Impact of Organic Farming on Economics of Sugarcane Cultivation in Maharashtra

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Abstract

Organic farming is a system of farm management to create an eco-system which can achieve sustainable productivity without the use of artificial external inputs such as chemo-synthetic fertilizers and pesticides. The potential of organic farming in generating socially and environmentally beneficial effects are impressive. However, it is essential to assess its performance in terms of its economics which ultimately influences the adoption. Therefore, the primary goal of this paper is to examine the impact of organic farming on economics of sugarcane cultivation in Maharashtra.

The study is based on primary data collected from two districts covering 142 farmers, 72 growing Organic Sugarcane (OS) and 70 growing Inorganic Sugarcane (IS) in Maharashtra. The study finds that OS cultivation enhances human labour employment by 16.90 per cent and its cost of cultivation is also lower by 14.24 per cent than IS farming. Although the yield from OS is 6.79 per cent lower than the conventional crop, it is more than compensated by the price premium received and yield stability observed on OS farms. The OS farming gives 15.63 per cent higher profits and profits are also more stable on OS farms than the IS farms. The paper concludes by suggesting some key policy measures for rapid advancement of OS farming in selected regions of the state

I Introduction

Maharashtra is the second largest sugarcane growing state in the country. It contributed 0.58 million hectares (13.53 per cent) to total area and 45.78 million tonnes (15.06 per cent) to total production of sugarcane in the country in TE 2002-2003 (GOI 2005)[a]. The potential of Maharashtra has been shown by the steady growth in area and production over the years. However, the unceasing decline in productivity in recent decades is a cause of great concern.[1] Sugarcane is also the second most important cash crop covering less than three per cent of the total cropped area of the state but it utilizes more than 60 per cent of the total water available for irrigation in the state. This has already exerted a considerable strain on the limited water resources of the state[2]. The demand of water for sugarcane irrigation has led to an increase in number of wells and had resulted into the decrease of water table by more than four meters over the past decade in several areas in the districts of Jalgaon, Ahmednagar and Aurangabad (World Bank 2003). The excess use of water through flood irrigation combined with higher doses of chemical fertilizers is observed to be resulting in enhanced rate of degradation of land resources in certain parts of the state. This is reflected in the secular decline of sugarcane productivity in recent decades in Maharashtra (Samui *et al* 2005).

"Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological

activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system". This definition of organic farming by the Codex Alimentarius Commission was found to be more useful for practical purposes under the Indian situation (GOI 2001).

The findings of several studies indicate that excessive use of chemical fertilizers results in degradation of soil, water and environmental resources (Ghosh 2003, Pachauri and Sridharan 1998, Singh *et al* 1987). On the other hand, the organic farming had beneficial effects on human health, sustainability of soil, water, and environmental resources and crop yields in the long run (Blaise 2006, Gareau 2004, Rahudkar and Phate 1992, Rajendran *et al* 2000, Singh and Swarup 2000, Thakur and Sharma 2005). It is recognized that the results of these studies are valuable to understand the benefits of various practices followed under organic farming. However, a keen perusal of these studies indicates that there is dearth of systemic studies probing into the impact of organic farming on economics and other aspects of sugarcane cultivation in Maharashtra. In fact, we have not came across a single comprehensive study that is based on farm level data looking at impact of organic farming on costs, yields, returns and other issues involved in cultivation of sugarcane crop in the state.

While the conventional high input intensive sugarcane cultivation is perceived as unsustainable and detrimental to environment, concerns are also raised about the viability of alternative agricultural system as OS farming. Therefore, the present study is designed to assess the impact of OS farming on input use, costs, yields and returns in relation to conventional inorganic sugarcane (IS) farming and to look at the various issues involved in the OS farming in the state. For example, some of the issues are: What are the characteristics of farmers who are cultivating organic sugarcane? What is the impact of OS farming on input use pattern, yields, costs, returns and profits from the sugarcane crop in Maharashtra? The paper aims to provide answers to above-mentioned questions. The paper also explores the emerging issues and suggests policy measures for sustaining the sugarcane cultivation by using alternative farming system such as organic farming in the state.

The paper is organized in five sections. After this first section on introduction, Section II provides the information on study area, sampling design, data and its sources. Section III presents salient characteristics of sampled farmers while the impact of OS farming on yields and returns is examined in Section IV. Section V concludes the paper by discussing the emerging constraints and outlining the future policies.

