

# Agricultural Diversification and Change in Income Levels of the Experimental and Control Groups

Kokila, B.M., Gopalappa, D.V.

**Abstract:** In the recent years we have been observing that the people in the rural areas have been suffering from so many problems. Out of these problems getting livelihood has become more important. The farmers have been cultivating the traditional crops and the returns from these traditional crops has been low. And therefore they need to diversify and change the cropping pattern from the traditional crops to modern and more remunerative crops. In this direction an effort has been made to study the impact of crop and activity diversification on the income levels of the sample HHs consisting of 385 farmers belong to Experimental Group and 100 HHs/farmers belong to Control Group. The study comes out with the conclusion that the income levels of the farmers who have diversified their cropping pattern have got more returns when compared to the Control Group belong to the same farm size category.

**Keywords:** Rural Areas, Rural Development, Traditional Crops, Agricultural, Diversification, Modern Crops, Increase in Production and Increase in Income.

## 1. INTRODUCTION

Agricultural diversification is an important step towards developing country's ruralsector, but it requires large investments in infrastructure, well-trained human capital, investment in research and towards extension service to spread diversification in the region (Goletti 1999). Anosike and Coughenour (1990) found that agricultural diversification is significantly related to farmsize, with a positive relationship. That is, the bigger the farm, the greater its diversification, because there is more room where the farmer can grow his crops without creating environmental problems, avoiding soil erosion (Cuelas and Mahendrarajah (2005). Caviglia-Harris and Sills (2005) presented one of the factors that curb diversification of commercial crops: farmers' clearing to increase the agricultural frontier, as this renders soils unproductive due to deforestation. In Latin America, there has been a pattern of upward

agricultural export diversification. The analysis reveals that the variables determining agricultural diversification both positively and negatively are the farmers interest in diversifying from the regular routine crops to some other remunerative crops. Studies by Gopalappa (1996) and Saleth (1997) reveal that the support extended by the government has led to the farmers who are able to diversify their cropping pattern and in turn that has led to increase in income and standard of living of the people.

In this paper an effort is made to document the impact of diversification on the income levels in relation to agricultural income, income from other activities like Non-farm Employment (NFE), service, etc. When it comes to the income from the agriculture sector as a whole we have considered yield per acre and total production from the given piece of land. In case of the total income from the agriculture cropping intensity, i.e., the number of crops grown per year in a given piece of land and the crops grown in the same piece of land is taken into account. Accordingly total agricultural income per HH/Group is worked out for the farmers belong to Experimental Group and Control Group. The total sample of 385 farmers in case of the Experimental group (belong to all the four categories of farmers) is drawn and 100 farmers from the Control group together 485 from both the groups to examine the extent of returns from the farmers who are dynamic and diversified their cropping pattern and the farmers who have not diversified their cropping pattern throughout though they belong to similar category as per the land-size groups are concerned. Hence the present paper is initiated with the study Hypothesis entitled "Agricultural diversification has led to improvement in the family income of the various categories of farmers".

## 2. RETURNS FROM THE CROPS CULTIVATED BY THE EXPERIMENTAL GROUP OF FARMERS

Before arriving at Gross and Net Income we have collected the data and analysed the data relating to the cost of cultivation, production and income realized by the farmers of various categories of farmers in detail. Any way all those minute details are not presented but the total cost and returns are presented here. The crop paddy has been cultivated by both the groups of sample HHs belong to Experimental Group and

Control Group. Table-1 contains the total agricultural income for the Experimental Group of farmers. In case of the marginal farmers the paddy is grown in 1.28 acres of land with the cropping intensity of two per year. The total cost is Rs. 53,658 and Gross income is Rs. 1,03,475 per year. After deducting the Gross Cost out of the Gross Income the Net Income is Rs. 49,818.

Table-1: Gross & Net Income from the Total Land Cultivated for Various Crops (EG in Rs.)

