-0.58%), was found to be decreased in major fallow land districts of Madhya Pradesh during the period under study. The area under non agricultural uses and net area sown was found to be increased significantly with the magnitude of 5.03 and 13.41 thousand ha/year respectively, while area under cultivable waste land, fallow land other than current fallow and current fallow land was found to be decreased significantly with the magnitude of 2.46, 4.25 and 10.69 thousand ha/year respectively.

Table 2. Trend and growth of different parameters of land use pattern in M.P. (area in '000 ha.)

Particulars	Forest	Area under non agricultural uses	Barren & uncultivable land	Net Area Sown	Permanent Pasture & other Grazing Land	Land under Misc tree crops &Groves not included in Net Area	Cultivable Waste Land	Falloff land other than Current Fallow	Current Fallow
Major District Fallow Land of M. P.									
The Base Year(TE)	3969.92	665.67	293.06	4268.89	409.26	8.37	501.30	396.20	460.95
The Current Year(TE)	3973.96	720.51	291.35	4443.70	389.77	8.71	465.68	341.82	338.57
Absolute Change	4.03	54.81	4.70	174.81	-19.49	0.33	-35.62	-54.37	-122.38
Relative Change (%)	0.10	8.24	-0.58	4.09	-4.76	3.98	-7.11	-13.72	-26.55
Mean	3960.36	691.07	306.31	4324.04	385.05	8.10	488.17	382.42	407.36
Standard Deviation	42.11	28.09	17.87	108.89	14.78	0.44	18.97	28.75	80.68
Coefficient of Variance %	1.06	4.06	5.83	2.52	3.84	5.40	3.89	7.52	19.81
Trend (b)	-1.56(2.33)	5.03**(0.82)	-0.73(0.98)	13.41*(4.95)	-1.24(0.76)	0.03(0.02)	-2.46*(0.84)	-4.25**(1.15)	-10.69**(3.51)
Compound Growth Rate (%)	1.00	1.01	1.00	1.00	1.00	1.00	0.99	0.99	0.97
Other Fallow Land Districts									
The Base Year(TE)	4702.99	1213.86	1094.11	10411.19	1077.51	10.97	709.46	205.71	356.11
The Current Year(TE)	4721.25	1420.56	1062.84	10863.87	909.61	9.61	556.05	144.17	94.32
Absolute Change	18.26	206.70	-31.27	452.67	-167.90	-1.36	-153.40	-61.54	-261.79
Relative Change (%)	0.39	17.03	-2.86	4.35	-15.58	-12.40	-21.62	-29.92	-73.51
Mean	4729.25	1330.03	1073.07	10669.57	971.72	12.12	639.58	189.77	187.93
Standard Deviation	44.31	78.96	31.09	177.10	64.97	2.86	60.70	28.96	115.50
Coefficient of Variance (%)	0.94	5.94	2.90	1.66	6.69	23.63	9.49	15.26	61.46
Trend (b)	3.07(2.35)	16.13**(1.03)	-3.55*(1.46)	31.93**(5.10)	-11.37**(2.02)	0.03(0.16)	-12.15**(1.03)	-4.72**(1.03)	-16.86**(4.66)
Compound Growth Rate (%)	1.00	1.01	1.00	1.00	0.99	1.00	0.98	0.97	0.92
Madhya Pradesh									
The Base Year(TE)	8672.92	1879.52	1387.17	14680.08	1486.77	19.34	1210.76	601.90	817.06
The Current Year(TE)	8695.21	2141.07	1354.19	15307.57	1299.38	18.32	1021.73	485.99	432.89
Absolute Change	22.29	261.55	-32.97	627.48	-187.39	-1.03	-189.02	-115.91	-384.17
Relative Change (%)	0.26	13.92	-2.38	4.27	-12.60	-5.31	-15.61	-19.26	-47.02
Mean	8689.62	2021.10	1379.38	14993.61	1356.77	20.22	1127.75	572.20	595.30