II Data and Methodology

The importance of organic farming is steadily growing in the state of Maharashtra. Organic sugarcane is an important crop grown in the state. Jalgaon and Kolhapur, the two most important OS growing districts of Maharashtra, were selected for this study. The Jalgaon district is the only district in the state that has the largest number of "certified" OS growing farmers. Moreover, the district is also facing the problems of water scarcity and sustainability due to sugarcane cultivation. The Kolhapur district has the highest area under sugarcane among all the districts of Maharashtra. It has sizeable area under OS crop also. Although, Kolhapur farmers practice OS farming, they have not gone for its certification.

The OS is being cultivated by few farmers in the selected districts. Therefore, purposive sampling technique was applied for the selection of OS farmers. In Jalgaon district the sample included 72 farmers, 38 OS growing farmers and 34 IS growing farmers. While from Kolhapur district 70 farmers, 34 OS growing farmers and 36 IS growing farmers were selected. Thus, in all 142 sugarcane-growing farmers consisting of 72 OS sample farmers and 70 IS sample farmers were selected for the study.

The study is based on primary data. The primary data was collected through personal interviews from the OS and IS farmers with the help of a specially designed questionnaire. The questionnaire covered information on household resource base, cropping pattern, input use pattern, cost of sugarcane cultivation, productivity, etc. The primary data for the study pertains only to the sugarcane crop, both organic and inorganic, planted and harvested during 2004-2005 agricultural year.

III Important Features of Sample Farmers

There are wide differences in the resource endowments across the sample groups and study districts. The average family size of OS households was found to be smaller (4.32) than IS households (4.96) in both the districts (Table1). The heads of OS households are younger and better educated than their counterparts from IS households.

Table 1: Important Features of Organic and Inorganic Sample Farmers

Characteristics	Jalgaon		Kolhapur		Average of both Districts	
	OS	IS	OS	IS	OS	IS
Family Size (No.)	4.18	4.94	4.48	4.97	4.32	4.96
Age of Family Head (Years)	42.35	43.50	44.06	48.16	43.12	46.00
Education of family Head (Education Years)	10.55	9.88	10.64	9.16	10.59	9.49
Size of Land Holding	6.39	6.43	1.52	1.38	4.48	3.72
Livestock (No./Household)	12.41	10.05	4.73	3.96	8.94	6.78
Machinery (No./Household)	7.06	5.48	2.97	2.37	5.21	3.81
Major Crops Grown						
Sugarcane	17.19	15.72	39.72	44.47	20.32	20.99
Cotton	16.90	28.27	0.00	0.00	14.55	23.09
Wheat	13.95	16.43	4.92	6.28	12.70	14.57
Fruit crops	11.59	6.49	6.87	0.00	10.93	5.30

Source: Field Survey.

The large land holding is associated with higher and early adoption of agricultural technologies in India. In view of this, it was expected that the size of land holding of OS sample farmers would be larger than IS sample farmers. This notion was found to be valid as the average size of land holding was found to be 4.48 ha on OS farms as compared to 3.72 ha on IS farms. Moreover, the OS farmers owned more livestock as compared to IS farmers. The better livestock position of OS farmers may be attributed to their higher demand for manures and other livestock products for cultivation of OS crops.

In Jalgaon, the sugarcane and cotton crops accounted for 17.19 and 16.90 per cent on OS farms and 15.72 and 28.27 per cent of GCA on IS farms, respectively. Thus, cotton and sugarcane, the most important cash crops of the state also prevail over the cropping pattern on

sample farms in this district. The sugarcane crop dominated the cropping pattern in Kolhapur district. It occupied 39.72 and 44.47 per cent of Gross Cropped Area (GCA) on OS and IS farms, respectively. This is understandable considering the favourable climate, rainfall, soils and the availability of irrigation and infrastructure facilities for sugarcane crop in the district, that makes it number one sugarcane growing district in the state. Sorghum, maize, soybean and chickpea were the other major crops grown by either OS or IS farmers across the study districts. From the point of view of present study, it is important to note that the OS crop occupied largest coverage at 17.19 and 39.72 per cent of GCA on sample farms in Jalgaon and Kolhapur, respectively.

