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An Empirical Assessment of Effectiveness of Agri-Business Entrepreneurs in Enhancing Farmers Income in Maharashtra

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ABSTRACT

The present investigation attempts to assess the functioning of various agri-ventures established by agribusiness entrepreneurs under broad based Agri Clinics and Agribusiness Centres Scheme launched by the Government of India in the early 2000s. The major focus of the study is on evaluating the extent of income generation from crop enterprises for member farmers of agri-ventures as against non-members, aside from identifying benefits accrued to farmers through extension services provided by agri-ventures, examining the factors serving as constraints in providing services to farmers and suggesting measures to strengthen extension services to farmers through agri-ventures. The study showed that the agri-ventures established by agri-entrepreneurs had a positive impact in Maharashtra since the beneficiaries of agri-ventures generated substantially high income from crop enterprises as against their non-beneficiary counterparts. The benefits rendered by agri-ventures to their member farmers in terms of access to farm technology, information on cropping practices, advice on plant protection measures and even on prices prevailing in various markets helped them to derive higher income from crop enterprises as against non-members. The agri-ventures not only extended various inputs, advices and service facilities but also provided various remedial measures to farmers, especially with respect to low germination of seeds, causes for the damage of crops, and created awareness about indiscriminate use of fertilisers. Further, the input supply ventures provided information to farmers on new ideas developed by agricultural research stations, improved crop varieties, improved water management and also information about plant diseases. These extension services helped beneficiaries to increase their productivity as well as income. However, as for the functioning of agribusiness entrepreneurs, one of the suggestions of the study is to enhance their outreach which would consequently provide access to their services to more farmers and benefit them in terms of rise in farm productivity and income.

Keywords: Agribusiness, Agri-ventures, Entrepreneurs, Agri-clinics, Maharashtra

JEL.: Q13, Q16

I

INTRODUCTION

The demand for knowledge on agricultural practices and technologies has been increasing from farmers. The farmers not only require organisational, marketing, technological, financial and entrepreneurial support but also knowledge based services from different sources, which helps them to integrate production-led strategy with market-led strategy, and, thereby, overcoming new concurrent challenges. Therefore, the role of agricultural entrepreneurs of late has gone beyond disseminating information on technologies, and includes, organising user groups, linking farmers to markets, engaging in research planning and technology selection, enable changes in policies and linking producers to a range of other support and service networks

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(Sulaiman and Hall, 2004, Rivera and Sulaiman, 2009). The farmer to extension worker ratio in India stands at very low despite increasing demand for agricultural extension services (Davis *et al.*, 2010; Mukherjee and Maity, 2015). It has been reported that only around 20 per cent of the agricultural extension workers are qualified agricultural graduates and the rest become incapable to explain the intricacies of agricultural production system and the linkage of production with complex marketing activities (ICAR, 1998). This makes transferring the emerging technologies to the poor and illiterate farmer at village level a challenging task for these extension workers.

In view of the role and importance of agricultural extension services to the farmers and in order to tap potential of unemployed agriculture graduates, the Government of India on 9th April, 2002 launched a scheme of setting up of Agri Clinics[1] and Agri Business Centres[2] (ACABCs)[3] by agriculture graduates with the financial support of National Bank for Agriculture and Rural Development (NABARD). It is a subsidy based credit linked scheme for setting up of agricultural ventures by unemployed agricultural graduates, especially to strengthen technology transfer, public extension system and employment generation in rural areas. It is to be noted that National Institute of Agricultural Extension Management (MANAGE) is responsible for providing training to eligible candidates through its nodal training institutes (NTIs), and also motivating them to set-up agri-ventures. MANAGE also ensures sponsoring of sufficient number of cases to the participating banks for their financial support under the scheme, besides arranging to establish required number of units at the ground level.

Although the scheme was launched more than one and half decade ago, the pertinent questions that need to be answered are the extent to which the scheme has encouraged the educated youth in the field of agriculture to undergo training from suitable identified nodal agencies, gain expertise, avail of loan and finally start an agri-clinic or agri venture. The other relevant aspect is the extent to which these agri-clinics and agri- ventures have reached out to the farmers so as to benefit them in the farming and allied activities.

The state of Maharashtra ranks first in India in terms of the candidates trained and agri-ventures developed under the Scheme during the past one and a half decades.[4] Therefore, the present study focuses on evaluating the extent to which the agri-ventures established under the scheme in Maharashtra is successful in augmenting farmers' income through crop enterprises, identifying the benefits accrued to farmers through extension services provided by agri-ventures, examining the factors that serve as a constraint for provision of extension services to farmers, and suggesting measures which will strengthen extension services to farmers by agri-ventures.

The outline of this study encompasses selection of agri-ventures and member and non-member beneficiary and non-beneficiary farmers, an assessment of their cropping pattern, details of various benefits received by the member farmers, extension services received by non-members, and an evaluation of cost, return and income generation from various crops cultivated by beneficiary and non-beneficiary farmers of agri-ventures.

