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Organic agriculture in relation to food security of developing countries

A study was conducted to investigate the differences in farm production, input use and farm income between organic and conventional systems in three regions (Uttaranchal, Madhya Pradesh and Tamilnadu) of India. From each region, 40 organic and 40 conventional farmers were interviewed with semi structured questionnaire. The results showed that input costs were less in the organic system while either total farm yield or net margin was righter in the organic system in two of the three regions. In Tamilnadu specializing in rice production, rice yield was less under organic system while net margin did not differ significantly. In addition, the IFPRI-IMPACT model was used to find out the impact of large scale conversion to organic farming on food security of Sub-Saharan Africa. The model showed that large scale conversion to organic farming in Europe and North America will not have major impact on food security of Africa and large scale conversion in Sub-Saharan Africa will improve the local food security.

Global food production and yield of cereals and other crops increased for the past few decades. The world daily calorie consumption increased from 2550 kcal per person per day in 1981 to 2800 kcal per person per day in 2003 (FAOSTAT, 2005). Global food production at present would be sufficient to provide everyone with his minimum calorie needs if available food was distributed according to need (Von Braun et al., 2003). However, a recent report on food insecurity in the world showed that there are still 848 million people undernourished in the world (830 million in developing countries), most of them living in rural areas (FAO, 2008). India, one of

the emerging economies in the world, increased food production through green revolution technology, and became self sufficient in food production in 1990s. However, India is still home for 231 million undernourished people (175 million in rural areas), which is more than in Sub-Saharan Africa, 212 million (FAO, 2008). This highlights that food security is more a matter of food distribution than on food production *per se*.

Thus, other ways of improving food access than merely increasing external inputs is needed and organic agriculture can be part of such a solution. The recent UNEP-UNCTAD, 2008, report says that 'organic agriculture is a good option for food security in Africa'. The FAO conference on OA and food security, May 2007, observed that OA has the potential to contribute to sustainable food security through improved household nutrient intake, resilience to food emergency situation and contribution to healthy diets (Scialabba 2007). Therefore, this paper discuss the following questions

1. Is organic agriculture a viable option for improving food security of small holding farms in India?
2. What are the consequences on food security after large scale conversion to organic farming in developed and developing world?

Materials and Methods

Quantitative and qualitative data was collected about household information, farm related information including livestock use, method of production and income, etc from 40 organic and 40 conventional small holding farmers from each of the three regions such as Tamilnadu from south India, Madhya Pradesh from central India, and Uttarakhand from North India for the first objective.

Table 1. Yield, input cost and income difference in conventional and organic systems in India.

Tamilnadu region	Conventional	Organic	P value
Rice yield (kg/ha)	4270	3400	*
Input cost (Indian Rupees/ha)	3976	2682	*
Net margin (Indian Rupees/ha)	25900	21835	Ns
Uttarakhand region	Conventional	Organic	Relative %
Total crop production (kg/ha/yr)	2845	3250	114
Keeping for home consumption(kg/ha/yr)	2046	2168	106
Total net margin (Indian Rupees/ha/yr)	14500	15200	105
Madhya Pradesh region	Conventional	Organic	P value
Irrigated cotton yield (kg/ha)	1694	1260	*
Rain fed cotton yield (kg/ha)	1187	1044	Ns
Net margin without premium (Indian Rupees/ha)- Irrigated cotton	28974	25234	Ns
Net margin without premium (Indian Rupees/ha)- Rain fed cotton	18900	19541	Ns
Net margin with premium*(Indian Rupees/ha)- Irrigated cotton	28974	30730	
Net margin with premium*(Indian Rupees/ha)- Rain fed cotton	18900	24134	

* price premium 20 percent of gross margin were added in the organic system

IFPRI's IMPACT model was used for the second objective. The International Center for Research in Organic Food Systems (ICROFS), together with International Food Policy Research Institute (IFPRI), modeled the potential impacts of large-scale conversion to organic farming on food availability and world market prices at regional and global levels to the year 2020 using IFPRI's IMPACT model (Halberg *et al.*, 2006). Two main scenarios were established, respectively organic conversion in high-input agricultural systems in Europe and North America and conversion of the low-input agricultural systems in sub-Saharan Africa (all African countries in south of the Sahara desert).

The main assumptions were that organic yields in the high input agricultural systems would be only 50 to 85 percent of conventional yields, while they would be 90 to 150 percent of conventional yields in low input agricultural systems. This rather conservative estimate was then tested with different assumptions of how the yields will grow over time due to technological and managerial improvements in organic agriculture.

