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Research Paper

Economic analysis of agricultural diversification in Morena district of Madhya Pradesh based on different farming patterns

■ MUNESH KUMAR SHAKYA, SONU JAIN AND P. S. BADAL

See end of the paper for authors' affiliations

Correspondence to :
SONU JAIN
Banaras Hindu University, VARANASI (U.P.) INDIA
Email:sonujain.karauli@gmail.com

ABSTRACT : Agricultural diversification can be described in terms of the shift from the regional dominance of one crop towards the production of a large number of crops to meet the increasing demand of these crops. Two types of diversification – horizontal and vertical diversification. The diversification of agriculture towards non-food-grain and high value commodities has been the right answer for it, because these commodities have potential of income augmentation, employment generation, poverty alleviation and export promotion. it takes note of different bases of measuring diversification more importantly, income, output and resource based agricultural diversification. In India, mixed farming has been a way of life and in such a system, agriculture and livestock have a complementary relationship. The study is based on farms in the Morena district shows that around 15 per cent of cropped area is under fodder. The share of horticulture in crop, cross-bred in bovine, bovine in livestock, inland in total fisheries and fisheries in allied sectors has increased thereby suggesting significant changes in the structure of agriculture and allied economies. Resource diversification also play an important role in agriculture diversity. Madhya Pradesh is endowed with rich and diverse forest resources. Fisheries also an important for agriculture diversity which create more money. Data were obtained by survey from the farmers. Stratified multi-stage sampling method was used to select sample households. There are many methods for computing Agricultural diversification like diversification index, entrophy index, simpson index, herphindal index. According to diversification index, 13.75 per cent farmers are having perfect specialization or no diversification and 16.25 per cent farmers are highly diversified. According to entropy index, 7.5 per cent farmers are having highly specialization or no diversification and 35 per cent farmers are highly diversified. According to herphindal index, 7.5 per cent farmers are having more specialization or less diversification and 37.50 per cent farmers are highly diversified. According to simpson index, 6.25 per cent farmers are having more specialization or less diversification and 45 per cent farmers are highly diversified.

KEY WORDS : Economic analysis, Agricultural diversification

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INTRODUCTION :

Agricultural diversification can be described in terms of the shift from the regional dominance of one crop towards the production of a large number of crops to meet the increasing demand of those crops. It can also be described as the economic development of non agricultural activities (Start, 2001). The process of diversification can be classified into horizontal and vertical diversification. Horizontal diversification can be referred to as that form of diversification wherein farmers diversify their agricultural activities in order to either stabilize or increase their income or both. It can either take the form of shift from subsistence farming to commercial farming or the shift from low value food crops to high value crops. Vertical diversification refers to the farmers' access to non-farm income,

i.e., the income from non agricultural sources.

The diversification of agriculture towards non-food-grain and high value commodities has been the right answer for it, because these commodities have potential of income augmentation, employment generation, poverty alleviation and export promotion. The crop sector is the principal income-generating source in agriculture followed by the livestock sector. It is depicted a steady diversification here with replacement of food-grain crops with nonfood-grain crops. Several non-food-grain crops such as fruits, vegetables, and medicines have substituted mainly coarse cereals in the farmers' pursuit for higher income. It takes note of different bases of measuring diversification more importantly, income, output and resource based agricultural diversification. While income or output diversification has been studied at the state level as well as district; resource diversification is examined at the level of state and district.

In India, mixed farming has been a way of life and in such a system, agriculture and livestock have a complementary relationship. The study is based on farms in the Morena district shows that around 15 per cent of cropped area is under fodder. The share of horticulture in crop, cross-bred in bovine, bovine in livestock, inland in total fisheries and fisheries in allied sectors has increased thereby suggesting significant changes in the structure of agriculture and allied economies.

Resource diversification also play an important role in agriculture diversity, Madhya Pradesh is endowed with rich and diverse forest resources. Fisheries also an important for agriculture diversity which create more money. Sankhayan and Sirohi (1971) studied productivity and allocation efficiency on seed potato farm in Himachal Pradesh. They observed that, at the present level of technology, the farm resources were optimally or near optimally allocated in the case of potato and maize. Bal *et al*. (1983) employed the Cobb-Douglas model to study the resource use efficiency, factor share and productivity of various factors in crop cultivation in the central districts of Punjab at two points of time, namely 1972-73 and 1980-81. It was noted that elasticities of production (in value terms) of human labour, draught labour and rental value of land have declined in 1980-81 over 1972-73, but that of irrigation had increased. The average level of use of other factors had increased over the period. It advocated substitution of human labour with other factors, mainly with irrigation, fertilizer and weedicides.

