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Diversification of existing farming system under marginal household condition in Maharashtra State

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Abstract
Diversification is need based and important in agriculture sector for increasing the productivity and sustainability by replacing the existing cultivar in particular area. Agricultural diversification involves movement of resources from low value commodity to high value commodity mix. It focuses mainly on horticulture, dairy, poultry and fisheries sector. A Field experiment was conducted on cultivator's field during *Kharif* and *Rabi* season of 2017-18 on medium black soil in scarcity zone of Satara district in Western Maharashtra. The diversification is carried on farmers field by replacing existing cultivar by university released varieties and technology. In Phaltan and Khandala blocks of Satara district four types of farming systems viz., 1.Crop + Dairy + Goatery + Poultry, 2. Crop + Dairy + Goatery, 3. Crop + Dairy + Poultry and 4. Crop +Dairy were identified. The major cropping systems was Green gram- Chickpea, The annual average net income of four types of farming systems of selected farmers was increased by 14.79 per cent as compared over the benchmark. The average net intervention cost of all components was `8139. The benefit cost ratio was highest in farming system No.1, i.e. Crop + Dairy + Goatery + Poultry i.e. 2.24 after interventions in all four components. Therefore, the farming system Crop +Dairy+ Goatery+ Poultry was found best suitable for getting sustainable and maximum net income in Khandala and Phaltan blocks of Satara district. In capacity building module, before pre score was 51 and the same was increased to 77. After training in respect of skill up gradation the farmers adopted improved package of practices in field crops, livestock, processing and horticulture components.

Keywords: Diversification, farming system.

Introduction
Diversification is need based and important in agriculture sector for increasing the productivity and sustainability by enhancement of production of crop by replacing the existing cultivar in particular area. Agricultural diversification involves movement of resources from low value commodity mix to high value commodity mix. It focuses mainly on horticulture, dairy, poultry and fisheries sector. While most definitions of diversification in developing countries do work on the assumption that diversification primarily involves a substitution of one crop or other agricultural product for another, or an increase in the number of enterprises, or activities, carried out by a particular farm, the definition used in developed countries sometimes relates more to the development of activities on the farm that do not involve agricultural production. The diversification is carried on farmers field by replacing existing cultivar by university released varieties and technology. Every year, the location specific experiments are conducted at six centres with farmers' participatory approach in Mahatma Phule Krishi Vidyapeeth Rahuri jurisdiction. The headquarters of centre is at Central Sugarcane Research Centre, Padegaon, Satara which comes under scarcity zone of Maharashtra state. The high productivity and low productivity blocks in Phaltan and Khandala, respectively were selected for conducting the experiments on farmers field. The present study was taken with the specific objectives, to enhance the productivity and profitability of marginal farmer's households through IFS approach and estimate the impact of capacity building in diversification of crop + livestock system.

Materials and methods
The Satara district was purposively selected with intension of carrying out present research on farmers' field in a district of scarcity zone of Western Maharashtra. The two blocks viz., Phaltan and Khandala were purposively selected. Three villages each from selected blocks, thus, in all six villages were also chosen purposely for the study. Four farmers each from these six selected villages, accordingly, twenty four farmers were selected. The details are shown in Table 1 and 2. The data of experiments were collected by cost accounting method with the

help of specially designed schedule provided by the Director, Farming System Research Project, Modipuram (Uttar Pradesh). The data for the year 2017-18 was collected and estimates were drawn for area under study.

Table 1: Blockwise selection of villages from Satara district

District	Block	Sr. No.	Name of village
Satara	Phaltan (High productive)	1	1. Aradgaon
		2	2. Chavanwadi
		3	3. Chambharwadi
	Khandala (Low productive)	1	4. Khed
		2	5. Sukhed
		3	6. Nimbodi

Table 2: Village and seasonwise distribution of selected farmers (2017-18)

S. No.	Block	Village	No. of Cultivators
1	Phaltan (High	1. Aradgaon	4
		2. Chavanwadi	4
	productive)	3. Chambharwadi	4
2	Khandala (Low productive)	4. Khed	4
		5. Sukhed	4
		6. Nimbodi	4
Total			24

Result

The data from the Table 3 revealed that, the total number of farming system identified were four viz., 1. Crop + Dairy + Goatery + Poultry, 2. Crop + Dairy + Goatery, 3. Crop + Dairy + Poultry and 4. Crop +Dairy in Phaltan and Khandala blocks. The mean area was 0.68 ha, family size of 4 members and benchmark average net income from the four farming system states above ranged between ` 46285 to ` 64714, which include crop, Livestock, products and other components. The highest net income was observed in Farming system No.1, (`64714) and Lowest in Farming System No.2 (`46285) for the bench mark year 2016-17.