Crop Particulars	No. Of Crops	Area in Acres	Total Cost in a year	Yield per Acre	Total Production per Annum	Price Per Quintal.	Total Gross Income	Total Net Income
Marginal								
Paddy	2	1.28	53658	37.6	48.13	2150	103475	49818
Ragi	1	0	0	0	0.00	0	0	0
Tomato	1	0.16	6362	103.16	16.51	1500	24758	18397
Sugarcane	1	0	0	0	0.00	0	0	0
Banana	1	0	0	0	0.00	0	0	0
Othr C.	1	0.16	5046	41	6.56	1700	11152	6106
Small								
Paddy	2	1.5	68700	38.6	57.90	2200	127380	58680
Ragi	1	0	0	0	0.00	0	0	0
Tomato	1	0.47	19416	106.03	49.83	1580	78738	59322
Sugarcane	1	1.25	67713	47.5	59.38	2200	130625	62913
Banana	1	0	0	0	0.00	0	0	0
Othr C.	1	0.47	15176	46	21.62	1750	37835	22659
Medium								
Paddy	2	2	99920	39.8	79.60	2250	179100	79180
Ragi	1	0	0	0	0.00	0	0	0
Tomato	1	1.43	61890	108.13	154.63	1625	251267	189377
Sugarcane	1	2.25	124605	48.8	109.80	2200	241560	116955
Banana	1	0.5	33030	82.5	4.13	28320	116962	83932
Othr C.	1	1.43	47033	48	68.64	1820	124925	77892
Large								
Paddy	2	1.95	98245	41.6	81.12	2275	184548	86303
Ragi	1	1	13000	0	9.20	2950	27140	14140
Tomato	1	1.12	48013	109.73	122.90	1650	202781	154768
Sugarcane	1	5.5	306796	50.6	278.30	2200	612260	305465
Banana	1	0.75	45930	87.5	6.56	28640	187878	141948
Othr C.	1	1.12	38640	48.2	53.98	1840	99331	60691

Source: Primary data collected towards the Ph.D. work by the Research Scholar.

Crop tomato is the other crop in about 0.16 acre of land it is cultivated by the same marginal farm HHs. The cost seems to be Rs. 6,362 and the Gross Income is Rs. 24,758 and the Net Income is Rs. 18,397 for the given land. The land which was cultivated for the crop tomato, the same piece of land 0.16 acre cultivated for Other Crop/s (Beans) and by cultivating it they have realized the income of about Rs. 6,106. The marginal

farmers have not cultivated the crops like Ragi, Sugarcane and Banana as the given land is not sufficient to allocate the land for these crops.

Even in case of the small farmers they are not cultivating the crop ragi and banana because of the same problem explained in case of the marginal farmers. However, the small farmers have allocated major portion of their land to the crops like paddy

(1.50 acres) and sugarcane (1.25 acres). Therefore, the total cost of cultivation of paddy is about Rs. 1,27,380 and Rs. 1,30,625 respectively per year. Once the cost is adjusted the total gain is Rs. 58,680 and Rs. 62,913 respectively per year. Small farmers have also cultivated tomato and other crop (Beans). The income what they have realized is Rs. 59,322 and 22,659 respectively. Out of the four crops cultivated by the small farmers the income from Sugar Cane is very high constituting about Rs. 62,913 followed by this is Rs. 59,322 from the crop tomato. The crops cultivated by the small farmers the income has been more compared to the Marginal farmers.

When it comes to the Medium category of farmers except Ragi they have cultivated all the five crops by allocating the land for each crop. The Medium category of farmers have allocated 2.00 acres for the crop Paddy, Sugarcane it is 2.25 acres and followed by this is for the crops like tomato and the other crops (beans). All the farmers have cultivated first tomato followed by this is crop Beans in the same given piece of land in a given year. The total cost incurred for the cultivation of crops like tomato is Rs. 2,51,267, Sugarcane it is Rs. 2,41,560 and this is followed by the crop Paddy constituting Rs. 1,79,100. By deducting the Gross cost out of the Gross returns the Medium category of farmers have realized the income from tomato, which is the highest constituting Rs. 1,89,377 followed by this is Sugarcane, which is Rs. 1,16,955. In total the income realized by the Medium farmers has been much more when compared to the Marginal and Small farmers for all the crops, which they have cultivated. Even the Medium farmers also have not cultivated the crop ragi as they have diversified to other commercial crops like tomato, beans and the crop banana.

