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# Organic Sugarcane Farming for Development of Sustainable Agriculture in Maharashtra

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## Abstract

Th economics of organic sugarcane farming (OSF) and inorganic sugarcane farming (ISF) have been examined and the OSF has been assessed with respect to important sustainability indicators such as conservation of soil, water, power and farmers' economic well-being and livelihood security. The study is based on data for 2004-05 collected from 30 certified OSF and 30 ISF sample households from the Jalgaon district of Maharashtra. The OSF households have been found younger and more educated having larger landholdings and better resources. The OSF is labour-intensive, but its cost of cultivation is lower due to savings on chemical fertilizers, irrigation, seeds and agrochemicals. The yield on OSF has been reported lower but it is more than compensated by the price premium received and the yield and profit stability observed on the OSF. In addition, the OSF has been found superior in terms of economic well-being and livelihood security of the farmer. The study has revealed that OSF has enormous potential for improving sustainability of agriculture and has suggested that organic farming should receive prime attention from all stakeholders to realize its full potential in increasing and providing the much sought after sustainability to agriculture.

## Introduction

Organic farming is basically a holistic management system which promotes and improves the health of agro-ecosystem related to biodiversity, nutrient biocycles, soil microbial and bio-chemical activities. It emphasizes management practices involving substantial use of organic manures, green manuring and management of pests and diseases through the use of non-synthetic pesticides and practices. Thus, organic farming prohibits the use of harmful chemicals and promotes the use of renewable organic resources

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to maintain the soil productivity and to control the crop diseases and pests (Government of India, 2001). The beneficial effects of organic farming on human health, wildlife, domestic animals, and environment are impressive. Although organic farming is gaining importance in recent years, increasing agricultural production is a vital national concern. At one end, high input-intensive agriculture is perceived as detrimental to sustainability of agriculture and environment while at the other, concerns are raised about the viability of alternative farming system such as organic farming. Therefore, it is essential to critically examine the performance of organic vis-à-vis inorganic agriculture. In view of this, the present study was focussed on organic sugarcane farming (OSF) and the inorganic sugarcane farming (ISF) in the state of Maharashtra. A study by the World Bank (2003) has indicated that the demand for water for sugarcane irrigation has led to an increase in the number of wells in the Jalgaon and few other districts of the state. The excessive sucking of water from these wells has led to declining of water table by more than 4 metres over the past decade in several places in the districts of Jalgaon, Ahmednagar, and Aurangabad. This has significantly enhanced the number of wells going dry over the years. The increased competition to bring more area under irrigation has exerted immense pressure on limited water resources of the state and has jeopardized its sustainability. Moreover, the excessive use of water through flood method of irrigation combined with higher doses of chemical fertilizers is observed to be resulting in enhanced rate of degradation of land resources. This is reflected in the decreased sugarcane productivity in recent years in the state (Samui *et al*., 2005).

The present study was conducted to assess the performance of OSF and ISF in Maharashtra with specific focus on costs, yields, returns and profits. An attempt has also been made to critically examine the OSF with respect to important sustainability indicators such as conservation of soil, water, power and farmers' economic well-being and livelihood security.

## Methodology

The organic farming in general, and OSF in particular, is still not highly prevalent in Maharashtra and its adoption is not uniform across the districts. However, the study district Jalgaon is an important organic sugarcane-growing district and it is the only district in the state that has the largest number of "certified" organic sugarcane farmers. Moreover, the district is also facing the problems of water scarcity and sustainability due to sugarcane cultivation.

A sample of 60 farmers (30 certified organic sugarcane growing and 30 inorganic sugarcane growing) was selected from the district. As the organic sugarcane is being cultivated by a few farmers in few villages in each taluka, purposive sampling technique was applied for selection of organic sugarcane growing farmers. The data were collected by personal interviews from OSF and ISF sample farmers from the same village through a specially designed and pre-tested schedule. The primary data for the study pertained to the sugarcane crop grown during the 2004-05 agricultural year.