IV Impact on Economics of Sugarcane Cultivation

This section assesses the impact of organic farming on the economics of sugarcane cultivation on sample farms in study districts with specific focus on input use, costs, yields, gross returns and profits.

Impact on Input Use

The sugarcane sector is one of the important employment generating sector employing over 7.50 per cent of total rural population in India (GOI 2004). The data presented in Table 2 also indicates that sugarcane cultivation, especially the OS cultivation, needs large number of human labour days. For example, on an average the human labour use was found to be higher by 16.90 per cent for OS crop than the IS crop. This is mainly attributed to increased labour requirement for carrying out operations such as preparatory tillage, manuring, green manuring and managing the pests and diseases on OS farms. Furthermore, the intercropping typically found on OS farms, with crops having various planting and harvesting schedules, may distribute the labour demand more evenly which could help stabilize employment. This implies that OS farming may provide an opportunity to rural masses of sustained gainful farm employment through out the year.

Table 2: Input Use Pattern on Organic and Inorganic Sugarcane Sample Farms in Study Districts of Maharashtra

(Units per ha)

Input	Jalgaon			Kolhapur			Average of both Districts		
	OS	IS	Per cent over IS	OS	IS	Per cent over IS	OS	IS	Per cent over IS
Human Labour (Days)	247.80	206.15	20.20	259.31	228.26	13.60	251.08	214.79	16.90
Bullock Labour (Pair Days)	9.72	8.51	14.22	10.29	8.78	17.20	9.88	8.62	14.71
Tractor (Hours)	6.42	5.96	7.72	7.67	8.15	-5.89	6.78	6.82	-0.57
Seed (Tonnes)	2.97	3.35	-11.34	2.85	3.26	-12.58	2.94	3.31	-11.44
Organic Manures (Tonnes)	11.40	6.36	79.25	12.65	7.18	76.18	11.76	6.68	75.99
Bio-fertilizers (Kg)	178.70	-	-	258.50	-	-	201.46	-	-
Chemical Fertilizers (Kg)									
● Nitrogen (N)	-	341.37	-	-	378.45	-	-	355.86	-
● Phosphate (P)	-	110.25	-	-	154.50	-	-	127.54	-
● Potash (K)	-	77.42	-	-	86.25	-	-	80.87	-
Insecticide/ Pesticide (kg)	2.03	2.50	-18.80	2.21	2.65	-16.60	2.08	2.56	-18.65
Irrigation (Number)	21.45	26.51	-19.09	20.96	24.73	-15.24	21.31	25.81	-17.45

Source: Field Survey.

The quantity and quality of seed influences the crop stand and productivity. The Table 2 shows that use of sugarcane seed ranged between 2.85 and 2.97 tonnes per ha for OS crop and 3.26 to 3.35 tonnes per ha for IS crop in study districts. On an average, 11.44 per cent less seed was used by OS farmers mainly due to use of 2-bud setts, and use of strip method of planting. In terms of manures, the OS farmers used about 5 tonnes per ha more manure than the manure used by IS farmers. This is obvious considering the dependence of OS farmers on organic manures for augmenting and sustaining the soil resources. In addition, on an average, 200 kg per ha of bio-fertilizer was used by OS farmers. The limited use of bio-fertilizers was attributed to lack of awareness, shortage of quality inputs, higher prices, and slow response unlike chemical fertilizers by the sample farmers.

As the sugarcane crop produces huge quantity of biomass, its nutrient requirements are also very high. It could be found from Table 2 that IS farmers used 355.86 kg N, 127.54 Kg P, and 80.87 kg K per ha for their sugarcane crop. This is quite high when compared with the levels of 110.10 kg N, 44.70 kg P and 30.10 kg K per hectare for irrigated sugarcane crop in the country (GOI 2000). The OS farmers also augmented their soil resources by complementing chemical fertilizers with organic manures. In terms of the average use of bio-pesticides for OS crop and chemical pesticides for IS crop, IS farmers used 18.65 per cent more quantity compared to OS farmers. This is mainly because, along with bio-pesticides, OS farmers also used other practices such as crop rotation and intercropping for management of pests and diseases.