The paper is organised in different sections. The outline of the study includes the introduction of the topic, followed by sampling technique for the selection of members and non-members of agri-ventures and method of date collection. A brief description of the status of agri-ventures established in the State and their growth trends is discussed subsequently. This is followed by empirical findings, which encompasses the cropping pattern of selected farmers, the type of benefits received by members from agri-ventures, and also certain extension services received by non-members from other sources. Further, an evaluation of cost and returns, and impact of agri-ventures on income generation from crop enterprises is undertaken. The study finally provides conclusions and policy implications of the study based on the findings.

II

DATA AND METHODOLOGY

The present study was conducted in Solapur and Ahmednagar districts of Maharashtra. Two NTIs were selected for the present investigation. Shriram Pratistan Mandal, Wadala was selected as one of the NTIs from Solapur district. The other selected NTI namely, Krishi Vigyan Kendra, Babhaleshwar, belonged to the district of Ahmednagar. It was further decided to select five agri-ventures randomly from each of the selected districts, which had been established with the help of selected NTIs subject to the condition of higher number of beneficiary farmers. A list of beneficiary member farmers was collected from each of the selected agri-ventures. It was decided to select 10 beneficiary member farmers from each of the five selected agri-ventures from each of the two sampled districts. Thus, a sample of 50 beneficiary member farmers was selected from Solapur district and another 50 from Ahmednagar district with a sum of 100 beneficiary member farmers selected from the two sampled districts of Maharashtra. As control group, 5 non-beneficiary member farmers were selected from each of the five selected agri-ventures from each of the two sampled districts. Therefore, a sample of 25 non-beneficiary farmers was also selected from Solapur district and another 25 from Ahmednagar district with a sum of 50 non-beneficiary farmers selected from the two sampled districts of Maharashtra.

The 100 beneficiary member farmers selected from two districts encompassed 20 marginal farmers, 37 small farmers, 29 medium farmers and 14 large farmers. The 50 non-beneficiary member farmers selected from two districts encompassed 15 marginal farmers, 13 small farmers, 15 medium farmers and 7 large farmers. In all, the study covered 150 sampled beneficiary and non-beneficiary farmers. The impact of ACABC Scheme was evaluated by comparing income and other relevant parameters for the beneficiary and non-beneficiary member farmers. The reference period for the primary data survey was the agricultural year 2015-16. The venture-wise and Service-wise distribution of sampled beneficiary and non-beneficiary member farmers is shown in Table 1. A brief profile of the entrepreneurs selected from the districts of Solapur and Ahmednagar is presented in Appendix 1.

TABLE 1. VENTURE-WISE AND SERVICE-WISE DISTRIBUTION OF SAMPLED BENEFICIARY AND NON-BENEFICIARY FARMERS

District	Name of agri-venture	Member beneficiary farmers					Non-member beneficiary farmers				
		Marginal	Small	Medium	Large	Total	Marginal	Small	Medium	Large	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Solapur	Vasundhara Agro services	2	3	2	3	10	3	1	1	-	5
	Mahalaxmi Krishi Kendra	1	3	6	-	10	1	-	3	1	5
	Penurkar nursery	3	4	3	-	10	2	-	-	3	5
	Kamdhenu dairy farm	7	2	1	-	10	3	-	2	-	5
	Matoshri Goat Farm	1	5	3	1	10	3	2	-	-	5
	Total	14	17	15	4	50	12	3	6	4	25
Ahmednagar	Parivar Agro seva	-	4	2	4	10	-	3	2	-	5
	Datta Agro seva	4	1	5	-	10	1	3	-	1	5
	Trimurty Agro nursury	2	6	1	1	10	1	1	3	-	5
	Radheya poultry farm	-	7	2	1	10	-	3	1	1	5
	Unimax	-	2	4	4	10	1	-	3	1	5
	Total	6	20	14	10	50	3	10	9	3	25
	Grand total	20	37	29	14	100	15	13	15	7	50

The agricultural graduates trained by various NTIs provide a wide range of agricultural extension services to farmers, which not only include advises on agricultural practices as well as input supply from ventures but also advises on improved production technologies. The agri-clinics related ventures provide various facilities to the farmers, viz., soil and water quality-cum-input testing laboratory services, plant/crop protection service, extension consultancy services, services through veterinary dispensaries, food processing and testing units services, mobile veterinary clinics services, plant protection services, etc. There are as many as 19 Nodal Training Institutes (NTIs) in Maharashtra, which provide training to unemployed agricultural graduates to establish agri-ventures (Appendix 2).

Agricultural Extension Services Provided to Farmers by Agri- Entrepreneurs

In general, various NTIs operating in Maharashtra put together were seen to provide training on ACABC Scheme to some 11,621 agricultural graduates during the period between 2002 and 2016. These NTIs were instrumental in establishing 5,276 agri-ventures in Maharashtra during the same period. Further, there has been significant growth in number of candidates trained and agri-ventures established in Maharashtra. The growth rate estimates with respect to division-wise number of agricultural graduates trained and agri-ventures established in Maharashtra during the period between 2002 and 2016 are given in Appendix 3.