The large farmers owning the land has been more than 10 acres of land. The large farmers have allocated major portion of the land for the crop Sugarcane constituting about 5.5 acres followed by this is crop paddy consisting of about 1.95 acres of land. Accordingly the Gross cost is worked out, which constitutes about Rs. 3,06,796 for the crop Sugarcane and followed by this is crop paddy consisting Rs. 9,245 per year for the given piece of land. The Gross income for this category from all the crops has been more than Rs. 99,331. However, the income from the crop ragi is Rs. 27,140 only. The highest income realised by the farmers is Rs. 3,05,465 and this is followed by the crop tomato consisting of Rs. 1,54,768 per annum. The lowest income seems to be Rs. 14,140 from the crop ragi. The large farmers have cultivated all the six crops in a given year. One more interesting point is that the large farmers total income has been much more than the other three categories of farmers viz., Marginal, Small and Medium farmers in the study area.

### 3. TOTAL RETURNS FROM THE CROPS CULTIVATED BY THE CONTROL GROUP OF FARMERS

In case of the crop paddy, all the sample HHs of the Control Group have cultivated. Table-2 contains the total agricultural income for the Control Group of farmers. In case of the marginal farmers the paddy is grown in 1.15 acres of land with the cropping intensity of two per year. The total cost is Rs. 53,935 and Gross income is Rs. 82513 per year. After deducting the Gross Cost out of the Gross Income the Net Income is Rs. 28,578.

Table-2:Gross and Net Income from Total Land Cultivated for Various Crops (CG Across Various Categories of Farmers (Control Group in Rs.)

Crop Particulars	No. Of Crops	Area in Acres	Total Cost in a year	Total yield	Actual yield	Price Per Quintal.	Total Gross Income	Total Net Income
Marginal								
Paddy	2	1.15	53935	35	40.25	2050	82513	28578
Ragi	1	0.25	2578	8.2	2.05	2750	5638	3060
Tomato	0	0	0	0	0	0	0	0
Sugarcane	0	0	0	0	0	0	0	0
Banana	0	0	0	0	0	0	0	0
Othr C.	0	0	0	0	0	0	0	0
Small								
Paddy	2	1	44690	36.8	36.8	2100	77280	32590

Ragi	1	0.66	7524	8.8	5.808	2800	16262	8738
Tomato	0	0	0	0	0	0	0	0
Sugarcane	1	1.5	75675	45.2	67.8	2200	149160	73485
Banana	0	0	0	0	0	0	0	0
Othr C.	0	0	0	0	0	0	0	0
Medium								
Paddy	2	1.75	84315	37.4	65.45	2150	140718	56403
Ragi	1	1.47	17846	9.8	14.406	2850	41057	23211
Tomato	0	0	0	0	0	0	0	0
Sugarcane	1	2	104140	46.8	93.6	2200	205920	101780
Banana	0	0	0	0	0	0	0	0
Othr C.	0	0	0	0	0	0	0	0
Large								
Paddy	2	2.5	127300	38.4	96	2200	211200	83900
Ragi	1	3.13	37357	10.4	32.552	2900	94401	57044
Tomato	0	0	0	0	0	0	0	0
Sugarcane	1	4.75	237049	48.6	230.85	2200	507870	270821
Banana	0	0	0	0	0	0	0	0
Othr C.	0	0	0	0	0	0	0	0

Source: Primary data collected towards the Ph.D. work by the Research Scholar.

Even in case of the small farmers they are not cultivating crop banana, tomato and Other Crops like Beans, because of the non availability of the land to be allocated for these crops. Same problem explained in case of the marginal farmers, even the small farmers have been facing. However, the small farmers have allocated major portion of their land to the crops like paddy (1.00 acres) and sugarcane (1.50 acres). Therefore, the total cost of cultivation of paddy is about Rs. 44,690 and Rs. 75,675 respectively per year. Once the cost is adjusted the total gain is Rs. 32,590 and Rs. 73,485 respectively per year. Small farmers have also cultivated crop Ragi. The income what they have realized is Rs. 8,738 from the same crop. Out of the three crops cultivated by the small farmers the income from Sugar Cane is very high constituting about Rs. 73,485 followed by this is Rs. 32,590 from the crop Paddy. From the three crops cultivated by the small farmers the income has been more compared to the Marginal farmers.

When it comes to the Medium category of farmers also we find that they are cultivating three crops viz., Paddy, Ragi and Sugarcane. The Medium category of farmers have allocated 1.75 acres of land for the crop Paddy, Sugarcane it is two acres and followed by this is for the crops like Ragi constituting 1.47 acres. The total cost incurred for the cultivation of crops like Paddy it is Rs. 84,315, Sugarcane it is Rs. 1,04,140 and this is followed by the crop Ragi constituting Rs. 17,846. By deducting the Gross cost out of the Gross returns the Medium category of farmers have realized the income from Sugarcane, which is the highest

constituting Rs. 1,01,780 followed by this is the crop Paddy, which is Rs. 56,403. In total the income realized by the Medium farmers has been much more when compared to the Marginal and Small farmers for all the crops, which they have cultivated. Even the Medium farmers also have not cultivated the crops like tomato, banana and crop beans – Any way that is how the sample is designed for the study.