Sugarcane being a long durational and water intensive crop, enormous quantity of water is required for its cultivation. The total water requirement of the crop varies between 2000 mm to 3000 mm inclusive of rainfall (GOM 1975). The major source of irrigation water for sugarcane crop was found to be wells in both the study districts. Farmers are virtually mining water from deep aquifers for sugarcane crop, specially in Jalgaon district. This is a cause of great concern and demands its conservation and judicious use as it has endangered the stability and sustainability of water resources. This is mainly because the individual farmers are only interested in their own gains and costs and paying no attention to the social costs of over exploitation of ground water resource (Vaidyanathan 1996).

The results presented in Table 2 reveals that the average number of irrigations given were 21.31 for OS crop and 25.81 for IS crop reflecting that OS crop needs 17.45 per cent less number of irrigations than the IS crop. This is mainly ascribed to the fact that incorporation of organic matter to soil improves its structure and enhances its micro-porosity leading to improved moisture retention capacity (Kumar and Tripathi 1990). Rahudkar and Phate (1992) noted that irrigation requirement of OS crop reduced by 45 per cent than the conventional production method.

With the assumption that each irrigation given by the sample farmers to sugarcane crop is minimum of about 100 mm, it can be noted from Table 2 that on an average, OS farmers saved about 450 mm of water when compared with IS farmers. This saving is equivalent to about 4.5 million liters of water per ha. Thus, OS cultivation has substantial potential in reducing the use of scarce water for irrigation providing an opportunity for its conservation and sustainable use. In addition, the major use of electricity in cultivation of sugarcane crop goes to irrigation. As the requirement of irrigation water is less in OS cultivation, the use of electricity is also expected to be less in OS farming. This is also reflected in lower irrigation cost by Rs. 1367.50 per ha on OS farms than IS farms (Table 3). No doubt, this saving is crucial in an electricity deficit state like Maharashtra.

Another notable aspect reported by most of the OS farmers which is important from the point of view of present study is that they did not purchased inputs from the market, rather they used self-produced inputs such as seeds, manures, green-manuring, vermi-compost, bio-fertilizers, Amrutpani, Jivamrut, bio-pesticides, etc. This reduced their dependence on external costly inputs and consequently enhanced their self-reliance in crop production. The OS farmers also expressed their satisfaction on being saved from the risk of getting sub-standard inputs.

Table 3: Cost of Cultivation of Organic and Inorganic Sugarcane on Sample Farms in Maharashtra

(Rs per ha)

Operations	Jalgaon			Kolhapur			Average of both Districts		
	OS	IS	Per cent over IS	OS	IS	Per cent over IS	OS	IS	Per cent over IS
Land Preparation	5834.73 (15.95)	4995.48 (11.65)	16.80	5799.69 (15.21) [a]	5450.57 (12.49)	6.41	5824.74 (15.74)	5173.28 (11.99)	12.59
Seed and Planting	5524.27 (15.10)	6834.95 (15.95)	-19.18	5451.96 (14.30)	6274.66 (14.38)	-13.11	5503.64 (14.87)	6616.06 (15.33)	-16.81
Manure and Manuring	9822.65 (26.86)	6152.77 (14.35)	59.65	10519.47 (27.59)	7017.38 (16.08)	49.91	10021.41 (27.07)	6490.56 (15.04)	54.40
Bio-fertilizers	1651.15 (4.51)	-	-	2464.57 (6.46)	-	-	1883.17 (5.09)	-	-
Chemical Fertilizers	-	9689.55 (22.61)	-	-	10246.15 (23.48)	-	-	9907.0 (22.95)	-
Weeding and Interculture	5168.24 (14.13)	4951.19 (11.55)	4.38	5346.92 (14.02)	5187.85 (11.89)	3.07	5219.21 (14.10)	5043.65 (11.68)	3.48
Irrigation	5899.56 (16.13)	7378.67 (17.22)	-20.05	6358.37 (16.68)	7427.97 (17.02)	-14.40	6030.43 (16.29)	7397.93 (17.14)	-18.48
Plant Protection	862.35 (2.36)	1193.42 (2.78)	-27.74	1275.89 (3.35)	1384.55 (3.17)	-7.85	980.31 (2.65)	1268.09 (2.94)	-22.69
Others	1810.79 (4.95)	1665.81 (3.89)	8.70	912.21 (2.39)	645.63 (1.48)	41.29	1554.48 (4.20)	1267.25 (2.94)	22.67
Total Cost (GCC) [b]	36573.74 (100.00)	42861.84 (100.00)	-14.67	38129.08 (100.00)	43634.76 (100.00)	-12.62	37017.38 (100.00)	43163.81 (100.00)	-14.24

Note: (a) Figures in parentheses are percentage to total cost; (b) This does not include the cost of harvesting, transport and marketing.
Source: Field Survey.