MATERIALS AND METHODS :

Data required for the present study were obtained by survey. Primary data was collected from farmers by direct interview method with well structured, pre tested schedule prepared exclusively for this study. Stratified multi - stage sampling method was used to select sample households. Morena district will be select purposively for the present study. The Morena district was purposively excluded from study as it is a rural area and contains less agricultural land. Out of 7 blocks, one Block (Kailaras) was selected purposively on the basis of maximum area in different types of farming system.

For agricultural diversification :

Diversification index :

$$\mathbf{Di} = 1 - \frac{\sum (si)^2}{\sum (s)^2}$$

where, Di is diversification index,

Si is share of net income of the i^{th} enterprise per farm net income,

S is per farm net income of a farming system.

The value of diversification index varies between zero to one. It is zero in case of perfect specialization and one in case of perfect diversification.

Entrophy index :

$$\mathbf{Entrophy\ (E)} = \sum_{i=1}^{n} \mathbf{P_i} \log \left(\frac{1}{\mathbf{P_i}} \right)$$

where, Pi is proportion of area under i^{th} crop.

$$\mathbf{Pi} = \frac{\mathbf{Ai}}{\sum_{i=1}^{n} \mathbf{Ai}}$$

Ai is area under i^{th} crop

$\sum_{i=1}^{n} \mathbf{Ai}$ is total cropped area

The value of entrophy index varies from zero to log n.

When there is perfect specialization 'E' takes the value of zero and when there is perfect diversification 'E' takes the value of log n.

Simpson index :

$$\mathbf{SID} = 1 - \sum_{i=1}^{n} \mathbf{Wi}$$

where, $\mathbf{Wi} = \frac{\mathbf{Xi}}{\sum \mathbf{Xi}}$

Xi is the area of the i^{th} crop

Wi is the proportionate area of the i^{th} crop in the total cropped area.

The value of simpson index varies from zero to one. When there is perfect specialization SID takes the value of zero and when there is perfect diversification SID takes the value of one.

Herphindal index :

$$\mathbf{H} = \sum_{i=1}^{n} \mathbf{Pi}$$

where, Pi is proportion of area under i^{th} crop.

The value of herphindal index varies between zero to one. It is one in case of perfect specialization and zero in case of perfect diversification.

RESULTS AND DATA ANALYSIS :

In diversification index from Table 1, it is evident that, 62 (77.5%) farmers out of total study farmers, they are having D.I. is less than 0.5 which shows that they are have less diversification or more specialization and 18 (22.5%) farmer are having D.I. is more than 0.5 which shows that they have more diversification or less specialization. 11(13.75%) farmers are having diversification index value is zero, which shows that they are having perfect specialization or no diversification. It means they are growing only agriculture crops on the farm.

In entropy index from Table 1, it is evident that, 15 (18.75%) farmers out of total study farmers, they are having E.I. value is less than 0.59 which shows that they are have less

Table 1 : Value of different index **(n=80)**

Sr. No.	Diversification index	Entrophy index	Herphindal index	Simpson index
1.	0.229	0.892	0.086	0.992
2.	0.9	0.768	0.336	0.787
3.	0.467	0.136	0.912	0.167
4.	0.28	0.759	0.358	0.871
5.	0.566	0.825	0.154	0.976
6.	0.46	0.302	0.721	0.479
7.	0.2	0.904	0.276	0.923
8.	0.179	0.847	0.234	0.945
9.	0.235	0.752	0.263	0.93
10.	0.753	0.852	0.259	0.932
11.	0.274	0.701	0.102	0.789
12.	0.099	0.539	0.566	0.679
13.	0.671	0.333	0.61	0.594
14.	0.64	0.74	0.202	0.959
15.	0.035	0.646	0.529	0.72
16.	0.029	0.644	0.538	0.709
17.	0.768	0.891	0.086	0.992
18.	0.033	0.725	0.155	0.875
19.	0.39	0.74	0.201	0.659
20.	0.26	0.803	0.105	0.988
21.	0.957	0.794	0.091	0.891
22.	0.674	0.896	0.093	0.992
23.	0	0.23	0.122	0.184
24.	0.047	0.608	0.101	0.789
25.	0	0.59	0.084	0.392
26.	0.328	0.79	0.084	0.892
27.	0.1	0.793	0.088	0.987
28.	0	0.677	0.065	0.995
29.	0.969	0.767	0.052	0.897
30.	0.006	0.801	0.103	0.989
31.	0.088	0.93	0.168	0.971
32.	0	0.691	0.086	0.792
33.	0.5	0.68	0.069	0.395
34.	0.515	0.702	0.103	0.987