The large farmers owning the land has been more than 10 acres of land. The large farmers have allocated major portion of the land for the crop Sugarcane constituting about 4.75 acres of land followed by this is crop paddy consisting of about 2.50 acres of land. Accordingly the Gross cost is worked out, which constitutes about Rs. 2,37,049 for the crop Sugarcane and followed by this is crop paddy consisting of Rs. 1,27,300 per year for the given piece of land. The Gross income for this category of farmers starts from Rs. 94,401, which is the lowest when compared to the crops Paddy and Sugarcane. The highest income realised by the farmers is Rs. 2,70,821 and this is followed by the crop Paddy consisting of Rs. 83,900. The lowest income seems to be Rs. 57044 from the crop ragi. Even the large farmers have cultivated only three crops in case of the Control Group of Farmers. One more interesting point is that the large farmers total income has been much more than all the other three categories of farmers viz., Marginal, Small and Medium farmers in the study area.

4. GROSS AND NET INCOME FOR THE EXPERIMENTAL GROUP & CONTROL GROUP OF FARMERS

In this subsection the Scholar has tried to document the Gross and Net Income from Various Crops Across two categories of farmers. This will help us directly to understand the impact of the crop diversification and on the agricultural income. The Table-3 reveals that in case of the Marginal farmers the total Net Income is

Rs. 74,321 from all the crops for the Experimental Group of Farmers and it is Rs. 31,638 in case of the farmers belong to the Control Group. Even in case of the Gross cost incurred also we get the same results. When it comes to the Small farm Category of farmers we get the similar trends as in the category of Marginal farmers. The total Net income realised by the small category of farmers has been Rs. 2,03,574 in case of the Experimental Group and it is Rs. 1,14,813 for the Control Group of farmers.

Table-3:Gross and Net Income Generated for the Experimental and Control Group of the HHs (In Rs.).

Crop Particulars	Total Gross Income	Total Net Income	Total Gross Income	Total Net Income
Marginal	Experimental Group		Control Group	
Paddy	103475	49818	82513	28578
Ragi	0	0	5638	3060
Tomato	24758	18397	0	0
Sugarcane	0	0	0	0
Banana	0	0	0	0
Othr C.	11152	6106	0	0
Total	139385	74321	88151	31638
Small				
Paddy	127380	58680	77280	32590
Ragi	0	0	16262	8738
Tomato	78738	59322	0	0
Sugarcane	130625	62913	149160	73485
Banana	0	0	0	0
Othr C.	37835	22659	0	0
Total	374578	203574	242702	114813
Medium				
Paddy	179100	79180	140718	56403
Ragi	0	0	41057	23211
Tomato	251267	189377	0	0
Sugarcane	241560	116955	205920	101780
Banana	116962	83932	0	0
Othr C.	124925	77892	0	0
Total	913814	547336	387695	181394
Large				
Paddy	184548	86303	211200	83900
Ragi	27140	14140	94401	57044
Tomato	202781	154768	0	0
Sugarcane	612260	305465	507870	270821
Banana	187878	141948	0	0
Othr C.	99331	60691	0	0
Sub total	1313938	763315	813471	411765

Source: Primary data collected towards the Ph.D. work by the Research Scholar.

The same Table-3 clearly reveals that the Medium category farmers of the Experimental group have realized the profit (Net income) to the extent of Rs.

5,47,336 and it is Rs. 1,81,394 in case of the Control Group of farmers belong to this category. The same table reveals the results relating to the Large category

of Farmers who are getting the Net Income of Rs. 7,63,315 and this is followed by the Control Group belong to the same category fetching Rs. 4,11,765. The Tabular analysis clearly indicates that the income generated for the Experimental Group of farmers belong to all the four categories farmers viz., Marginal, Small, Medium and Large has been high compared to the Control Group of farmers belong to the same groups. Therefore, the study Hypothesis entitled “Agricultural diversification has led to improvement in the family income of the various categories of farmers” has been accepted.