The growth in agri-ventures established was faster than growth in candidates trained under ACABC Scheme in Maharashtra between 2002 and 2016. This held true

for almost all the divisions of Maharashtra. Further, there was slowing down in terms of candidates trained and agri-ventures established during 2010-16 period as against 2002-09 period.

Empirical Findings

The empirical findings of the study mainly revolved around area allocation under different crops in various seasons of member and non-member farmers of agri-ventures, details regarding extension services received by the member beneficiaries, receipt of inputs, training and other support from ventures established under the Scheme, awareness of non-member farmers regarding the Scheme, sources of procuring inputs, extension services received by them, input cost, output value and income generation from various crops, and impact of the scheme on member farmers in enhancing their farm income.

Cropping Pattern of Farmers

The area allocation of member and non-member farmers of agri-entrepreneurs during *kharif, rabi* and summer seasons and under perennial crops is presented in Table 2. The area allocation under different seasons varied significantly for member and non-member farmers. Although area allocation under *kharif* crops as proportion of gross cultivated area (GCA) was the highest for both member and non-members, the member farmers also showed significantly high proportion of GCA under perennial crops as against non-member farmers. In general, the GCA was estimated at 295.45 hectares for member farmers and 148 hectares for non-member farmers.

While member farmers of agri-entrepreneurs showed 37.33 per cent of the GCA under *kharif* season, 28.35 per cent under *rabi* season, 0.82 per cent under summer season and 33.50 per cent under perennial crops, the area allocation as proportion of GCA for non-member farmers was 47.18 per cent under *kharif* crops, 32.28 per cent under rabi crops, 0.82 per cent under summer crops and 19.66 per cent under perennial crops. The member farmers also showed a tendency of rise in proportion of GCA under perennial crops and a decline in proportion of GCA under *kharif* and *rabi* crops with the increase in their land holding size.

Benefits Received from Agribusiness Entrepreneurs/Ventures

The main purpose of the ventures established by agri-entrepreneurs under the scheme was to increase the productivity of crops/animals and thus increase the incomes of farmers. Accordingly, an attempt was made to observe the extent to which member farmers availed extension services/support/advices from agri-ventures, and views/opinion of member farmers in this respect are recorded in Table 3.

TABLE 2. CROPPING PATTERN OF MEMBER AND NON-MEMBER FARMERS OF AGRI-ENTREPRENEURS IN MAHARASHTRA

(*area in hectares*)

	Area Sown													
	Kharif Season				*Rabi* Season				Summer	Perennial Crops				GCA
Category	Cereal	Pulses	Others	Total	Cereal	Pulses	Others	Total	crops	Sugarcane	Pomegranate	Others	Total	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
A. Member Farmers														
Marginal	3.74	1.01	3.23	7.98	4.44	0.51	0.81	5.76	-	3.13	0.51	1.21	4.85	18.59
	(20.12)	(5.43)	(17.37)	(42.93)	(23.88)	(2.74)	(4.36)	(30.98)		(16.84)	(2.74)	(6.51)	(26.09)	(100.0)
Small	17.88	1.23	11.92	31.03	17.70	0.61	4.64	22.95	1.82	10.91	7.27	3.03	21.21	77.01
	(23.22)	(1.60)	(15.48)	(40.29)	(22.98)	(0.79)	(6.03)	(29.80)	(2.36)	(14.17)	(9.44)	(3.93)	(27.54)	(100.0)
Medium	16.55	4.55	16.44	37.54	20.61	3.84	6.16	30.61	0.60	27.68	7.88	2.22	37.78	106.54
	(15.53)	(4.27)	(15.43)	(35.24)	(19.34)	(3.60)	(5.78)	(28.73)	(0.56)	(25.98)	(7.40)	(2.08)	(35.46)	(100.0)
Large	14.55	2.42	16.77	33.74	15.35	3.43	5.66	24.44	-	11.72	22.63	0.80	35.15	93.33
	(15.59)	(2.59)	(17.97)	(36.15)	(16.45)	(3.68)	(6.06)	(26.19)		(12.56)	(24.25)	(0.86)	(37.66)	(100.0)
Total	52.71	9.21	48.36	110.28	58.10	8.38	17.28	83.76	2.42	53.43	38.28	7.28	98.99	295.45
	(17.84)	(3.12)	(16.37)	(37.33)	(19.66)	(2.84)	(5.85)	(28.35)	(0.82)	(18.08)	(12.96)	(2.46)	(33.50)	(100.0)
B. Non-Member Farmers														
Marginal	3.23	-	2.43	5.66	2.22	0.61	0.50	3.33	1.21	1.41	0.61	0.71	2.73	12.93
	(24.98)		(18.79)	(43.77)	(17.17)	(4.72)	(3.87)	(25.75)	(9.36)	(10.90)	(4.72)	(5.49)	(21.11)	(100.0)
Small	5.37	-	7.07	12.44	3.84	1.21	1.01	6.06	-	3.03	4.14	0.41	7.58	26.08
	(20.59)		(27.11)	(47.70)	(14.72)	(4.64)	(3.87)	(23.24)		(11.62)	(15.87)	(1.57)	(29.06)	(100.0)
Medium	9.29	2.42	11.52	23.23	16.36	0.40	1.83	18.59	-	5.66	3.84	0.50	10.00	51.82
	(17.93)	(4.67)	(22.23)	(44.83)	(31.57)	(0.77)	(3.53)	(35.87)		(10.92)	(7.41)	(0.96)	(19.30)	(100.0)
Large	11.92	2.42	14.14	28.48	17.37	1.62	0.81	19.80	-	5.66	0.81	2.42	8.89	57.17
	(20.85)	(4.23)	(24.73)	(49.82)	(30.38)	(2.83)	(1.42)	(34.63)		(9.90)	(1.42)	(4.23)	(15.55)	(100.0)
Total	29.82	4.85	35.15	69.82	39.80	3.84	4.14	47.78	1.21	15.76	9.39	3.95	29.10	148.00
	(20.15)	(3.28)	(23.75)	(47.18)	(26.89)	(2.59)	(2.80)	(32.28)	(0.82)	(10.65)	(6.34)	(2.67)	(19.66)	(100.0)