Results

Household level: In two of the regions organic farming increased or stabilized yield by efficient use of resources at small holding farm (Food availability), or tended to increase income for buying food (Food access). In addition the organic system reduced input costs compared to non organic system, thus making the household less vulnerable to debt. Organic system produced 80 per

cent of the conventional rice yield in conversion period in Tamilnadu region (Table 1). However, there was no difference between organic and conventional rice in net margin, though no price premium was added.

Food output per unit area-time is the relevant factor for food security rather than focusing on single crop yield. Organic system produced more food and income per unit time-area compared to conventional system in Uttaranchal region (Table1).

In general, most of the research focused on main crop yield without considering the intercrop yield, but yield from intercrop is also important for small farmers to get additional yield for home consumption and selling extra produce for additional income. In Uttarakhand and Madhya Pradesh region, average yield of various intercrops were higher under organic than conventional systems. Likewise, organic farmers kept more for home consumption rather than selling to market, where as conventional farmers sold more to repay the cost spent for the input or debt (Table 2).

Increasing income of small farmers will improve food security through food access components. Results showed that there was no difference between organic and conventional cotton in net margin (price premium was not added). However, organic cotton produced slightly more net margin in rain fed conditions though no premium were added. End of the season, organic farmers received 20 percent of their gross margin as premium from BioRe private ltd company. Organic farmer's had

Table 2. Yield (Kg/farm/year) from intercrops in Uttarakhand and Madhya Pradesh regions.

	Uttarakhand		Madhya Pradesh	
	Conventional	Organic	Conventional	Organic
Cereals	200(15)	390(24)	400(7)	487(12)
Pulses	125(13)	164(21)	97(6)	111(9)
Oilseeds	42(17)	60(19)	300(3)	350(2)

Note: values in () number of farms out of 40

higher net income (premium added) in both irrigated and rain fed condition compared to conventional system when organic cotton received premium (Table 1).

Regional level: The scenario of the conversion of the high input agricultural systems showed that conversion to organic farming of large parts of Europe and North America would not raise global food prices significantly compared to the baseline IMPACT scenario – but only under an assumption of higher productivity gains (yearly yield increase) in organic compared with conventional crops. This is a real challenge for the further development of organic agricultural systems, and will probably only be possible with increased investments in research into eco-functional intensification, better nutrient recycling and plant breeding partly using new smart techniques.

Regarding the conversion of the low input agricultural systems, the baseline IMPACT scenario projected that the area with cereals in Sub-Saharan Africa would increase by 20 percent and the yields per hectare would grow by almost two percent per year. But still, due to a high population growth, there would be an increasing dependence on food imports to Sub-Saharan Africa and food security would be compromised, with an increasing number of malnourished children (18 percent more in 2020 compared with 1997). Large-scale conversion to modern, organic agriculture could significantly reduce the needs for food import, thus making the countries less dependent on fluctuating world market prices. This is shown in Figure 1, where the import in “Other coarse grain” was projected to decrease two-three percent by 2020 in the organic low input scenario compared with the expected 17 percent increase in imports in the baseline scenario. Thus, in the organic scenario, where an increased yield growth rate was assumed, the import would possibly be replaced by a small surplus (shown in Figure 1 as negative import) if the expected yields of organic crops could be realized. At the same time, food

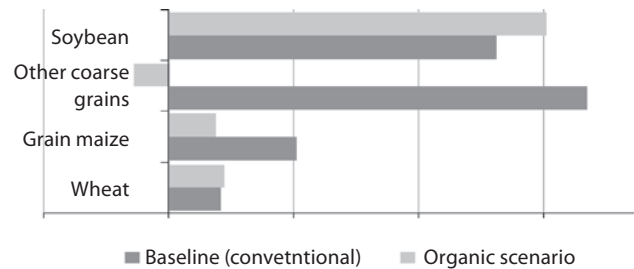


Figure 1: Changes in net trade in important food crops for sub-Saharan Africa Projected for scenarios of large-scale conversion to organic farming until 2020 (Percent increase in import until 2020 in the baseline and in an organic scenario) Source: ICROFS and IFPRI 2006.

access among the rural poor would improve because of (the assumption of) increased yields in traditional food crops such as cassava and sweet potatoes.

Conclusion

Organic agriculture seems to be a viable option for improving food security of small holding farms by – under certain circumstances – to increasing total farm yield, income and by reducing input cost. OA can contribute significantly to improving food security among small-holder farmers in developing countries, and a large-scale conversion has the potential to reduce the future dependence of food imports in Sub Saharan Africa. However, such a positive scenario depends on well-designed training and extension focusing on building human, natural and financial capital. There is also a huge need for more research and innovation to improve local farming systems and adaptation of agro ecological principles.

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