5. TOTAL FAMILY INCOME FOR THE HHS OF EXPERIMENTAL GROUP AND CONTROL GROUP

It is interesting to understand the total family income of the farmers belonged to various categories of

Table-4: Total Family Income of the HHs from Various Sources (in Rs.)

Income from Various Sources	Experimental Group			
	Marginal	Small	Medium	Large
Total Agricultural Income	74321	242702	387695	813471
Income from Labour Activity	45936	30624	0.00	0.00
Income from Artisan Activities	24000	36200	0.00	0.00
Income from Trading Activities	0.00	0.00	36890	62890
Income from Service	102000	102000	177600	210000
Income from Non-Farm Employment	18000	24000	60000	60000
Total Income of the HH	264257	435526	662185	1146361
Income from Various Sources	Control Group			
Total Agricultural Income	31638	114813	181394	411765
Income from Labour Activity	53592	38280	0.00	0.00
Income from Artisan Activities	18000	24000	0.00	0.00
Income from Trading Activities	0.00	0.00	0.00	0.00
Income from Service	0.00	0.00	0.00	0.00
Income from Non-Farm Employment	12000	16000	36000	36000
Total Income of the HH	115230	193093	217394	447765

Source: Primary data collected towards the Ph.D. work by the Research Scholar.

The same Table-4 reveals that there are six income sources for the farmers belonged to the Control Group. Among the six income sources, in case of the Marginal farmers, the income from labour activity (Agricultural labour, casual labour, construction labour, labour activity in Non-Farm Employment, etc.) has been higher when compared to the other five income sources constituting Rs. 53,592. The next highest income source is agriculture income constituting Rs. 31,638. Except the income source like trading and service from all the other sources the income is

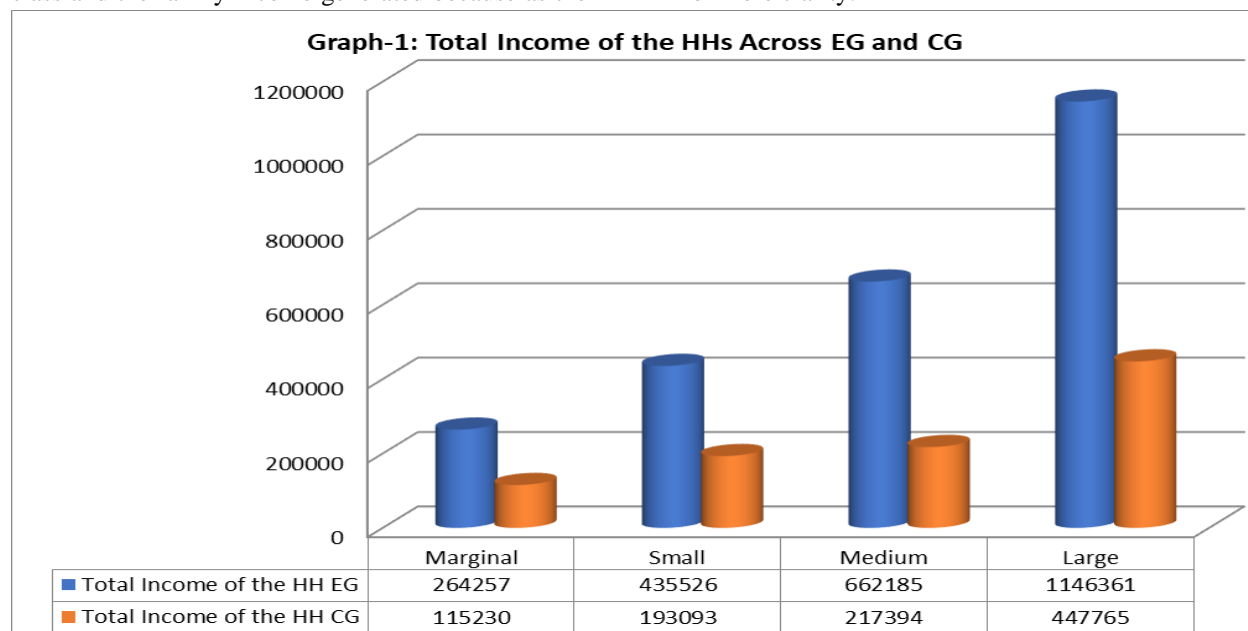
farmers and groups. The Table-4 reveals that there are six income sources for the farmers in the study area for both the groups of farmers, viz., Experimental Group and Control Group. Among the six income sources in case of the Marginal farmers the income from service has been higher when compared to the other five income sources. The next highest income source is agriculture income constituting 74,321. Except the income source like `trading` from all the other sources the income is generated for this category of farmers. In the same category when it comes to the small farmers the major income source is agriculture. From the agriculture sector they are getting Rs. 2,42,702, which is the highest when compared to any other category of farmers. The second major income source is the income from the service constituting about Rs. 1,02,000. Even in case of the small farmers they are not getting any income from the trading activities.