Note: In *Kharif* season, 'Others' include crops viz. cotton, fodder (jowar), vegetable and flower crops. In Rabi Season, 'Others' include crops viz. fodder (jowar, Lucerne and vegetable crops. In Summer Season, crops include oilseeds, fodder (jowar) and ginger. Other perennial crops include papaya, grape, mango, lemon, chiku, guava and coconut.

TABLE 3. DETAILS OF VARIOUS BENEFITS RECEIVED BY MEMBER FARMERS FROM AGRI-VENTURES

(*No. of Beneficiaries*)

Sr. No. (1)	Particulars (2)	Marginal (3)	Small (4)	Medium (5)	Large (6)	Total (7)
	Sample Size (N)	20	37	29	14	100
A)	Extension services received from ventures on					
	- Farm machine	1	2	-	-	3
	- Dairy, poultry, etc.	9	13	5	1	28
	- Apiary, sericulture, etc.	-	-	-	-	-
	- Other extension services including production trend and advices, etc.	20	30	27	13	90
	- All extension services received	30	45	32	14	121
B)	Support received from ventures					
	- Availability of inputs	4	11	8	7	30
	- Marketing services of output	7	18	11	1	37
	- repairs and maintenance	2	4	4	1	11
	- Other support (advice and guidance)	20	37	29	14	100
C)	Extension services and expert advices which raised income					
	- Farm technology	16	28	26	10	80
	- Cropping practices	4	19	19	8	50
	- Protection from pests and diseases	12	22	23	10	67
	- prices of crop outputs in market	5	17	15	5	42
	- Animal health services	9	14	9	6	40

The input supply ventures also provided information to farmers on new ideas developed by agricultural research stations, improved crop varieties, improved water management and also information about plant diseases. All these extension services helped to increase productivity of member farmers. There was also regular visit by input suppliers to the farm so as to monitor the health of the crop. With respect to allied services, it was observed that that those who had set up dairy ventures provided a wide variety of services to farmers who maintained milch animals. These services encompassed guidance to farmers regarding scientific method of feeding, fodder production, pregnancy diagnosis of the animal, transportation of milk and milk products, etc.

It is to be further noted that about 30 percent of members received support in the form of availability of inputs, and 37 per cent of them received market information since prevailing price information in various markets for output were supplied by ventures. In general, all sampled farmers received some form of support from agri-ventures. The farmers gained maximum from agri-ventures through information on farm technology, followed by cropping practices, protection from pests and diseases, animal health services, etc. The agri-ventures also provided several remedial measures to farmers, especially to cope up with low germination of seeds, causes for the damage of crops, and created awareness about indiscriminate use of fertilisers.

In general, it can be observed that the farmers had benefited from agri-ventures through access to farm technology, information on cropping practices, advice on plant protection measures and even prices prevailing in various markets. All farmers who practiced allied activities had received information on health care and scientific

feeding/management of animals, which helped them to maximise output. These farmers effectively tacked problems faced by them.

The agri-ventures in the study also provided various remedial measures to farmers, especially with respect to low germination of seeds, causes for the damage of crops, and created awareness about indiscriminate use of fertilisers. Further, the input supply ventures provided information to farmers on new ideas developed by agricultural research stations, improved crop varieties, improved water management and also information about plant diseases. These extension services helped beneficiaries to increase their productivity as well as income.

Extension Services with Respect to Non-Members

The non- members were not aware of the availability of standardised inputs from agri-ventures. Therefore, they had to resort to other sources[5] for procurement of inputs. It could be discerned from Table 4 that 78 per cent of non-members largely resorted to *Krishi Seva Kendras (KSK)* for purchase of inputs. The KSK normally provide inputs such as seed, planting material, pesticides, fertilisers, plant protection chemicals to the farmers. In case of farmers who were involved in dairy and other activities, they purchased inputs from Baramati Agro-foods or Warana Dairy.