## Results and Discussion

### Characteristics of Organic and Inorganic Sample Farmers

The characteristics of organic and inorganic sugarcane growing farmers have been recorded in Table 1. The average size of landholding observed on sample farms, both organic and inorganic, was quite big. This could be attributed to the fact that most of the sampled 'certified organic farmers' were the large farmers, and therefore comparable households were sampled to represent the inorganic sugarcane growers.

The ownership of livestock is vital for practising organic farming. The major livestock owned by sample farmers included bullocks, cows, buffaloes,

**Table 1. Characteristics of organic and inorganic sugarcane sample households**

| Characteristics | Organic | Inorganic |
|---|---|---|
| **Demographic characteristics** | | |
| Average family size (Number) | 4.23 | 5.00 |
| Average age of family head (years) | 39.90 | 43.76 |
| Average education of family head (education years) | 11.03 | 9.67 |
| Farmers with agriculture as a main occupation (%) | 90.33 | 96.66 |
| **Landholding** | | |
| Size of owned landholding (ha) | 7.15 | 6.89 |
| Major livestock and machinery owned | | |
| Major livestock owned (Number per household) | 13.23 | 9.03 |
| Value of major livestock owned (Rs per household) | 75,116 | 53,708 |
| Major machinery owned (Number per household) | 7.57 | 6.07 |
| Value of major machinery owned (Rs per household) | 186,861 | 112,185 |
| **Major crops grown (per cent to gross cropped area)** | | |
| Organic sugarcane | 21.20 | 0.00 |
| Inorganic sugarcane | 0.00 | 16.30 |
| Cotton | 31.40 | 22.90 |
| Wheat | 15.90 | 16.00 |
| Sorghum | 10.30 | 15.10 |

sheep and goats. The livestock position, depicted in Table 1 reveals that the number as well as the value of livestock owned by organic sugarcane farmers was higher than of inorganic sugarcane farmers. The better livestock position of organic farmers may be attributed to their higher demand for manures and other livestock products. The major machinery consisted of bullock carts, electric pumps, drip irrigation sets, tractors, threshers, sprayers and dusters. The major machinery position was also better, both in terms of number and value, on OSF sample farms than ISF sample farms.

## Economics of Organic and Inorganic Sugarcane Cultivation

This section has examined the economics of OSF vis-à-vis ISF on sample farms with specific focus on costs, yields, returns, and profits. In this context, the concepts such as cost of cultivation, gross value of production and gross profits were applied. The cost of cultivation was referred to cost $A_2$ + family labour (FL), which included 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 Costs and Prices (CACP), Government of India. The gross profit was calculated as gross value of production (GVP) minus the cost of cultivation.

## Cost of Cultivation

It could be seen from Table 2 that the cost of cultivation was lower by 15.39 per cent in OSF than ISF. The lower cost in OSF could be attributed to (i) non-use of chemical fertilizers, (ii) lower cost on irrigation, (iii) lower cost on seed and planting; and (iv) lower cost on plant protection chemical. In addition to cost reduction, OSF was also more cost efficient than ISF. The cost of production of OSF was Rs 334 per tonne compared to Rs 366 per tonne on ISF (Table 3).

**Table 2. Cost of cultivation of organic and inorganic sugarcane crop**

(Rs per ha)

| Operations | Organic | Inorganic | Per cent change |
|---|---|---|---|
| Land preparation | 5,838 | 5,307 | 10.01 |
| Seed and planting | 5,372 | 6,974 | -22.97 |
| Manures and manuring | 10,534 | 5,242 | 100.95 |
| Chemical fertilizers | 0.00 | 8,980 | - |
| Weeding and interculture | 5,157 | 4,959 | 3.99 |
| Irrigation | 5,986 | 7,587 | -21.00 |
| Plant protection | 781 | 1,274 | -38.70 |
| Others | 1,964 | 1,792 | 9.60 |
| Total* | 35,632 | 42,115 | -15.39 |

*This did not include the cost on harvesting, transport and marketing.