generated for this category of farmers. In the same Group when it comes to the small farmers the major income source is agriculture. From the agriculture sector they are getting Rs. 1,14,813, which is the highest when compared to any other category of farmers. The second major income source is the income from the labour activity constituting Rs. 38,280. Even in case of the small farmers they are not getting any income from the trading and service activities.

In case of the Medium category of farmers belong to the Control group we find that the income from the agriculture sector has been very high constituting Rs. 1,81,394 followed by this, the next most important income source is NFE, the income from this activity is Rs. 36,000. Interestingly for the medium category of farmers, in the Control group, only two sources of income as they are not getting income from any other activity. The large category of the same group of farmers their agricultural income is the highest when compared to any other source of income constituting Rs. 4,11,765 and this is followed by the income from NFE. Like medium category of farmers, the large farmers also not getting income from any other source except these two sources.

At the end it can be summarised from the same Table-4 that there is a positive relationship between the size class and the family income generated because as the

size class increases obviously the family income also increases for both the groups of farmers. However, the marginal farmers belonged to the Experimental Group get more income constituting Rs. 2,64,257 when compared to the Marginal category of farmers belong to the Control Group, which constitutes only Rs. 1,15,230. In percentage terms the marginal farmers of this group constitutes only 30.36 per cent. Even in case of the small farmers of this group also we find the similar results constituting only 30.72 per cent. In case of the medium farmers the gap is widened, which constitutes only 24.72 per cent. Even for the large farmers we find the similar result constituting 28.09 per cent. Therefore, the performance of the Experimental Group has been much more than the Control Group in mobilizing the family income in a given year. Similar results are shown in the Graph-1 for more clarity.



Source: Table No. 04.

## 6. CONCLUSION

In the countries like India where there is lot of scope for the crop and activity diversification to improve their income and employment as there is a diversified temperature, climate, cropping pattern, population etc. the people in our country definitely try some thing new in case it is proved profitable. And moreover given the chance they don't want to migrate from the rural areas to urban areas. During the special circumstance like when their livelihood is challenged and incase they

find it that it is highly difficult to survive then only they think of moving to better places. Therefore, the development agencies have to create such an atmosphere in the rural areas where they have so many alternative avenues to earn their livelihood (Niehof, 2004). In this direction the diversification of agriculture i.e., taking up some new income generating activities will go a long way as the study, which has proved. Towards this the people need to be educated and create awareness so that overall rural development can be done.

REFERENCE

- [1] Anosike, N. and Coughenour, C.M. (1990). The Socioeconomic Basis of Farm Enterprise Diversification Decisions. *Rural Sociology*, 55(1): 1–24.
- [2] Caviglia-Harris, J.L. and Sills, E.O. (2005). Land use and Income Diversification: Comparing Traditional and Colonist Populations in the Brazilian Amazon. *Agricultural Economics*, 32(3): 221-237. Available online: <http://ageconsearch.umn.edu/bitstream/24647/1/cp05cu01.pdf>.
- [3] Goletti, F. (1999). Agricultural Diversification and Rural Industrialization as a Strategy for Rural Income Growth and Poverty Reduction in Indochina and Myanmar. MTID Discussion Paper (1999): Pages-51
- [4] Gopalappa, D.V. (1996). Crop Diversification and Income Levels in Karimnagar District of Andhra Pradesh. *Indian Journal of Agricultural Economics*, 51(3): 381-8
- [5] Maria Saleth, R. (1997). Diversification Strategy for Small Farmers and Landless: Some Evidence from Tamil Nadu. *Indian Journal of Agricultural Economics*, 52 (1).
- [6] Niehof, A. (2004). The Significance of Diversification for Rural Livelihood Systems. *Food Policy*, 29, 321–338. [Cross Ref.]