TABLE 4. DETAILS OF EXTENSION SERVICES RECEIVED BY NON-MEMBER FARMERS IN MAHARASHTRA

(*No. of Non-Beneficiaries*)

Category of non-members (1)	Sample size (2)	Baramati agro feeds (3)	Krushi seva kendra (4)	Narayangaon nursery (5)	Rahuri agro centre (6)	Sugar factory outlet (7)	Warna dairy (9)
Marginal	15	1	11	1	1	-	1
Small	13	1	11	1	-	-	-
Medium	15	1	11	3	-	-	-
Large	7	-	6	-	-	1	-
Total	50	3	39	5	1	1	1

Thus, the non-members of agri-ventures neither heard about the Scheme nor were aware of the services provided by them. They were dependent on Krishi Seva Kendras or other sources for purchase of inputs and other extension services. However, some of them revealed that fertilisers were not available on time and also water scarcity is often the cause of low yield.

Input Cost, Output Value and Income Generation from Crops

The input costs and output value for various crops cultivated during *kharif, rabi*, and summer seasons as well as for perennial crops were computed to ascertain the extent of income generation from these crops for member and non-member farmers of agri-ventures. However, in this study only the overall scenario with respect cost and return estimates for all crops put together are delineated for member and non-member farmers of agri-ventures and these are shown brought out in Table 5, with Appendix 4 showing a break-up of income generation.

TABLE 5. INPUT COST, OUTPUT VALUE AND NET INCOME FROM ALL CROPS CULTIVATED BY MEMBER AND NON-MEMBER FARMERS OF AGRI-VENTURES IN MAHARASHTRA

Category	Member farmers			Non-member farmers		
	Input cost	Output value	Net income	Input cost	Output value	Net income
(1)	(2)	(3)	(4)	(5)	(6)	(7)
			In Rs./Hectare			
Marginal	29465	72625	43160	25893	67877	41984
Small	35366	93986	58621	38006	92583	54577
Medium	49946	110908	60963	34350	72314	37964
Large	60615	150273	89658	32657	64233	31576
Total	48230	116531	68301	33601	72377	38775
			In Rs./Household			
Marginal	27388	67505	40118	22320	58510	36190
Small	73608	195619	122011	76246	185737	109490
Medium	183490	407454	223964	118667	249820	131153
Large	404086	1001786	597700	266714	524600	257886
Total	142497	344292	201795	99460	214235	114775

Note: Input cost includes cost of imputed value of owned inputs and purchased inputs (all paid out cost).

The estimates clearly underscored the fact that the annual income generation on per hectare basis with all crops put together was of the order of Rs.68,301 for member and Rs.38,775 for non-member farmers, showing 76 per cent higher income generation for member as against non-member farmers. The member farmers also derived significantly higher income from crop enterprises on per household basis. The per household income generation with all the crops put together was Rs.2,01,795 for member and Rs.1,14,775 for non-member farmers. Thus, as against non-member farmers, the member farmers not only derived 76 higher income from crop enterprises on per hectare basis but also on per household basis.

A substantially higher income generation for member farmers of agri-ventures could be due to higher area allocation under high value perennial crops, better management of cultivation practices, higher productivity of crops, better quality, higher prices on offer for output, etc. Various types of inputs, extension services and advices provided by agri-ventures to their member farmers worked as a catalyst in improving yield levels of crops as well as animals, which subsequently augmented the income of member farmers as against non-members.

Impact of Agri-Ventures on Income Generation

In order to examine the impact of agri-ventures established by agri-entrepreneurs on income generation from crop enterprises, mean differences of income between member and non-member farmers were computed on per hectare and per household basis, which were also tested to see their significance using t-statistics. The estimates relating to income generation from all crops for member and non-member farmers on per hectare and per household basis and their mean differences (MD) in this respect are brought out in Table 6.

TABLE 6. INCOME FROM ALL CROPS FOR MEMBER AND NON-MEMBER FARMERS OF AGRI-VENTURES

Category of farmers	Member farmers		Non-member farmers		MD-I	MD-II
	Rs./Hectare	Rs./Household	Rs./Hectare	Rs./Household	(1-3)	(2-4)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Marginal	43160	40118	41984	36190	1176	3928
	(4022.14)	(3366.19)	(3900.22)	(2366.98)	(953.0322)	(3169.2951)
Small	58621	122011	54577	109490	4044	12521**
	(4889.67)	(8234.11)	(3722.88)	(8566.45)	(3822.3771)	(5253.1119)
Medium	60963	223964	37964	131153	22999*	92811*
	(3927.84)	(22300.12)	(5299.36)	(7769.31)	(5678.5560)	(22133.6045)
Large	89658	597700	31576	257886	58082*	339814*
	(7412.33)	(41562.99)	(2985.55)	(26005.88)	(10771.8812)	(45360.2264)
Total	68301	201795	38775	114775	29526*	87020*
(average)	(6711.55)	(15800.38)	(2465.36)	(8564.38)	(6033.0465)	(1282.2298)

Note: 1) Figures in parentheses under income in Rs./Hectare and Rs./Household are their respective standard errors, 2) Figures in parentheses under MD-I and MD-II are standard errors of differences between mean values of income of member and non-member households, 3) * and ** indicate significance of mean difference at I, 5 per cent level of probability.