Impact on Cost of Cultivation

This subsection explores the relative impact of organic farming on operation-wise cost of cultivation of sugarcane in study districts.[3] This analysis shows that average cost of cultivation of OS crop was Rs. 37,017.38 per ha as against Rs. 43,163.81 per ha for IS crop, reflecting 14.24 per cent lower cost on OS farms than the IS farms (Table 3). The lower cost of cultivation observed on OS farms is not surprising. This is because, first, the highest cost reduction observed on OS farms is on account of non-use of chemical fertilizers.

The OS farmers spent Rs. 10,021.41 per ha on manures and manuring mostly produced by themselves, and additional Rs. 1,883.17 per ha on bio-fertilizers, etc. These two together, on an average, cost Rs. 11,904.58 per ha which is quite less than the cost of Rs. 16,397.56 per ha incurred by IS farmers on fertilizers and manures put together. Thus, OS farmers saved 26.76 per cent expenditure on account of soil nutrient supplements.

Secondly, the irrigation cost was found to be 18.48 per cent less on OS farms. Thirdly, OS farmers spent about Rs. 1,100 per ha less for seed and planting as compared to IS farmers. Fourthly, the average per ha cost on plant protection was lower on OS sample farms, as most

of this material was prepared by OS farmers themselves and they also used other methods such as crop rotation and intercropping. Besides this, the OS cultivation was also found to be more cost efficient than IS cultivation as the per tonne cost of production of OS cane was found to be 8.02 per cent lower on OS farms (Table 4).

Table 4: Yield of Organic and Inorganic Sugarcane on Sample Farms

District and Sample	Yield (Tonnes per ha)	CV of Yield (Per cent)	Cost of Production (Rs per Tonne)
Jalgaon			
Organic	95.16	29.84	384.34
Inorganic	101.45	44.38	422.49
Per cent over IS	-6.20	-14.54	-9.03
Kolhapur			
Organic	99.97	24.59	381.41
Inorganic	106.86	32.90	408.34
Per cent over IS	-6.45	-8.31	-6.60
Average of both Districts			
Organic	96.63	28.11	383.50
Inorganic	103.56	40.72	416.96
Per cent over IS	-6.79	-12.61	-8.02

Source: Field Survey.

The increased cost of cultivation due to increased input prices has also increased the requirement of credit for agriculture. However, several studies have concluded that the inability to payback the credit is one of the important reason for creating distress among farmers (Mishra 2006, TISS 2005). The foregoing results indicate that OS farming reduces the cost of cultivation of a crop implying reduced requirement of credit for crop production.

Impact on Yields

The capacity of organic farming in achieving the yield levels obtained under the conventional inorganic farming is under doubt (Bhattacharyya and Chakraborty 2005, Das and Biswas 2002). Some studies have also noted that the change from conventional intensive farming to organic farming reduces the yield, at least during the initial years (IFAD 2005, Rajendran *et al* 2000). This study also found that the average yield of OS crop was 96.63 tonnes per ha as against 103.56 tonnes per ha of IS crop showing that OS farmers realised 6.79 per cent lower yield than IS farmers (Table 4). However, the OS farmers were confident and it has also been reported by some scholars that in subsequent years, the OS farming is able to reduce this yield gap (Rajendran *et al* 2000) and some times have also given higher yields than conventional methods (Thakur and Sharma 2005).

The stability in yield is pivotal for sustaining sugarcane cultivation. The yield stability measured by Coefficient of Variation (CV) indicates that the CV of yields was substantially lower at 28.11 per cent in OS crop as against the 40.72 per cent in IS crop implying that yields were more stable under OS farming than the IS farming (Table 4). It is also to be noted here that lower yields on OS farms were more than compensated by the price premium fetched by organic sugarcane and the sugarcane yield stability observed on OS farms. On an average, organic cane received 10 per cent premium price than inorganic cane.

