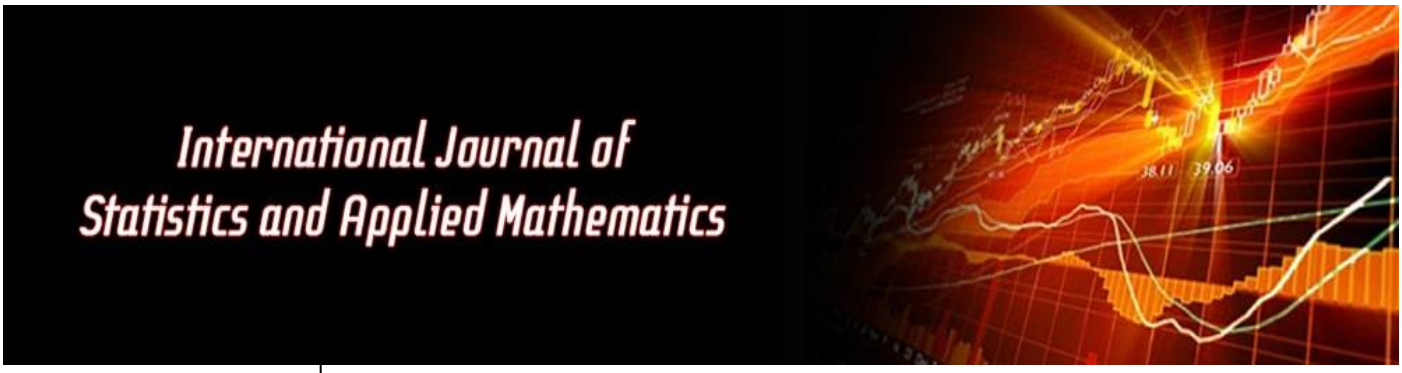
International Journal of Statistics and Applied Mathematics 2024; SP-9(3): 88-91



ISSN: 2456-1452
Maths 2024; SP-9(3): 88-91

https://www.mathsjournal.com
Received: 14-02-2024
Accepted: 13-03-2024

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Factor affecting on crop diversification in different regions in Maharashtra

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Abstract
The purpose of the study was to examine the variables affecting crop diversification in various Maharashtra regions. The foundation of the study was the secondary data. The secondary source for the data was used between 2001–02 and 2020–21. Because multiple linear regression is more easily computed and interpreted than other regression models, it was used to determine the factors influencing crop diversification. In Vidarbha region cropping intensity, gross cropped area and fertilizer consumption were positively affected on crop diversification. The variables rainfall, net cropped area and percentage of marginal and small holding in total holding were negatively affected on crop diversification. In Marathwada region, the grossed cropped area, fertilizer consumption, forest area and average size of marginal and small holding were positively affected on crop diversification. The rainfall was affected negatively on crop diversification. In Western Maharashtra region cropping intensity, per capita income, fertilizer consumption and average size of marginal and small holding affected positively on crop diversification and in Konkan region cropping intensity, rainfall, grossed cropped area, fertilizer consumption and use of fertilizer positively affected on crop diversification. The variables per capita income and percentage of marginal and small holding in total holding negatively affected on crop diversification.

Keywords: Diversification, Factors affecting, marginal

Introduction
An important sector of the Indian economy is agriculture. More than 58% of rural households make agriculture their primary source of income. The agricultural sector employs over 65% of the population, both directly and indirectly. The definition of diversification in agriculture is the transition from one crop's regional dominance to another crop's, or the engagement in other complementary activities, from one enterprise (such as crop-based) to another enterprise (like livestock). Agricultural diversification the theoretical point of view may be considered as diversification of resources from low income generating crops to high income generating crops. The benefits of crop diversification include lower production and pricing risks, higher yields, ecological balance, sustainability of natural resources, increased flexibility, and the ability to maintain productivity and growth. Moreover, it generates prospects for increased workforce assimilation and increased earnings by optimizing resource allocation and capitalizing on competitive edge. Overall, crop diversification is a process that gives consumers access to a wider variety of food products while also assisting growers in increasing their per capital income and reducing risk. It lessens the risk involved in growing a single crop and aids in the farmers' escape from the poverty cycle.
The importance of diversification in agriculture is often noted, but the factors influencing diversification have not been the subject of many empirical studies. This paper's primary goal was to identify the variables influencing crop diversification. Hence, present study was conducted with the specific objectives to study the factors affecting on crop diversification over the year or period in different regions of Maharashtra.

Material and Methods

For the purpose of the present study four regions of Maharashtra *viz*. Vidarbha, Marathwada, Western Maharashtra and Konkan were selected. Time series data on area under different regions from the periods from 2001-2002 to 2020-21 were collected from various sources. Multiple linear regression analysis was carried out to find the factors affecting crop diversification in the study area. Using secondary data, multiple linear regression analysis was performed to identify the determinants influencing diversification. The following independent variables were used to determine the influence on crop diversification index and Entropy index (Y).

