Organic Farming in Rainfed Agriculture : Opportunities and Constraints

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Introduction

The rainfed agro ecosystem in India covers arid, semi arid and sub humid zones which represents more than 70% of the geographical area. Sixty six percent of the 142 m.ha. cultivated area is rainfed. Unlike irrigated areas where homogenous, high intensive cropping systems are common, rainfed farming systems are more diverse and heterogenous. Coarse cereals, pulses, oilseeds and cotton are the major cropping systems. Livestock farming plays an important role in farmer's livelihood. Historically, rainfed farmers followed a low intensive sustainable farming system with excellent integration of crops-trees-pastures and livestock. However, from 70s, with the introduction of hybrids and high yielding varieties particularly in sorghum, pearlmillet and oilseeds, a shift of cropping pattern towards monoculture took place and a corresponding increase in the use of chemical inputs in crop production. The various developmental schemes of the Government of India under different missions have also contributed towards increased use of chemical inputs and higher production.

Rainfed Agriculture : Low Input Farming

However, the vast majority of rainfed farmers in remote areas still practice low external input or no external input farming which is well integrated with livestock, particularly small ruminants. The average use of chemical fertilizers in rainfed areas based on a survey of non irrigated SAT districts was found to be 18.5 kg as against 58 kg in the irrigated districts (Katyal and Reddy, 1997). Based on several surveys and reports, it is estimated that upto 30% of the rainfed farmers in many remote areas of the country do not use chemical fertilizers and pesticides. Thus, many resource poor farmers are practicing organic farming by default. The Government of India task force on organic farming and several other reviewers have identified rainfed areas and regions in north east as more suitable for organic farming in view of the low input use (GOI, 2001; Dwivedi 2005; Ramesh *et al* 2005).

Based on research data generated under the All India Coordinated Research Project on Dryland Agriculture and related projects during the last 25 years, it is evident that chemical fertilizers have significantly contributed to improved productivity in rainfed crops, even in areas where legumes are part of the cropping systems. However, long term data suggest that even in drylands, sustainability of higher yields over a period of time is possible only when optimum nutrients are supplied through organics or a combination of organics and chemical fertilizers but not when supplied as chemical fertilizers alone (Hegde, 1988). Similarly in the area of pest management also, significant yield benefits were reported in a number of pulse and oilseed crops with the use of chemical pesticides initially but more recent data across the country particularly from the network projects on IPM under the National Agricultural Technology Project (NATP) clearly showed that sustainable yields are achieved only with integrated pest management (CRIDA, 2003). However, there have been many, but isolated examples of realizing on par yield levels (with that of IPM or using chemicals) in cotton, pulses and oilseed crops with non pesticidal management, particularly from trials conducted by NGOs across the country. But most often such data are not systematically analysed with cost benefit ratios.

However, all rainfed areas can not be treated at par. Crops like cotton, hybrid sorghum and millets, groundnut, pigeonpea receive relatively higher levels of chemical fertilizers and pesticides all over the country. The chemical input use increased where the varietal replacement was high and greater accessibility to farmers for surface or ground water for protective irrigation. Therefore, it is essential to delineate different regions and crops within rainfed areas depending on the nature and level of input use, so that a proper research and policy initiative can be taken up for identifying prospective regions/commodities

Available Knowledge Base

Very few well replicated field trials were conducted on organic farming involving major rainfed crops, except for a six year trial on cotton in Maharashtra which showed reduction in cost of cultivation and increased gross and net returns compared to conventional cotton cultivation (Rajendran *et al* 2000). However, extensive information is available on the yield and economics with a number of rainfed crops and cropping systems where complete organic manures or

organics as part of INM packages have been used (Lomte *et al* 2004). In most such trials however, no attention was paid on the method of pest management. In large number of on-farm trials conducted under the National Agricultural Technology Project (NATP), farmers practice was included as one of the treatments for comparison. In twenty five percent of the 3000 on-farm trials conducted during 3 years in 5 production systems viz., rainfed rice, oilseeds, pulses, cotton and nutritious cereals, the farmers practice did not include any application of chemicals either as nutrients or for pest management. However, such no input treatments invariably resulted in 40-50% lower yields than the plots that received recommended level of inputs (CRIDA, 2003). The INM treatments however produced higher yield and better cost benefit ratios.