Impact on Gross Returns and Profits

The increase in price of inputs in conventional agriculture has inflated the cost of cultivation and had reduced the profitability (Sen and Bhatia 2004). Therefore, the issue of profitability is intimately related to economic well being and livelihood security of the farmers. In this context, the Gross Value of Production (GVP) and profits were higher on OS farms than the IS farms. For example, the GVP from OS farm amounted to Rs. 116,711.38 per ha as against Rs. 112,087.84 per ha from IS farm showing more than 4 per cent higher GVP on OS farms than the IS farms (Table 5). On the whole, this has resulted in higher profits by 15.63 per cent from OS crop than the IS crop. This is mainly due to lower cost of cultivation on OS farms and relatively higher price fetched by organic sugarcane. Moreover, the CV of gross profits was also lower on OS farms than IS farms implying greater stability of profits on OS farms. The output-input ratio (GVP/GCC) was found to be 3.15 on OS farm as compared to 2.60 on IS farm. The higher output-input ratio is the reflection of both the higher cost efficiency achieved and higher price fetched by sugarcane produced on OS farms.

Table 5: Gross Value of Production and Profits from Organic and Inorganic Sugarcane

(Rs per ha)

District and Sample	Gross Value of Production (GVP)	Gross Profit	CV of Gross Profit (per cent)	GVP/GCC
Jalgaon				
Organic	114017.85	77444.11	41.63	3.12
Inorganic	109784.25	66922.41	49.81	2.56
Per cent over IS	3.86	15.72	-8.18	21.71
Kolhapur				
Organic	123460.92	85331.84	30.17	3.24
Inorganic	117860.26	74225.50	37.74	2.70
Per cent over IS	4.75	14.96	-7.57	19.88
Average of both Districts				
Organic	116711.38	79694.00	39.76	3.15
Inorganic	112087.84	68924.04	45.68	2.60
Per cent over IS	4.12	15.63	-5.92	21.41

Source: Field Survey.

Higher profitability is another feature of OS farming. The OS farming gives 15.63 per cent higher profits per ha than IS farming thereby enhancing farmers income. Organic sugarcane farming not only enhances the farm income but also provides greater stability to farm income. These advantages of OS farming are very important for ensuring economic well-being and livelihood security of the farmers and for sustaining the sugarcane cultivation in the state.

V Emerging Constraints and Future Policies

Conversion to Organic Farming

The sample farmers reported that the period involved in conversion from conventional farming to organic farming is the most difficult one. This is mainly because (a) lack of knowledge about the principles of organic farming, (b) shift to organic farming brings in several significant changes in agricultural practices, (c) at least it takes three years to complete the conversion successfully, (d) decrease in sugarcane yield with the beginning of

the conversion period, (e) no premium prices, (f) due to (d) and (e) there is reduction in farmers income during the conversion period, and (g) non-cooperation from neighbouring farmers who practice conventional agriculture. These factors form the major hurdle in the adoption and spread of organic farming. Therefore, it is recommended that the beginners should receive not only the training but also the support in organic production methods certification and marketing during this period. If feasible, the beginners should shift to organic in stages rather than trying to convert all the landholding at once. It is suggested that the beginners themselves should also prepare for transition period in terms of time required, crops to be taken, inputs management, financial provision, etc. to pass the period of transition rather smoothly. Moreover, all the farmers having contiguous fields should be encouraged to shift to organic methods to avoid problems related to leaching and or contamination of chemical fertilizers and pesticides.

Certified Organic Inputs

The use of manures, organic fertilizers, bio-fertilizers, vermi-compost, bio-pesticides, etc. is very high in organic farming compared to conventional farming as organic farmers substitute chemical fertilizers and pesticides with these organic inputs. The demand for these crucial organic inputs is likely to increase with the expansion of area under organic farming. Therefore, it is most essential to ensure the smooth flow of these inputs so that they do not become the hurdle in the spread of organic farming in the state. In this context, the involvement of Self-Help Groups (SHGs) of landless households for production of certified bio-fertilizers, vermi-compost, as well as, the bio-pesticides would be most useful. Therefore, it is recommended that specific schemes may be developed for involvement of SHGs in production of certified inputs required for OS farming. The transfer of technology for production of certified organic inputs along with training, financial assistance, facilities for distribution and marketing should form the major components of such schemes for the SHGs. This may help in smooth supply of quality organic inputs at a reasonable price to organic farmers at the same time it may also help in providing employment opportunities to the landless people in their own area.