Although the marginal and small category of member and non-member farmers of agri-ventures did not show much difference in income from crop enterprise on per hectare basis, the medium and large category of member farmers showed significantly higher income generation from crop enterprise on both per hectare and per household basis. Therefore, the impact of agri-ventures established by agri-entrepreneurs on income generation was more pronounced for medium and large category of member farmers. In general, the study showed a positive impact of agri-ventures on income generation for member farmers from all crops as against non-member farmers since mean difference of income from all crops was significantly higher for member as against non-member farmers of agri-ventures.

IV

CONCLUSIONS AND POLICY IMPLICATIONS

The study showed a positive impact of agri-ventures established by agri-entrepreneurs in the state of Maharashtra since member of agri-ventures generated substantial income from crop enterprise as against non-member. The extent of annual income generation from crop enterprise on per household as well as per hectare basis was 76 per cent higher for member as against non-member farmers. The major reasons that favoured member farmers to derive significantly higher income were higher area allocation under high value perennial crops, better management of cultivation practices, higher productivity of crops, better quality, higher prices on offer for output, etc. Various types of inputs and extension services provided by agri-ventures to their beneficiary farmers worked as catalyst in augmenting the income of member farmers as against non-members.

It is to be noted that while agri-ventures in the study provided various remedial measures to farmers, especially with respect to low germination of seeds, causes for the damage of crops, and created awareness about indiscriminate use of fertilisers, the

input supply ventures provided information to farmers on new ideas developed by agricultural research stations, improved crop varieties, improved water management and also information about plant diseases. These extension services helped the member farmers to increase their productivity as well as income.

The higher productivity of crops and higher income generation for members of agri-ventures may not be solely attributed to the facilities and services provided by these ventures and there could be several other factors which might be responsible for rise in their income generation. However, in general, it can be inferred that agri-ventures played a positive role in facilitating farmers not only in acquiring requisite input facilities but also various other service facilities due to their wider access to public extension system, technology transfer, and financial support.

Although the members of agri-ventures did benefit from the services in terms of suitable extension services and also with respect to purchase of inputs at reasonable prices, the non-members in this respect depended on *Krishi Seva Kendras* or other sources for purchase of inputs and other extension services, and they also showed concern for the delay in availability of fertiliser and scarcity of water, which caused low yield. As for functioning of agribusiness entrepreneurs, there is still a need to increase their outreach so that more farmers can have access to their services and benefit from higher farm productivity and income. Another suggestion is that loans should be made available more easily so that more clinics/ventures may be established.

NOTES

(1) The concept of Agri-Clinics is that Agri-Clinics are envisaged to provide expert advice and services to farmers on technology, cropping practices, protection from pests and diseases, market trends, prices of various crops in the markets and also clinical services for animal health etc. which would enhance productivity of crops as well as animals and to increase income to farmers (ACABC, GOI).

(2) The concept of Agri-Business Centres is that they would not only be engaged in selling of inputs but also provide farm equipments to farmers on hire basis, besides extending other services (ACABC, Government of India).

(3) The ACABC scheme was launched with three major objectives, viz., (a) providing extension and other services to farmers on payment basis (b) supplementing agriculture development and entrepreneurship; and (c) promotion of self-employment in agriculture sector (ACABC, Government of India).

(4) In terms of number of candidates trained by NTIs and agri-ventures established, the state of Maharashtra ranks first with 11,669 candidates trained and 5,310 agri-ventures developed during the period between 2002 and 2016. During this period, the numerical strength of candidates trained by NTIs in India was worked out at 50,163, whereas number of agri-ventures established stood at 21,039, implying 41.94 per cent of the total candidates trained under ACABC scheme turned into ventures (ACABC, Government of India).

(5) The other sources of extension services encompassed Krushi Seva Kendra (KSK), Baramati Agro Feeds, Narayangaon Nursery, Rahuri Agro Centre, and Sugar factory outlet. The extension services provided by these sources were not included under ACABC scheme. The KSK are licensed agricultural input marketing outlets, which provide inputs like seed, planting material, pesticides, insecticides, fertilisers, plant protection chemicals, etc. to farmers. They have limited scope in terms of providing facilities like soil and water testing, animal health care services, etc. Similarly, the scope of extension services provided by other sources is also very limited. Similarly, they also do not have ties with higher tier bodies and institutions. On the other hand, the agri-ventures established under the scheme of ACABC have much wider scope to facilitate farmers, especially in terms of providing various service facilities like soil and water testing through government recognises laboratories, animal health care facilities such as A.I. and disease control measures. The agri-ventures established under ACABC scheme have access to nodal training institute (NTI) and higher tier bodies. They also facilitate farmers in procuring loans from formal financial institutions. Therefore, extension services received from other sources by non-members are treated within control group.