Extensive literature is also available on the usefulness of legume based inter and sequenced cropping systems in the context of organic production. In general, the benefits from legume crop in the system to other component crop in terms of nutrient transfer are not found significant but the succeeding cereal crop benefitted due to the residual effect (Katyal and Reddy, 1997). Intercropping systems have also recorded low pest loads and emerged as a key component of IPM modules in pulse and oilseeds based cropping systems in large number of trials conducted under NATP (CRIDA, 2003). Therefore the cropping systems concept has to be built in, while designing the organic production protocols for rainfed crops.

Vermicomposting, use of biomass raised on the bunds as source of nutrients and biofertilisers are other approaches that were tried in rainfed areas across the country. Vermi composting in particular has been accepted by the rainfed farmers and gained momentum during the last 5 years.

Adoption of soil and water conservation measures, a key component of rainfed farming is also one of the pillars of organic farming. Mulching or mulch cum manuring, residue management, green leaf manuring, cover cropping are other strategies that conserve moisture and improve nutrient use efficiency in drylands which are also the essential components of organic production methods. The use of FYM or other organic nutrient sources during aberrant rainfall years in particular have an additional advantage of protecting the crop from drought besides the nutritional benefits, so critical in drylands. While there is no contradiction between

these established rainfed farming technologies and the objectives of the organic farming, the only issue will be the labour and capital intensive nature of some of these technologies and its ultimate impact on the cost of production.

Constraints in Scaling Up

Besides the well known limitation of the availability of FYM and other organic forms of nutrients in desired quantities as highlighted by Chhonkar (2004), water availability also is an important constraint for adoption of organic farming, particularly in arid and dry semi arid tropics. Absence of surplus rainwater for harvesting and long periods of low soil moisture can limit the overall biomass production for recycling, green leaf manuring and on-farm composting. Application of 5-10 t FYM/ha is required in most crops to produce on par yields with recommended chemical fertilizers. Such level of inputs use can only be possible in limited areas for specific crops. However, biomass production during the off season (without competition with the kharif crop) through a legume cover cropping and its incorporation in the soil can be another strategy to over come the limitation of organic matter availability (Venkateswarlu *et al* 2005). Since the overall biomass production is linked to rainfall, using crop biomass either by composting or through recycling should be a major strategy in relatively high rainfall receiving areas in moist semi arid and dry subhumid regions (750 – 1200 mm) while the dry semi arid and arid areas (300 – 750 mm) may depend on use of FYM as the principal source, since live stock is a strong component in these regions.

Considering the low organic matter and fertility status of Indian soils, the yield declines during conversion period could be sharp in the absence of external inputs. In view of the limited biomass and organic resources available for use in rainfed areas, organic production either for domestic or export markets should be encouraged in highly selected areas and commodities. This strategy alone can sustain the production and marketing of organic food on a long term basis.

Focus on Niche Areas and Commodities

Rainfed areas are reported to have relative advantage to go for organic farming primarily due to i) low level of input use, ii) shorter conversion period and iii) smaller yield reductions compared to irrigated areas, but no one can suggest any large scale conversion in view of the limitations referred above. Moreover, following WTO agreement, and expected free trade of commodities both within and outside the country, the cost of production is sure to play a major role in the profitability. Hence, rainfed farmers producing same commodity as in irrigated areas need to realize high yields in order to remain competitive. Moreover, large yield gaps still exist between research station productivity and farmers fields. Therefore, it is necessary that farmers have to increase the quantum and efficiency of input use and achieve higher productivity.

However, the inherent advantages of rainfed areas should be capitalized by encouraging organic farming in highly selected areas and commodities with edapho-climatic and price advantages. The primary focus should be on commodities which have export potential with price premiums. A list of such crops and the suggested areas are given in Table 1. Having selected the commodities, a two pronged strategy need to be followed for popularising organic farming. Firstly, areas where relatively low or no inputs are used and which are climatically well endowed with reasonable productivity levels may be identified. Farmers in contiguous areas can be encouraged to adopt farm management practices that are required in organic production. Yield levels in such areas may be further enhanced by using permitted inputs. A commodity and area oriented group certification system may be possible with the support of the Government agencies and service providers. As a second strategy, areas where farmers are already realizing higher yields but using chemical inputs need to be identified and a systematic conversion protocols need to be introduced based on research data. Besides training and capacity building of farmers on production of inputs required for organic farming at farm level, the availability of other bio inputs like biofertilisers and bio pesticides need to be increased in selected areas by encouraging the setting up of bio resource centers. Forward linkages with certifying agencies and markets will be essential to sustain the initiative.