Table 3: Farming systems, number of households and mean area

Farming Systems	No. of households	Mean area (ha)	Mean family size (No.)	Cropping systems	Livestock diversification	Product diversification	Other components	Mean benchmark net income from farming (`/ha)
Crop + Dairy + Goatery + Poultry	7	0.70	5	36210	26004	2500	0	64714
Crop + Dairy + Goatery	7	0.63	4	22629	21206	2450	0	46285
Crop + Dairy + Poultry	6	0.83	5	33732	21901	3200	0	58833
Crop + Dairy	4	0.54	3	39100	20950	2450	0	62500
Average		0.68	4	32918	22515	2650	0	57500

Table 4: Constraints of Phaltan and Khandala block of Satara district

Constraints related to the identified problem	Interventions for diversification
Crop 1.Unvailability of improved variety seed 2. Imbalance fertilizer use.	**Cropping system diversification** Providing seed of improved variety of diversified crop Supply of chemical fertilizer
Livestock 1. Unavailability of improved Goat breed/poultry birds. 2.Lack of technical Knowledge about feeding/ animal nutritional housing	**Livestock diversification** 1. Providing improved Goat kid/poultry chicks for backyard farmin g 2. Providing technical Knowledge of animal nutrition/housing/health/cattle shed management and hygienic milk production.
Product 1. No equipment for grading. 2.No equipment for making ghee 3. Lack of Technical knowledge of preparation of feed and mineral mixture.	**Product diversification** 1.Supply of sieve for grading food grain 2.Provide equipment for ghee making 3.Providing technical Knowledge for sieving of food grain and Providing technical Knowledge for preparation of ghee
Information and training Lack of knowledge regarding improved package of practices of *Kharif, Rabi and Summer* crops	**Capacity Building** Organizing training./field day/visit/.Supply of, bulletin and Krishi Darshani/ Sughi publications of M.P.K.V. Rahuri.

Table 5: Types of Farming Systems and components and net income (Rs.)

Farming System (s)	No. of house holds	Mean holding size (ha)	Mean Family size (no's)	Components			Average Net Income (`)	
				Cropping systems	Livestock (Dairy, Goatery, Poultry)	Other components	Bench Mark	2017-18
Crop +Dairy+ Goatery+ Poultry	7	0.70	5	Pearl millet - Wheat Maize -Onion Green gram - Chickpea Sorghum (Fodder) Sugarcane-	Cow Buffaloes Goatery Chickpea	--	64714	73452
Crop +Dairy + Goatery	7	0.63	4	Pearl millet - Wheat Maize - Onion Onion - Chickpea Sorghum (Fodder) - Sugarcane-wheat	Cow Buffaloes Goatery	--	46285	65142
Crop+ Dairy + Poultry	6	0.83	5	Pearl millet - Wheat Maize - Onion Onion - Chickpea Sorghum (Fodder) - Sugarcane-Chick pea	Cow Buffaloes Chickpea	--	58833	64642
Crop +Dairy	4	0.54	3	Pearl millet - Wheat Maize - Onion	Cow Buffaloes	--	62500	63460

				Onion - Chickpea Sorghum (Fodder) - Chickpea Maize fodder-Sugarcane				
Total	24	0.68	4	Increase over previous year (Per cent)				14.79

Result: The data from the Table 5 revealed that, the Phaltan and Khandala blocks were four types of predominant farming systems namely, 1. Crop + Dairy + Goatery + Poultry, 2. Crop + Dairy + Goatery,3. Crop + Dairy + Poultry and4.Crop +Dairy. The major cropping systems observed were Pearlmillet-Wheat, Green gram- Chickpea, Onion - Chickpea, and Sugarcane-Maize fodder. The annual average net income of first farming system was highest and increased from `64714to `73452 over bench mark. The overall from four types of farming system the net income was increased by 14.79 per cent as compared to previous year. Thus the farming system No.1 i.e. Crop +Dairy+ Goatery+ Poultry is best suitable as compared to other three farming systems for getting sustainable and maximum net income in Khandala and Phaltan blocks of Satara district.