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APPENDIX 1. PROFILE OF SELECTED AGRI-VENTURES/ ENTREPRENEURS

District (1)	Profile (2)
Solapur	*Vasundhara Agro Services*: The business profile of the venture mainly includes retail sale of vegetable seed such as tomato, capsicum, lady finger, spinach, etc. The venture is located in the village of Vairaj of Barshi Taluka of Solapur district in Maharashtra. The venture was established in 2008 though its owner, an agricultural graduate, underwent a two months training in 2012 on production and marketing of vegetable seed conducted by the nodal training institute (NTI), Shriram Pratistan Mandal (SPM). *Mahalaxmi Krishi Kendra*: It is located in the village of Shirapur of Mohol Taluka of Solapur district in Maharashtra. The owner of the agri-venture is an agricultural graduate. Although the venture came into being in 2011, the owner had undergone a two months training in 2016 on agricultural input use and their application conducted by the nodal training institute (NTI), Shriram Pratistan Mandal (SPM). The agri-venture mainly deals with selling of various inputs viz. fertilizers, seed, pesticides and insecticides. *Penurkar Nursery*: Penurkar Nursery, located in the village of Akote Budruk of Tuljapur Taluka in Solapur district, came into being in 2004 and it mainly grows various fruits, flowers and vegetables such as papaya, marigold, tomato, chili, capsicum, brinjal, water melon, etc. The owner of the nursery is an agricultural graduate and received a two months training from SPM on propagation and cultivation of nursery plants in 2013. It not only sells sapling of various plants but also provides advices in cultivation related practices. *Kamdhenu Dairy Farm*: It is located in the village of Kurdu of Madha Taluka in Solapur district and the owner of the farm is a masters' degree holder in Zoology and also a diploma holder in animal husbandry. The owner had undergone a two months training in 2012 on dairy farming conducted by the nodal training institute (NTI), Shriram Pratistan Mandal. The agri-venture not only sells fluid milk but also provides animal health care related services to other producers. It has a heard strength of about 50 bovines. *Matoshri Goat Farm*: The venture came into being in 2011 in the village of Bemble of Madha Taluka in Solapur district. The owner of the venture is a veterinary diploma holder who had undergone a two months training in goat keeping during 2011 conducted by the NTI, Shriram Pratistan Mandal. It has a heard strength of 25 goats which are raised mainly for the marketing of meat. Apart from rearing goats, it provides animal health care services to farmers.
Ahmednagar	*Parivar Agro Seva*: The venture is located in the village of Pimpri Nirmal of Rahata Taluka in Ahmednagar district, and it was established during 2008. The owner holds a two year diploma in agriculture and the business profile of venture mainly includes marketing of agro chemicals. The owner of the venture had undergone a two months training on agricultural input marketing during 2010 conducted by the nodal training institute (NTI), Krishi Vigyan Kendra (KVK). The venture also provides water and soil testing facilities to the farmers through various established government and private laboratories. It also markets seeds of various crops. *Datta Agro Seva*: The venture, located in the village of Yeawala Akhada of Rahuri Taluka in Ahmednagar district, was established in 2006. It mainly deals with marketing of agricultural inputs like seed, pesticides and insecticides. The owner of the venture is an agricultural graduate and he had undergone a two months training on agricultural input marketing during 2007 conducted by the NTI, Krishi Vigyan Kendra (KVK). The venture also provides facility of water and soil testing to its member farmers. *Trimurty Agro Nursery*: The nursery was established during 2009 in Shrirampur Taluka of Ahmednagar district. The owner of the nursery holds a B.Sc. degree in horticulture and also a two year diploma in agriculture. The nursery came into being after the owner had undergone a two months training on propagation and cultivation of nursery plants conducted by the NTI, Krishi Vigyan Kendra (KVK). It grows and markets saplings of vegetables like tomato, chili, capsicum, papaya, cabbage, cauliflower, etc. *Radheya Poultry Farm*: The poultry farm is established in the village of Kelwad of Rahata Taluka in Ahmednagar district, and it came into being during 2010 when the owner of the farm, an agricultura1 graduate, had undergone a two months training on poultry farming conducted by the NTI, Krishi Vigyan Kendra (KVK). The venture is mainly engaged in marketing of broiler and eggs. *Unimax*: It was established during 2011 and it mainly conducts training programme on pomegranate cultivation through the nodal training institute (NTI), Krishi Vigyan Kendra (KVK), Rahata, Ahmednagar. It is involved in Agricultural and animal husbandry service activities, except veterinary activities, which includes specialized activities, on a fee or contract basis, mostly performed on the farm. The venture has so far provided training to 12 farmers on pomegranate crop cultivation.