Table 1 : Contd.……

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35.	0	0.367	0.052	0.997
36.	0.071	0.757	0.426	0.818
37.	0.035	0.721	0.144	0.879
38.	0.018	0.816	0.132	0.782
39.	0.137	0.641	0.557	0.689
40.	0.001	0.559	0.336	0.286
41.	0.011	0.734	0.181	0.867
42.	0.271	0.506	0.111	0.687
43.	0.157	0.779	0.068	0.895
44.	0.081	0.421	0.648	0.579
45.	0.327	0.886	0.078	0.93
46.	0.446	0.953	0.27	0.926
47.	0.671	0.566	0.051	0.797
48.	0.888	0.664	0.051	0.797
49.	0.955	0.785	0.0767	0.994
50.	0.331	0.556	0.293	0.613
51.	0.1	0.975	0.063	0.896
52.	0.058	0.858	0.413	0.829
53.	0.666	0.296	0.093	0.291
54.	0.65	0.813	0.126	0.984
55.	0.59	0.799	0.098	0.89
56.	0.813	0.493	0.088	0.692
57.	0.54	0.61	0.101	0.689
58.	0.276	0.88	0.097	0.99
59.	0	0.711	0.121	0.785
60.	0.019	0.689	0.763	0.416
61.	0.409	0.85	0.076	0.994
62.	0.524	0.722	0.147	0.978
63.	0.022	0.79	0.084	0.892
64.	0.5	0.76	0.063	0.895
65.	0.033	0.811	0.122	0.984
66.	0	0.78	0.066	0.995
67.	0.048	0.49	0.244	0.44
68.	0.246	0.406	0.111	0.687
69.	0	0.969	0.055	0.996
70.	0.11	0.826	0.158	0.874
71.	0.2	0.823	0.149	0.877
72.	0	0.787	0.079	0.793
73.	0.082	0.606	0.112	0.987
74.	0.036	0.537	0.19	0.763
75.	0.027	0.537	0.19	0.644
76.	0.058	0.345	0.222	0.95
77.	0.017	0.815	0.13	0.983
78.	0	0.707	0.113	0.987
79.	0.027	0.603	0.106	0.788
80.	0	0.802	0.104	0.89

diversification or more specialization and 65 (81.25%) farmers are having E.I. value is more than 0.6 which shows that they have more diversification or less specialization. 1 (1.25%) farmer is having entropy index value is between 0.136, which shows that he is having highly specialization or no diversification. It means he is growing only agriculture crops on the farm. 5 (6.25%) farmers out of total study farmers are having E.I. value is between 0.2 to 0.3, which shows that they are having more specialization, mseans they are growing horticultural crops along with agricultural crops.

In herphindal index from Table 1, it is evident that, 9 (11.25%) farmers out of total study farmers, they are having H.I. is >0.5 which shows that they are have less diversification or more specialization and 71 (88.75%) farmers are having H.I. is <0.5 which shows that they have more diversification or less specialization. 1 (1.25%) farmer is having herphindal index 0.912, who is having highly specialization. It means he is growing only agriculture crops in his farm. 5 (6.25%) farmers are having H.I. value is between 0.6 to 0.8, which shows that they are having more specialization, means they are growing horticultural crops along with agricultural crops

In simpson index from Table 1, it is evident that, 8 (10%) farmers out of total study farmers, they are having S.I. value is less than 0.59 which shows that they are have less diversification or more specialization and 72 (90%) farmers are having S.I. value is more than 0.6 which shows that they have more diversification or less specialization. 2 (2,5%) farmers are having simpson index values are 0.167 and 0.184, which shows that they are having highly specialization or no diversification. Alagumani and Anjugam (2000), Ali and Nupur (2009), Kulkarni and Kunnal (2002), Deaton *et al.* (2005), Muralidharan (1987), Nagaraj *et al.* (1996) and Naik (1998) also worked on the related topic.

Conclusion :

According to diversification index, 13.75 per cent farmers are having diversification index value is zero, means perfect specialization or no diversification, means they are growing only agriculture crops on the farm and 16.25 per cent farmers are highly diversified, means farming of livestock, poultry, business and horticultural crops etc. along with agricultural crops on farm.

According to entropy index,7.5 per cent farmers are having highly specialization or no diversification, means growing only agriculture crops on the farm and 35 per cent farmers are highly diversified, means farming of livestock, poultry, business and horticultural crops etc. along with agricultural crops on farm.

According to herphindal index, 7.5 per cent farmers are having more specialization or less diversification, means growing only agriculture crops on the farm and 37.50 per cent farmers are highly diversified, means farming of livestock, poultry, business and horticultural crops etc. along with agricultural crops on farm.

According to simpson index, 6.25 per cent farmers are having more specialization or less diversification, means growing only agriculture crops on the farm and 45 per cent farmers are highly diversified, means farming of livestock, poultry, business and horticultural crops etc. along with agricultural crops on farm.

Authors' affiliations:
MUNESH KUMAR SHAKYA AND P.S. BADAL, Banaras Hindu University, VARANASI (U.P.) INDIA

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