**Table 3. Yield, gross value, cost and profit on organic and inorganic sugarcane farms in Maharashtra**

(Rs per ha)

| Particulars | Organic | Inorganic | Per cent change |
|---|---|---|---|
| Yield (tonnes per ha) | 106.70 | 114.94 | -7.17 |
| | (26.32)* | (42.71) | - |
| Gross value of production (GVP) | 122,705 | 120,687 | 1.67 |
| Gross cost of cultivation (GCC) | 35,632 | 42,115 | -15.39 |
| Cost of production (Rs per tonne) | 334 | 366 | -8.86 |
| Gross profit | 87,073 | 78,572 | 10.82 |
| | (74.35) | (91.15) | - |
| GVP/GCC | 3.44 | 2.87 | - |

* Figures within the parentheses are coefficients of variation (CV).

## Productivity

Serious doubts have been raised about the ability of organic farming in attaining the productivity levels achieved under the conventional agriculture (Bhattacharyya and Chakraborty, 2005; Das and Biswas, 2002). It has been noted that the change from conventional intensive farming to organic farming reduces the yields, at least during the initial years (IFAD, 2005; Rajendran *et al*., 2000). This study also found that organic farmers realized 7.17 per cent lower yield than inorganic farmers. However, it has been reported that in subsequent years the organic farming is able to reduce this yield gap (Rajendran *et al*., 2000) and sometimes has given higher yields also (Thakur and Sharma, 2005). It was observed in Karnataka that by the end of third year the sugarcane yields were stabilized and from the fourth year the yields became higher on OSF than ISF (IFAD, 2005). A stable yield is an important feature of sustainability. The yield stability measured by coefficient of variation (CV) was substantially lower at 26.32 per cent in OSF as compared to 57.71 per cent on ISF, implying that yields are more stable under OSF than ISF.

## Profitability

The results portrayed in Table 3 clearly indicate that profits were higher by 10.82 per cent from OSF than ISF. This could be attributed to lower cost of cultivation on OSF and higher price fetched by the organic sugarcane. The CV of gross profits was also substantially higher on OSF than ISF. Thus, this analysis shows that not only profitability was higher but was much more stable also under OSF than ISF. The higher cost efficiency observed on OSF was also reflected in higher gross returns on per rupee of total cost.

## Organic Farming as a Locus for Sustainable Agriculture

### Conservation of Water

In Maharashtra, about 80 per cent of water is utilized for agriculture (World Bank, 2003), and more than 60 per cent of it is utilized for the sugarcane crop alone. Moreover, farmers mine water from deeper aquifers for the sugarcane crop, especially in the study district. This is a cause of great concern and demands conservation and judicious use of water, as it has endangered the stability and sustainability of agriculture.

Two very broad indicators (irrigation cost and farmers' estimates) can be used in the absence of actual measured data to assess the water-use for irrigation on OSF and ISF. The costs incurred by OSF sample farmers on irrigation as well as the irrigation cost per unit of sugarcane production were observed to be substantially lower on OSF than ISF, implying less use of water for irrigation (Table 2). Secondly, the sample farmers' estimates have shown that OSF needs about 500 mm less water as compared to that by ISF. This could be due to the fact that incorporation of organic matter into soil improves its structure and enhances its micro-porosity, leading to improved moisture-retention capacity (Kumar and Tripathi, 1990). Rahudkar and Phate (1992) had observed that irrigation requirement was reduced by 45 per cent in OSF than the conventional method. Thus, OSF has substantial potential in reducing the use of scarce water for irrigation, providing an opportunity for its conservation and sustainable use. The requirement of irrigation water being less under OSF, the use of electricity is also expected to be less on OSF. The OSF sample farmers reported a saving of about Rs 1000/ha on account of electricity expenditure.