The diversity index can be expressed as a function of

$Y = a + b_i x_i + b_2x_2 + b_3x_3 + b_4x_4 - - - - - - - - - - - - - - - + b_{10}x_{10} + \mu$

Where,

Y = Crop diversification index (Entropy index)

Dependent variable (Entropy Index) was selected on the basis of literatures.

Independent variables = $x_1, x_2 - - - - - - - - - - - - - - - x_{10}$

The explanatory variables considered were

X_1 = Cropping Intensity (%)

X_2= Annual Rainfall (MM)

X_3 = Gross cropped area (Lakh ha)

X_4 = Net cropped area (Lakh ha)

X_5= Per capita income (Rs. in lakh)

X_6 =Fertilizer consumption (Qt./ha)

X_7 = Use of fertilizer (Lakh MT)

X_8 = Forest (Area in sq. kilometer)

X_9 = Percentage of Marginal and small land holding in total holding

X_{10} = Average size of marginal and small land holding (Acre/person)

μ = random error term

Results and Discussion

The present study was to examine the factors affecting the crop diversification across different regions of Maharashtra. Multiple regression analysis was carried out to study the factors affecting crop diversification. For regression analysis, obtained values of indices considered as dependent variable (the Entropy index for crop diversification was regressed on several considered factors) and total ten (10) numbers of factors have been identified that might affecting the crop diversification in the present study.

Factors affecting on crop diversification in Vidarbha region

Estimated regression analysis function for the determination of factors affecting crop diversification in Vidarbha region is presented in Table 1. The value of coefficient of determination i.e. R^2 was found to 0.94 which indicates that the variables included in the model are sufficient to explain the variation in the crop diversification. The regression analysis for factor affecting crop diversification of Vidarbha region revealed several significant factors like cropping intensity, gross cropped area and fertilizer consumption showed statistically significant relationships with crop diversification. It was observed from the above t able that, cropping intensity has significantly positively affecting the crop diversification index (Entropy index). Similarly, the variables like grossed cropped area, fertilizer consumption were also affecting significantly positively on the dependent variable i.e. crop diversification index. On the other hand, rainfall, net cropped area, use of fertilizer, area of forest and percentage of marginal and small holding in total holding have significant negative impact on crop diversification. The variables like per capita income, use of fertilizer, forest area and average size of marginal and small holding (acre per person) have not any significant impact on the crop diversification.

Table 1: Factors affecting on crop diversification in Vidarbha region

Sr. No.	Variables	Factors	Regression Coefficient b	Standard Error (SEb)
	Intercept			5.184
1	X_1	Cropping Intensity (%)	0.044***	0.013
2	X_2	Rainfall (MM)	-0.005***	0.001
3	X_3	Gross cropped area (Lakh ha.)	0.095***	0.027
4	X_4	Net cropped area (Lakh ha.)	-0.104**	0.033
5	X_5	Per capita income (Rs. In lakh)	0.007	0.023
6	X_6	Fertilizer consumption (Qt./ha)	0.047***	0.013
7	X_7	Use of fertilizer (Lakh MT)	-0.001	0.003
8	X_8	Forest (Area in sq. kilometre)	-0.285	1.263
9	X_9	Percentage of Marginal and small landholding in total holding	-0.001**	0.001
10	X_{10}	Average size of marginal and small land holding (Acre/person)	0.054	0.043
R^2				0.9462
Adjusted R^2				0.8864

Note: ***, **, * indicate significant at 1, 5, 10 percent level respectively.

Factors affecting on crop diversification in Marathwada region: The results of the factors affecting on crop diversification in Marathwada region is given in the Table 5.22. The value of coefficient of determination was found to 0.96 which indicates that the variables selected in the model are explain 96 per cent variation in the crop diversification. Among the selected variables in the model gross cropped area, fertilizer consumption, forest area in square kilometer and average size of marginal and small holding were significantly positively affecting on crop diversification in Marathwada region. The variable rainfall was significantly negatively affecting crop diversification. The variables

Table 2: Factors affecting on crop diversification in Marathwada region

Sr. No.	Variables	Factors	Regression Coefficient b	Standard Error (SEb)
		Intercept	-0.1807	
1	X_1	Cropping Intensity (%)	0.0002	0.0008
2	X_2	Rainfall (MM)	-0.0065**	0.0024
3	X_3	Gross cropped area (Lakh ha.)	0.0057***	0.0010
4	X_4	Net cropped area (Lakh ha.)	-0.0037	0.0024
5	X_5	Per capita income (Rs. In lakh)	0.0699	0.0383
6	X_6	Fertilizer consumption (Qt./ha)	0.0505**	0.0166
7	X_7	Use of fertilizer (Lakh MT)	0.0003	0.0034
8	X_8	Forest (Area in sq. kilometre)	0.2569**	0.1016
9	X_9	Percentage of Marginal and small landholding in total holding	-0.0011	0.0017
10	X_{10}	Average size of marginal and small land holding (Acre/person)	0.1246**	0.0518
		R^2	0.9654	
		Adjusted R^2	0.9270	

Note:- ***, **, * indicate significant at 1, 5, 10 per cent level respectively

Cropping intensity, net cropped area, per capita income, use of fertilizer and percentage of marginal and small land holding in total holding were not showed any significant effect on the crop diversification in Marathwada region.

