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A Review Study on Integrated Organic Farming Systems in India

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Farming System is a complex inter-related matrix of soil, plants, animals, implements, power, labour, capital and other inputs controlled in parts by farming families and influenced to varying degrees by political, economic, institutional and social forces that operate at many levels. Rapid evolution took place in the last two decades when crop and livestock yields increased, together with concerns about their socio-economic and biological tradeoffs. The application of Organic farming systems research to agricultural development was a response to problems arising from a predominantly reductionist approach to research and a cornucopian view of external inputs. Modern technologies were either not welcomes or caused unexpected negative trade-offs. This paper reviews definitions and forms of organic farming systems and the need for evolution in thinking about agricultural development. This is a multidisciplinary whole-farm approach and very effective in solving the problems of small and marginal farmers. The approach aims at increasing income and employment from small-holdings by integrating various farm enterprises and recycling crop residues and by-products within the farm itself. This paper of Organic farming systems influences discussion between cornucopias and conservationists, and between reductionist and holistic approaches to research. There is a need to recognize context, and to pay more attention to relations within systems and to defining criteria for sustainability also paper links biological and socio-economic processes, gives a social and environment background for the concepts of waste, and reviews aspects of objectivism and constructivism. It is argued that organic farming systems can only advance if the full portent of these issues is considered in thinking about development of organic farming system. The complexity of the reality should make scientists think more carefully about the appropriate strategy that will get people out of poverty. According to this experience poor women invest in small livestock and the household step by step gets out of poverty. There is a great and unmet challenge for research on local resources to cater to the needs of these people.

Organic Farming systems and thinking about farming change continuously. These processes can be called the evolution of farming systems and system philosophy, if change is called evolution and if thinking about systems is called philosophy. Rapid change took place in the last two decades in both temperate and tropical regions in terms of yield per animal or plot, and in terms of input use. All over the world the grain yields went up at spectacular rates during the green revolution and individual levels of production in animals followed a similar trend (Alexandratos, 2010 and E. Porcire, and R. Rabbinge). Ensuring food security for a fast growing global population estimated at 9.1 billion in 2050 and over 10 billion by the end of the twenty first century is a mammoth challenge for the present agricultural production system (UNPFA). Shrinking average farm size in India and financial constraints for higher investment in agriculture due to 80% farm families belonging to small and marginal farmer categories further heighten the challenge. For securing food and nutrition security for sizable population, productivity enhancement may provide a vital solution. This involves the adoption of scientific agronomic practices and technologies which promise an augmentation of the productive capacity of traditional agricultural systems. Agronomic practices such as the liberal use of inorganic pesticides and fertilizers during the twentieth century enhanced productivity significantly but undesirable environmental degradation accompanied by increased operational costs in agriculture raised concerns about economic feasibility and sustainability (IAASTD, 2009 and FAO, 2010). About 75% of the adversely affected households belong to rural communities of developing economies whose livelihood is directly or indirectly dependent on agriculture and allied activities (FAO, 2009). Unsustainable farming leads to environmental pollution and threatens the livelihood of millions of small farm holders. Strengthening agricultural production systems for greater sustainability and higher economic returns is a vital process for increasing income and food and nutrition security in developing countries (Ravallion et al., 2007).

The emergence of integrated organic Farming Systems has enabled us to develop a framework for an alternative development model to improve the feasibility of small sized farming operations in relation to larger ones. Integrated organic farming system is a commonly and broadly used word to explain a more integrated approach to farming as compared to monoculture approaches. It refers to agricultural systems that integrate livestock and crop production or integrate fish and livestock and may sometimes be known as Integrated Bio systems. In this system an inter-related set of enterprises used so that the “waste” from one component becomes an input for another part of the system, which reduces cost and improves production and income. Its works as a system of systems to ensure that wastes from one form of agriculture become a resource for another form. Since it utilizes wastes as resources, we not only eliminate wastes but we also ensure overall increase in productivity for the whole agricultural systems.

The term “farming system” refers to a particular arrangement of farming enterprises that are managed in response to physical, biological and socio-economic environment and in accordance with farmer’s goals, preferences and resources. “The household, its resources and the resource flows and interactions at the individual farm levels are together referred to as a farm system” (FAO, 2001).

MAJOR FOCUS IN FARMING SYSTEM

In the past few decades farming system research (FSR) has emerged as a popular and major theme in international agricultural research (Sands, 1986). Yet despite the widespread use of the term FSR, substantial ambiguity persists about its meaning and the types of research concepts, objectives, approaches, activities and methods to which it should be applied. FSR integrates the following key activities and concepts into a coherent research process designed to overcome the perceived weaknesses in main-stream agricultural research.