### Organic Farming: A Low Cost Farming

Several studies have concluded that inability to payback the credit is the main reason of distress among farmers (Mishra, 2006; TISS, 2005). It has been found that organic farming reduces the cost of cultivation of a crop. For example, the cost of cultivation was reported 15.39 per cent less on OSF than ISF. It was also reflected in reduced borrowing by the OSF sample farmers. On an average, the OSF households borrowed Rs 23,540 as compared to Rs 35,850 by the ISF sample household. Thus, the low cost on OSF reduces the level of credit requirement for agriculture.

### Organic Farming Enhances Farmers' Self-reliance

Most of the OSF farmers reported that they did not purchase costly inputs from the market, rather they used self-produced inputs such as seeds,

manures, green manure, vermi-compost, farm compost, plant protection material, etc. It reduced their dependence on external costly inputs, and consequently enhanced their self-reliance in crop production. Moreover, the OSF farmers also expressed their satisfaction on being saved from the risk of getting substandard inputs, and the possibility of reduction in yields due to use of such inferior quality inputs.

### Organic Farming: Higher Farm Employment

Generally, organic farming methods are labour-intensive (FAO, 1998; IFAD, 2005). The present study also found that the requirement of human labour was 21.53 per cent higher on OSF than ISF. This implies that OSF may provide opportunity to the rural masses of gainful farm employment in their own area. This feature of OSF may help reduce the acute problem of migration to urban areas.

### Organic Farming: Increased Profitability

Higher profitability is another important feature of OSF. As can be seen from Table 3, OSF has given almost 11 per cent higher returns per ha than those by the ISF.

### Organic Farming: Reduced Risk

Organic sugarcane farming not only increases the farm income but also provides greater stability to yields and profits. The CV of yields and profits under OSF were 26.32 and 44.35 per cent as compared with 57.71 and 91.15 per cent under ISF. This risk-reducing feature of OSF is very important for achieving the goal of sustainability of agriculture by ensuring economic well-being and livelihood security of the farmers.

## Emerging Issues

The study has concluded that OSF is quite successful in the study area. Some of the key factors in the success of OSF, not discussed so far, are the infrastructure facilities for certification, production, processing and marketing. These and few other issues are briefly discussed in this section.

First, although certification helps in receiving premium prices, it is both complicated and expensive (Bhattacharya and Chakraborty, 2005; Das and Biswas, 2002). The organic farmers in the study area have formed an association which has facilitated group certification for them through an internationally recognized certification agency. The association arranges training for the member farmers and takes care of harvesting, transportation, processing and marketing of their produce. The member farmers are paid

about 15 per cent higher price than the cane price paid by the sugar factories in the area. Thus, this association has made it easy for the farmers to adopt OSF without much problems. This implies the need of such organizations which could facilitate rapid adoption of organic farming.

Some of the farmers reported of being deceived by the traders by selling spurious inputs to them as productivity-enhancing organic inputs, resulting in heavy losses to them. Therefore, efforts may be made to enhance awareness among the organic farmers and strict vigilance by the quality control and regulatory authorities to prevent such malpractices. Thirdly, the use of organic manures in the form of FYM being very high in OSF, it is essential to see that this vital input does not become an obstacle in the progress of OSF in the state.

In addition to the financial benefits, the OSF provides such social benefits as conservation of soil and water, decreased use of power and environmental safety.

## Conclusions

The organic sugarcane farming (OSF) has been found quite successful in the study area and has offered several benefits as compared to those by inorganic sugarcane farming (ISF). Although OSF requires more human labour, cost of cultivation has been found lower due to savings on chemical fertilizers, irrigation, seeds and agrochemicals. The yields have been observed to be relatively lower on OSF but are more than compensated by the price premium fetched by the organic sugarcane and the yield and profit stability observed on OSF. The OSF has been found to conserve the soil and water resources, increases farmers' income, thereby enhancing their economic well-being and livelihood security. Thus, OSF is important in achieving the goal of sustainable agriculture. It has been suggested that organic farming should receive prime attention from all the stakeholders to realize its full potential in increasing profitability and providing the much sought after sustainability of agriculture.

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