Low Yields

The sugarcane yield on OS farms was observed to be 6.79 per cent lower than the IS farms. It is thus necessary to resolve the yield limiting issues in OS farming on priority basis. A fairly well developed infrastructure for agricultural research, training, and education exists in Maharashtra. The use of this infrastructure can be made effectively to resurrect the productivity by developing and spreading package of practices for soil nutrient and water management, as well as, biotic and abiotic stress management in organic farming. Focus on development and transfer of new technologies that are most suited for high sugarcane yield in general and OS yield in particular, may help revive productivity in Maharashtra. In addition, involvement of farmers, where possible, in research should prove beneficial for developing and transferring the new technologies within the shortest possible time.

Certification

The certification of organic products is essential to distinguish it from those produced by conventional methods, and to get an appropriate price for the organic product in the market. It is also a pre-requisite for its acceptability by the consumers. Our study noted that the OS

sample farmers from Jalgaon operated certified farms while the Kolhapur OS sample farmers operated non-certified farms.

Among all the districts, Jalgaon is the only district in Maharashtra that has largest number of "certified" OS farmers in the state. The credit goes to farmers association. The association facilitated the certification of their organic produce through an internationally recognised certification agency. The association obtained the organic certification under the group certification programme. Thus, the association made organic certification easy, less costly and beneficial for its member farmers. In contrast, the Kolhapur OS sample farmers did not obtain organic certification due to several constraints. The important constraints reported by sample farmers include high cost of certification, complicated process and non-availability of certification services in their own area. These constraints can be resolved through coordinated and concerted efforts of public and private agencies, NGOs, certification agencies and farmers.

Other Constraints

The Jalgaon organic sugarcane sample farmers were successful in going through the difficult period of conversion and managing the organic certification and post harvest operations very efficiently due to able support from their association. This implies the need of such associations which play an important role in rapid adoption and spread of organic farming. Therefore, public and private agencies, and NGOs can play an important role in encouraging farmers to form their own associations.

Some OS sample farmers complained of being deceived by traders by selling them spurious organic inputs. This resulted in heavy losses to victimized farmers. Therefore, efforts may be made to enhance the awareness among the organic farmers and strict vigilance by the quality control and regulatory authorities to prevent such malpractices involving pseudo-organic inputs.

The organic farming is an important emerging area in agricultural sector of Maharashtra. However, it may be pointed out that the state level data on various aspects of organic farming is very inadequate. Therefore, it would be useful to develop standard data base on organic farming for its assessment and for setting priorities and policy interventions aimed at advancing organic farming in general and OS farming in particular in Maharashtra.

The growing of crops by following organic practices in conformity with certain standards is a process beginning from land preparation to finally reaching the produce in the hands of consumers. Therefore, it is essential to impart scientific training not only to farmers but also to other stakeholders to make them knowledgeable, skilled and efficient in production, processing and marketing of organic products

The organic farming does have social benefits in terms of resources and benefits to human health and environment. Therefore, it is suggested that the social benefits of OS farming may be properly measured and quantified to get an idea about the extent of subsidy that could be justified for promotion of OS farming in the state. In this context, the state Government may form a high level committee comprising of representative of all the stakeholders to help identify the high potential regions, as well as, the high potential crops and to formulate and priorities the policies and strategies in order to promote the organic farming to reap the benefits of a rapidly growing national and international market for organic products.

Endnotes

1 The sugarcane productivity in Maharashtra attained a high level of 95.15 tonnes per ha in TE 1982-1983 from just 70.95 tonnes per ha a decade earlier (TE 1972-1973). After that the productivity declined to 80.98 tonnes per ha in TE 1992-1993 and further dwindled to 78.33 tonnes per ha in TE 2002-2003.

2 The area under irrigation was only 18.10 per cent of gross cropped area of the state as compared to 40.20 per cent at the national level in 2002-2003. Thus, Maharashtra is on one of the water deficient states of the country. Despite this, the coverage of irrigation for sugarcane crop is 100 per cent in the state. Sugarcane being a relatively long durational water intensive crop producing huge quantity of biomass, it requires enormous quantity of water for its cultivation.

3 The cost of cultivation is referred to cost A_2 plus family labour which includes all actual expenses in cash and kind incurred in production by owner plus rent paid for leased-in land plus imputed value of family labour as defined by the Commission for Agricultural Costs and Prices (CACP), Government of India (2005)[b]. The gross profit is calculated as gross value of production minus the cost of cultivation.

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