Table 6: Economics of Farming system (`)

S. No.	Farming Systems	Average Gross Returns	Average Cost of Cultivation	Average Net returns	B:C Ratio
1	Crop +Dairy + Goatery + Poultry	132452	59000	73452	2.24
2	Crop +Dairy + Goatery	125467	60325	65142	2.08
3	Crop+ Dairy + Poultry	131454	66812	64642	1.97
4	Crop +Dairy	130622	67162	63460	1.94

Economics: The data from the Table 6 indicated that, the average gross income, net income and benefit cost ratio was highest in farming system No.1viz. ` 132452, ` 73452 and 2.24 respectively. Whereas, the average gross income was lowest in farming system No.2 i.e. `125467 and net income and benefit cost ratio was lowest in farming system No.4, `63460 and 1.94, respectively. Therefore, it is inferred that farming system No.1 was best suitable and economically viable after interventions in crop, livestock, product diversification and capacity building system among the other three types of farming system. This might be due to integrated effect of different component.

Table 7: Net benefit due to intervention (2017-18)

Farming Systems	Holding size (ha)	Average Interventional cost (Rs)					Average net income due to interventions (Rs)					Increase over bench mark (Per cent)
		Cropping systems	Livestock diversification	Product diversification	Capacity building	Total	Cropping systems	Livestock diversification	Product diversification	Capacity building	Total	
Crop + Dairy + Goatery +Poultry	0.70	1270	6325	300	244	8139	40242	29003	3187	1020	73452	13.50
Crop + Dairy + Goatery	0.63	1270	6325	300	244	8139	35114	26187	2611	1230	65142	40.74
Crop + Dairy + Poultry	0.83	1270	6325	300	244	8139	34780	25274	3438	1150	64642	9.87
Crop +Dairy	0.54	1270	6325	300	244	8139	33945	24750	3025	1740	63460	1.54
	0.68	--	--	--	--	--	36020	26304	3065	1285	66674	14.79

Result: The data from the table 7 indicated that, the average net intervention cost of all components was `8139during the year 2017-18. The total average net income was highest in farming system No.1 ` 73452 and lowest in farming system No.4 ` 63460. The percentage increase in net income over the bench mark year was highest in farming system No.2 i.e. 40.74 per cent because at bench year 2016-17 the net income in crop and animal component was less as compared to other types of farming system and after intervention which has increased due to diversification crop, dairy and Goatery components. At overall level the average net income increased by 14.79 per cent due to interventions as compared to bench mark year 2016-17. This might be due to intervention for diversification in cropping systems, livestock, products and capacity building the similar result was observed by Makate C & etal.

Table 8: Impact of capacity building module

Farming System	No. of trainings	Knowledge		Net Income enhancement (`)	
		Pre-score (mean)	Post score (mean)	Before training	After training
Crop +Dairy + Goatery + Poultry	1	11.40	18.75	776	1020
Crop +Dairy + Goatery	1	12.50	14.50	986	1230
Crop+ Dairy + Poultry	1	14.65	22.50	906	1150
Crop +Dairy	1	12.50	21.60	1496	1740

Result

From the table No.8 it is indicated that, net return enhancement was notably recorded by training on diversified component of different Farming system. The highest net income was increased in farming system No.4 as compared to three farming system. The lowest net income was observed in farming system No.1 due to capacity building module.

Conclusions

1. In Phaltan and Khandala blocks of Satara district four types of farming systems namely, 1. Crop + Dairy + Goatery + Poultry, 2. Crop + Dairy + Goatery, 3. Crop + Dairy + Poultry and 4. Crop +Dairy were identified. The major cropping systems in four farming systems are Pearlmillet-Wheat, Green gram- Chickpea, Onion - Chickpea, and Sugarcane-Maize fodder. The annual average net income of farming system No.1 was highest and increased net income from `64714to `73452 over bench mark. From overall four types of farming system the average net income of selected farmers was increased by 14.79 per cent as compared to previous year.
2. The average net intervention cost of all components were `8139 which has increased the average all component wise net income after interventions to `73452, `65142, `64642 and `63460 of farming system No.1, 2, 3 and 4 respectively. This is due to combinely diversification of crop, livestock, product and capacity building components.
3. The benefit cost ratio was highest in farming system No.1, i.e. Crop + Dairy + Goatery + Poultry i.e. 2.24 after interventions in all four components. Therefore, the farming system No.1 i.e. Crop +Dairy+ Goatery+ Poultry is best suitable for getting sustainable and maximum net income in Khandala and Phaltan blocks of Satara district.
4. In capacity building module, before pre score was 51 and the same was increased to 77. After training in respect of Skill up gradation the farmers adopted improved package of practices in field crops, livestock, processing and horticulture components.

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