1. **It is problem solving:** FSR is an operational research which first identifies technical, biological and socioeconomic constraints to improved production in farming systems. It then endeavours to develop solutions which are appropriate for the management conditions of that system (Biggs and Stephen, 1995).
2. **FSR is farmer-oriented:** FSR views small farmers as clients for research and technology development. Therefore, its fundamental objectives are to generate technologies relevant to their goals, needs and priorities. Several mechanisms are employed to attain these objectives: (i) farmers are integrated in to research process, the existing farming system is studied before proposing technological solutions, and (iii) technologies are adapted to local circumstances and needs of a specific group of farmers (Rhoads and Booth, 1982; Chambers and Ghildyal, 1985).

3. **FSR is system oriented:** FSR views the farm in a holistic manner and focuses on interactions between components. In practice, the whole farming system serves as the frame-work for analysis, but specific components, sub-systems or interactions are targeted for interventions.
4. **FSR is interdisciplinary:** FSR, by nature, cuts across conventional, commodity and disciplinary boundaries. Biological and social scientists must collaborate in order to understand the conditions under which small farmers operate, to diagnose constraints and to develop appropriate and improved technologies (Rhoades and Booth, 1982; Mahapatra and Behera, 2004).
5. **FSR complements mainstream commodity and disciplinary agricultural research; it does not replace it**. FSR draws on the "body of knowledge" of technologies and management strategies, generated by discipline and commodity research and adapts them to the specific environment and socio-economic circumstances of a target group of relatively homogeneous farmers.
6. **On-farm research is central to FSR approach:** On-farm research provides the context for collaborations between farmers and researchers (Chambers and Ghildyal, 1985). Researchers get a deeper understanding of the farming system and the decision making context of the farm family. It revolves round the basic principle that successful agricultural research and development efforts should start and end with the farmers (Rhoades and Booth, 1982). Farmer participation is ensured at different stages of technology generation and transfer processes, such as system description, problem diagnosis, design and implementation of on- farm trials, and providing feed-back through monitoring and evaluation.

Goals of Integrated Farming System The four primary goals of IFS are:

- Maximization of yield of all component enterprises to provide steady and stable income at higher levels.
- Rejuvenation/amelioration of system's productivity and achieve agro-ecological equilibrium.
- Control the build-up of insect-pests, diseases and weed population through natural cropping system management and keep them at low level of intensity.
- Reducing the use of chemical fertilizers and other harmful agro-chemicals and pesticides to provide pollution-free, healthy produce and environment to the society at large.

Organic Farming Systems Approach:

The shortcomings of the reductionist, command-and-control approach to agricultural research became increasingly evident, especially as it was understood that the farmers‟ production environment was much more heterogeneous than had been thought. Indeed, farmers in less favored areas resisted these innovations and did not adopt the technological packages. This raised the awareness that technological innovations needed to be assessed not only through their immediate efficiency. They also needed to be flexible and needed to take into account the farmers‟ perception of uncertainty and security, their long term perspectives and their farming goals. Thus, it was recognized that the research approach needed to be more integrative, systemic and comprehensive and that multiple spatial and temporal scales needed to be taken into account. Also, the limits of a science-based recommendation were acknowledged and with it the need to take an actor-oriented approach to ensure compatibility with the socioeconomic environment. This led to a new developmental paradigm, which Korten characterizes as a "people-centered learning process‟ rather than the earlier „technological blueprint" approach. Thus, the farming systems approach developed in the late 1970s, which had as its key characteristics an interdisciplinary approach and the involvement of farmers in the research process. Initially the focus was still on how yields of particular crops could be increased. This early farming systems approach involved looking at one specific enterprise and identifying improvements that were compatible with the whole farming system. This approach allowed several developments:

The efforts of develop sustainable integrated farming system models for irrigated agro ecosystem of southern Tamil Nadu of north-eastern plain zone revealed that rice-pea-okra was the most remunerative cropping sequence with highest rice equivalent yield of net returns than the conventional rice-wheat sequence. The rice based integrated farming system comprising of crop components, dairy, poultry and fishery was the most suitable and efficient farming system model giving the highest system productivity and ensured the multiple uses of water. This model generated significantly higher levels of employment than rice-wheat system. The approach aims at increasing income and employment from small-holding by integrating various farm enterprises and recycling crop residues and by products within the farm itself.

Optimizing the Total System

The "Farmer first and last model" is an alternative to the "transfer-of- technology" model, and is based in the farmer's perceptions and priorities rather than on the scientist's professional preferences, criteria and priorities. The starting point is the scientific learning from and understanding of the resources, needs and problems of the resource-poor farmers and that the research stations and laboratories play a referral and consultancy role. This model is characterized by the use of informal survey methods, research and development within the farms, and with the farmers, and evaluation through the technology adoption. The farming system must be fully integrated in order to optimize the use of locally "available alternative" resources. Strategies for sustainable livestock production in the tropics have been developed in Colombia and elsewhere.