Table 1: Selected list of commodities with potential for organic production in rainfed regions

Commodity	Scope/Opportunity	Potential Area
Cotton	Demand for organically produced lint. To cut down on chemical use	Maharashtra, A.P., Karnataka, Gujarat
Sesame	Demand for organic sesame seed for medicinal and confectionary uses	Gujarat, Rajasthan
Niger	Demand for niger seeds produced organically for bird feed in Europe	Tribal areas of different states, in particular Orissa and Chhattisgarh
Lentil	Preference for Indian lentil in world markets; organic product to fetch price premium	U.P.
Safflower	Growing market for safflower petals as natural food dye and herbal products	Maharashtra
Fingermillet	Scope to export fingermillet flour as health food ingredient	Karnataka, Orissa, Jharkhand
Medicinal herbs	Need for residue free crude drugs	All over India
Ginger/Turmeric	Demand for residue free spices/natural colours	Orissa
Groundnut	To produce residue/toxin free table varieties	Gujarat
Soybean	Demand for organically produced DOC for livestock feed	M.P.

Recommendations

While rainfed regions undoubtedly offer good scope for organic production atleast in niche areas and commodities, a number of research, development and policy issues need to be addressed before realizing the potential.

- Prepare an enlarged list of crops, herbs and livestock products which can be sourced from rainfed regions considering the international trade in organic food and allied products.
- Carry out a country wide survey/inventorisation of areas in arid, semiarid and dry sub humid regions about the level of chemical input use, productivity in selected commodities which have potential to fetch price premiums in international markets.

- Identify contiguous blocks of areas with little or no chemical input use and where productivity can be enhanced by using permitted inputs to enable group certification to farmers.
- To develop protocols for organic production of important commodities through farmers participatory network research. These protocols should be based on the entire cropping system approach and not on individual seasonal crops.
- To create awareness and capacity building of different stakeholders on different aspects of organic production like cultivation, harvesting, certification and marketing.
- Develop preferential policy instruments for rainfed farmers particularly in terms of providing market information, subsidized supply of inputs and group certification.

References

Chhonkar, P.K., Organic Farming: Science and Belief, Journal of the Indian Society of Soil Science, Vol.51, No.4, pp.365-377 (2003).

CRIDA (2003). Annual Progress Report of the Production Systems Research under Rainfed Agro Ecosystem, 2003-04, Agro Ecosystems Directorate, CRIDA, Hyderbad. pp. 1-136.

Dwivedi Vandana (2005). Organic farming : Policy initiatives, Paper presented at the National Seminar on National Policy on Promoting Organic Farming, 10-11 March, 2005. pp.58-61.

GOI (2001). The report of the working group on organic and biodynamic farming, Planning Commission, Government of India. pp:1-25.

Hegde, B.R., Krishnagowda, K.T., and Parvathappa, H.C. (1988). *In* Recent Advances in Dryland Agriculture, Part 2., Somani, L.L. (ed.), Scientific Publishers, Jodhpur, pp.277-285.

Katyal, J.C. and Reddy, K.C.K (1997). Plant nutrient supply needs : Rainfed food crops. In Plant Nutrient Needs, Supply, Efficiency and Policy Issues : 2000-2025 (ed. Dr.J.S.Kanwar and Dr.J.C.Katyal), National Academy of Agricultural Sciences, New Delhi. pp. 91-113.

Lomte, M.H. and Pendke, M.S. (2004). Organic Farming Inventory. Proceedings of the State Level Seminar on Present and Future Prospects of Organic Farming, Marathwada Agricultural University, Parbhani, pp. 1-133.

Rajendran, T.P., Venugopalan, M.V. and Tarhalkar, P.P., Organic Cotton Farming in India. Central Institute of Cotton Research, Technical Bulletin No.1/2000, Nagpur, 2000.p.39.

Ramesh, P, Mohan Singh and Subba Rao, A. (2005). Organic farming: Its relevance to the Indian context. Current Science, Vol. 88, No.4. pp.561-568.

Venkateswarlu, B., Srinivasa Rao, Ch., Ramesh, G., Venkateswarlu, S., and Katyal, J.C. (2005). Effect of long term incorporation of legume biomass on soil quality under rainfed conditions. Extended abstract of a paper presented at the International Conference on Soil Water an Environment : Issues and Strategies, 28th January to 1st Feb., 2005, New Delhi, pp.118.