Factors affecting on crop diversification in Western Maharashtra region: The results for regression analysis of factors affecting on crop diversification in Western Maharashtra region is given in the Table number 5.23.
The value of coefficient of determination i.e. R^2 was found to 0.97 which indicates that the variables selected in the model are explaining 97 per cent variation in the crop diversification. Out of the selected variables in the model cropping intensity, per capita income, fertilizer consumption and average size of marginal and small land holding were Significantly positively influenced the dependent variable i.e. crop diversification in Western Maharashtra region. On the other hand, rainfall, grossed cropped area, net cropped area, use of fertilizer, forest area and percentage of marginal and small holding in total holding were not showed any significant effect on the crop diversification in Western Maharashtra region.

Table 3: Factors affecting on crop diversification in Western Maharashtra region

Sr. No.	Variables	Factors	Regression Coefficient b	Standard Error (SEb)
		Intercept	0.6570	
1	X_1	Cropping Intensity (%)	0.0084*	0.0038
2	X_2	Rainfall (MM)	0.0016	0.0014
3	X_3	Gross cropped area (Lakh ha.)	0.0002	0.0007
4	X_4	Net cropped area (Lakh ha.)	0.0008	0.0010
5	X_5	Per capita income (Rs. In lakh)	0.0115***	0.0030
6	X_6	Fertilizer consumption (Qt./ha)	0.0424*	0.0212
7	X_7	Use of fertilizer (Lakh MT)	-0.0020	0.0024
8	X_8	Forest (Area in sq. kilometre)	-0.1699	2.3200
9	X_9	Percentage of Marginal and small landholding in total holding	-0.0035	0.0025
10	X_{10}	Average size of marginal and small land holding (Acre/person)	0.0721*	0.0388
		R^2	0.9731	
		Adjusted R^2	0.9431	

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

Table 4: Factors affecting on crop diversification in Konkan region

Sr. No.	Variables	Factors	Regression Coefficient b	Standard Error (SEb)
		Intercept	0.3496	
1	X_1	Cropping Intensity (%)	0.0068**	0.0029
2	X_2	Rainfall (MM)	0.0005*	0.0002
3	X_3	Gross cropped area (Lakh ha.)	0.1420***	0.0369
4	X_4	Net cropped area (Lakh ha.)	-0.1378***	0.0322
5	X_5	Per capita income (Rs. In lakh)	-0.0033***	0.0010
6	X_6	Fertilizer consumption (Qt./ha)	0.0222*	0.0099
7	X_7	Use of fertilizer (Lakh MT)	0.2146***	0.0399
8	X_8	Forest (Area in sq. kilometre)	0.6489	0.7680
9	X_9	Percentage of Marginal and small landholding in total holding	-0.0039**	0.0016
10	X_{10}	Average size of marginal and small land holding (Acre/person)	-0.0036	0.0256
		R^2	0.9776	
		Adjusted R^2	0.9526	

Note:-***, **, * indicate significant at 1, 5, 10 per cent level respectively

Factors affecting on crop diversification in Konkan region
The results of regression analysis function for the factors affecting on the crop diversification in Konkan region was presented in Table 5.24. It is observed from the table that, the R^2 value is 0.97, it indicates that the variables selected for the regression model explain 97 per cent variation in the crop diversification of Konkan region. Among the selected variables cropping intensity, rainfall, grossed cropped area,

fertilizer consumption and use of fertilizer having significant positive effect on crop diversification. On the other hand, net cropped area, per capita income and percentage of marginal and small holding in total holding affected negatively on the crop diversification. The variables namely, forest area and average size of marginal and small size holding were not showed any significant effect on the crop diversification in Konkan region.

Conclusion

In Vidarbha region cropping intensity, gross cropped area and fertilizer consumption were positively affected on crop diversification. The variables rainfall, net cropped area and percentage of marginal and small holding in total holding were negatively affected on crop diversification. In Marathwada region, the grossed cropped area, fertilizer consumption, forest area and average size of marginal and small holding were positively affected on crop diversification. The rainfall was affected negatively on crop diversification. In Western Maharashtra region cropping intensity, per capita income, fertilizer consumption and average size of marginal and small holding affected positively on crop diversification and in Konkan region cropping intensity, rainfall, grossed cropped area, fertilizer consumption and use of fertilizer positively affected on crop diversification. The variables per capita income and percentage of marginal and small holding in total holding negatively affected on crop diversification.

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