APPENDIX 2. INSTITUTE-WISE STATUS OF ACABC SCHEME IN MAHARASHTRA: 2002 – 2016

Sr. No. (1)	Name of Nodal Training Institute (NTI) (2)	No. of Candidates Trained (3)	No. of Agri-ventures Established (4)	Sr. No. (5)	Name of Nodal Training Institute (NTI) (6)	No. of Candidates Trained (7)	No. of Agri-ventures Established (8)
1)	Krishna Valley Advanced Agriculture Foundation, Sangli	2453	1149	11)	Shriram Pratisthan Mandal, Ratnagiri	389	186
2)	Mitcon Consultancy Services Ltd.., Pune	1763	764	12)	Krishna Valley Advanced Agriculture Foundation, Pune Regional Centre	379	140
3)	Shriram Pratistan Mandal, Wadala, Solapur	1063	542	13)	Shashwat Sheti Vikas Pratisthan (SSVP)	339	153
4)	Krishna Valley Advance Agriculture Foundation, Uttur	735	357	14)	Shriram Pratishtan Mandal, Akola	264	111
5)	Krishi Vigyan Kendra, Durgapur, Dist Amravati	656	253	15	Vasant Prakash Vasakh Pratistan , Sangli	187	67
6)	Baramati Agriculture Development Trust Krishi Vigyan Kendra, Baramati	652	253	16)	Krishna Valley Advanced Agriculture Foundation, Sindhudurg	245	94
7)	Krishi Vigyan Kendra, Babhaleshwar	614	326	17)	Krishna Valley Advanced Agriculture Foundation, Jalgaon	209	96
8)	Shriram Pratishtan Mandal, Osmanabad	615	304	18)	Manjara Charitable Trust's KRISHI VIGYAN KENDRA, Latur	13	-
9)	Krishna Valley Advanced Agriculture Foundation, Nagpur	556	276	19)	Krishi Vigyan Kendra, Narayangaon	28	-
10)	Mahatma Phule Krishi Vidyapeeth, Pune	461	205				
					Total	11621	5276

Source: Compiled from ACABC Database

APPENDIX 3. ANNUAL COMPOUND GROWTH ESTIMATES FOR DIVISION-WISE CANDIDATES TRAINED AND VENTURES ESTABLISHED UNDER ACABC SCHEME IN MAHARASHTRA: 2002 – 2016

	ACGR (per cent)					
	Candidates trained			Agri-Ventures established		
Division	2002-09	2010-16	2002-16	2002-09	2010-16	2002-16
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Konkan	-3.86	31.53**	16.67*	9.13	48.31*	22.38*
Nashik	5.23	4.97	9.16*	14.02	9.44	15.70*
Pune	10.37	-0.79	13.28*	26.11	1.38	21.74*
Aurangabad	5.96	16.33	15.52*	9.65	18.62	21.27*
Amravati	7.53	15.05	14.86*	35.56**	17.04	23.92*
Nagpur	7.15	10.46	29.80*	-5.27	45.12**	29.19*
Maharashtra	8.25	5.11	13.87*	24.24	9.56	22.17*

Note: 1) For Aurangabad and Nagpur divisions, growth rate estimates with respect to candidates trained and ventures established are for the period between 2003 and 2016, 2) * and ** - represent significance of growth rates at 1 and 5 per cent level of probability.

APPENDIX 4. DISTRIBUTION OF PER HOUSEHOLD INCOME GENERATION FROM VARIOUS CROPS FOR MEMBER AND NON-MEMBER FARMERS OF AGRI-VENTURES

Category	*Kharif* crops	*Rabi* crops	Summer crops	Perennial crops	All crops
(1)	(2)	(3)	(4)	(5)	(6)
			A. Member Farmers (in Rupees)		
Marginal	5690	4827	-	29600	40118
Small	12301	15062	1149	93499	122011
Medium	23243	31810	1941	166969	223964
Large	44886	59750	-	493064	597700
Total (average)	18714	24128	988	157965	201795
			B. Non-Member Farmers (in Rupees)		
Marginal	3967	3723	2600	25900	36190
Small	11965	8977	-	88548	109490
Medium	18253	24400	-	88500	131153
Large	64200	65471	-	128214	257886
Total (average)	18765	19937	780	75293	114775
			Per cent Income Distribution: Member Farmers		
Marginal	14.18	12.03	-	73.78	100.00
Small	10.08	12.34	0.94	76.63	100.00
Medium	10.38	14.20	0.87	74.55	100.00
Large	7.51	10.00	-	82.49	100.00
Total (average)	9.27	11.96	0.49	78.28	100.00
			Per cent Income Distribution: Non-Member Farmers		
Marginal	10.96	10.29	7.18	71.57	100.00
Small	10.93	8.20	-	80.87	100.00
Medium	13.92	18.60	-	67.48	100.00
Large	24.89	25.39	-	49.72	100.00
Total (average)	16.35	17.37	0.68	65.60	100.00