Particulars	Forest	Area under non agricultural uses	Barren & uncultivable land	Net Area Sown	Permanent Pasture & other Grazing Land	Land under Misc tree crops &Groves not included in Net Area	Cultivable Waste Land	Falloff land other than Current Fallow	Current Fallow
Standard Deviation	11.08	103.58	37.27	265.80	76.33	2.79	74.16	56.86	177.77
Coefficient of Variance (%)	0.13	5.13	2.70	1.77	5.63	13.81	6.58	9.94	29.86
Trend (b)	1.51**(0.47)	21.16**(1.35)	-4.28*(1.75)	45.34**(8.71)	-12.61**(2.65)	0.06(0.16)	-14.61**(1.45)	-8.97**(2.11)	-27.55**(6.74)
Compound Growth Rate (%)	1.00	1.01	1.00	1.00	0.99	1.00	0.99	0.98	0.95

*The base year: Tn average of first three years (2001-03), the current year: Tn average of last three years (2014-16); *significant at 5% level of probability, figures in parenthesis show SEb;**Significant at 1% level of probability*

3.1.2 Other fallow land districts

The area under non agricultural uses (17.03%), forest area (0.39%) and net area sown 4.35%) was found to be increased, while area under current fallow (-73.51%), land under miscellaneous tree crops & groves not included in net area (-12.40%), fallow land other than current fallow (-29.92%), cultivable waste land (-21.62%), permanently pasture other than grazing land (-15.58%) and barren & uncultivated land (-2.86%) was found to be decreased in other fallow land districts of Madhya Pradesh during the period under study the under non agricultural uses and net area sown was found to be increased significantly with the magnitude of 16.13 and 31.93 thousand ha/year respectively, while area under cultivable waste land, fallow land other than current fallow, permanent pasture other than grazing land, barren & uncultivated land and current fallow was found to be decreased significantly with the magnitude of 12.15, 4.72, 11.37, 3.55 and 16.86 thousand ha/year respectively.

3.1.3 Madhya Pradesh

The area under non agricultural uses (13.92%), net area sown(4.27%) and forest area (0.26%) was found to be increased, while area under current fallow land (-47.02%), fallow land other than current fallow (-19.26%), cultivable waste land (-15.61%), permanent pasture other than grazing land (-12.60%), barren & uncultivated land (-2.38%) and land under miscellaneous tree crops & groves not included in net area (-5.31%) was found to be decreased in Madhya Pradesh during the period under study. The area under fallow land other than current fallow showed decreasing trend and found to be decreased by -19.26 percent from 601.90 thousand ha (base year) to 485.99 thousand ha (current year) with fluctuation of only 9.94 percent (56.80 thousand ha) and magnitude of -8.97 thousand ha per year showed a negative compound growth of 0.98 percent per year during the period under study.

The area current fallow showed decreasing trend and found to be decreased by -47.02 percent from 817.06 thousand ha (the base year) to 432.89 thousand ha (the current year) with fluctuation of 29.86 percent (177.77 thousand ha) and magnitude of -27.55 thousand ha per year showed a negative compound growth of 0.95 percent per year during the period under study.

3.2 Factor Affecting Change in Share of Total Fallow Land

The multiple regression analysis was carried out to measures the change in share of total fallow land to cultivated land in response of monsoon rainfall and percentage of net irrigated area to net area sown with the help of Multiple Regression Linear Model00.

4. CONCLUSIONS

It is concluded from the above results that in Madhya Pradesh, the area under non agricultural uses and net area sown was found to be increased by 13.90 and 4.27 percent in the current year over the base year with the annual growth rate of 0.21 and 0.45 thousand ha per year and compound growth of 1.01 and 1.00 percent per year respectively during the period under study. The area under barren and uncultivated land, other uncultivated land excluding fallow land, land under misc. tree & groves, cultivated waste land, fallow land other than current fallow and current fallow was found to be decreased by 0.240, -12.62, -5.26, -15.64, 19.34 and -47.04 percent respectively in current year over the base year with the annual growth of approximately 1.00 percent per year during the period under study. It is observed that 1.00 per cent increase in net area irrigated to net area sown resulting highly significant decrease in share of total fallow land to total net sown area by 0.27 percent. The fitted model found to be good fit as it explained the selected independent variables explaining 78.11 per cent variability in the dependent variables. There effects to be made to increase area under irrigation for the increasing area under cultivation, cropping intensity of the different districts of Madhya Pradesh.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/65930