When livestock are available, and there are suitable conditions, a simple and low-cost biodigester technology can be developed. Earthworms provide another route for the recycling of manure and are especially appropriate for the processing of excreta from goats and rabbits which, for physical reasons, is not suitable as a substrate for bio digesters. The results reported here demonstrate that the basic model has many variants but the principles are the same. It is important to identify local feed resources and the preferences of local people for different types of livestock. In all cases, there should be minimum "waste" in the system. By-products and residues originating in one component of the system become inputs for another "productive" activity.

Integrative Simulation Modeling In Farming Systems Research

Integrative simulation modeling is a promising tool in farming systems research, which will help in unraveling the complex and dynamic interactions and feedbacks among bio-physical, socio-economic and institutional components across scales and levels and are useful for taking decisions to foster sustainable farming systems. Participatory approach in integrated simulation modeling is the need of the hour to address the problem of shrinking of resource availability and competition to access of resources and its market economy. The strength of integrated simulation models is that of providing a platform for the integration of research approaches, knowledge and data in the frame of interdisciplinary or trans-disciplinary processes.

On-Farm Processing and Value Addition

A substantial change has already taken place in consumer preferences for graded, packaged and processed food items of daily use in urban market, especially among middle and high classes. With opening of more and more departmental stores in townships and retailing food items at competitive prices within next few years this trend will certainly filter down to rural areas also. Low-cost improved technologies are required to unleash potential and improve market efficiency and remain competitive simultaneously. Moreover, recent trends have clearly shown the accelerated use of by-products for value addition. For example, now sugarcane is not only used for sugar production but every by-product of it is used economically by sugar mills – biogases for electricity generation, pressman for preparation of high value organic manure and molasses for alcohol production. Similarly, in case of paddy, husk is being used as very efficient source of fuel in boilers and bran for edible oil extraction. Many vegetable oils – earlier considered to be non-edible are being extensively used as edible after development of refining technology.

Empowerment of women through integrated organic farming

Women play a very important role in household management including agricultural operations. This is especially true for hilly and tribal areas. There is a vast scope to improve the household profitability by judiciously utilizing family labor using innovative practices and ensuring multiple uses of various household resources. This is possible through women's empowerment through location specific trainings and critical need based support. With the improvement in educational status in the years to come, the role of women in agriculture and management of household resources will be increasingly important. As such, feminization of agriculture in the long run is expected and developing women-centric farming system models will be a real challenge as men are migrating to rural non-farm sectors.

Conclusion

Farming system research is recognized as a potential tool for management of vast natural resources in developing countries. The farming system, as a concept, takes into account the components of climate, soil, water, crops, farm wastes livestock, land, labour, capital, energy and other resources with the farm family at the centre managing agriculture and related activities. Integrated farming system is extremely important for the efficient management of available resources at the farm level to generate adequate income and employment for the rural poor, and improvement of their livelihoods in a of sustainable manner. The synergistic interactions of the components of farming systems need to be exploited to enhance resource-use efficiency and recycling of farmby-products. Rice-based farming offers tremendous potential for food security and poverty alleviationin rural areas. It is an efficient way of using the same land resource to produce both carbohydrate and animal protein concurrently or serially as well as meeting the vitamins and mineral requirement through cultivation of vegetables and fruits on dykes and bunds, thus providing balanced diet to farm family, reducing hunger and malnutrition. Integrating aquaculture with rice farming results in an efficient nutrient use through by-product recycling, eradicating weeds some insect pests; an important side effect is a cleaner and healthier rural environment.

There was evidence that with the right type of institutional, credit and technical interventions, the poorest households - and especially when the work is routed through women - have tremendous capacity to pull themselves out of hardcore poverty with immediate benefit to the most vulnerable groups, i.e. children under five and pregnant women. The strategy to develop feeding systems based on the use of local resources has to go together with the socio-economical aspects. The emphasis should be on small livestock such as chickens, ducks, pigs, goats in accordance with the "ladder concept", but should respect differences in countries and cultures. Addition of organic residues in the form of animal and plant wastes could also help in improving the soil – health and thereby productivity over a longer period of time with lesser environmental hazards. On-farm research is an active process.

Integrated organic farming systems offer unique opportunities for maintaining and extending biodiversity. The emphasis in such systems is on optimizing resource utilization rather than maximization of individual elements in the system. The wellbeing of poor farmers can be improved by bringing together the experiences and efforts of farmers, scientists, researchers, and students in different countries with similar eco-sociological circumstances i.e. through Integrated Organic Farming System.

Empowering today's youth is our greatest responsibility. Providing a platform to create professional and business oriented organic farming systems for youth will be very important. Further, the role of highly educated and skilled youth will be quite useful in managing the knowledge intensive farming systems. Capacity building of youth population through advanced trainings will further empower them to go for creating input-output supply chains for primary and secondary agriculture.

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