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A REVIEW STUDY ON INTEGRATED FARMING SYSTEMS

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ABSTRACT

Integrated Farming systems (IFS), and methods of thinking about them, developed in place and time. Rapid change has occurred in the past two decades when agricultural and animal outputs rose, along with worries about their socio-economic and ecological tradeoffs. The use of farming systems research (FSR) to agricultural development was a reaction to issues emerging from a primarily reductionist approach to research and a cornucopian perspective of external inputs. Modern technology were either not accepted or produced unanticipated unfavorable trade-offs. This article examines definitions and types of FSR and the necessity for evolution in thinking about agricultural development. The article connects biophysical and socio-economic processes, provides a physical basis for the anthropomorphic notions of waste, and examines elements of objectivism and constructivism. It is claimed that FSR can only progress if the full significance of these problems is addressed in thinking about growth of IFS. The intricacy of the reality should make scientists think more carefully about the right approach that will bring people out of poverty. Research in Asia of replications of the renowned Bangladesh Grameen Bank micro-credit programs indicate that there is an ideal development for farm families in the sub-continent that even the impoverished aspire too. According to this experience impoverished women invest in little animals and the family bit by step climbs out of poverty. There is a significant and unmet need for study on local resources to respond to the requirements of these individuals.

KEYWORDS: *Agriculture, Integrated Farming, Farming Systems, Feed Resources, Livestock.*

1. INTRODUCTION

Farming systems and ideas about farming evolve constantly. These processes may be termed the evolution of agricultural systems and system philosophy, if change is called evolution and if thinking about systems is called philosophy. Rapid change has occurred in the past two decades in both temperate and tropical areas in terms of yield per animal or plot, and in terms of input usage. All across the globe the grain yields went risen at remarkable rates during the green revolution and individual levels of output in animals followed a similar pattern. Ensuring food security for a rapidly increasing global population projected at 9.1 billion in 2050 and over 10 billion by the end of the twenty first century is a huge task for the current agricultural production system. Shrinking average farm size in India and financial limitations for greater investment in agriculture owing to 80 percent farm families belonging to small and marginal farmer groups further heighten the issue. For ensuring food and nutrition security for large population, productivity improvement may offer a crucial answer[1]–[4].

This includes the use of scientific agronomic techniques and technology which promise an augmentation of the productive potential of conventional 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. About 75 percent of the negatively impacted families belong to rural communities in developing countries whose livelihood is directly or indirectly reliant on agriculture and related activities. Unsustainable farming contributes to environmental degradation and threatens the livelihood of millions of small farm holders. Strengthening agricultural production systems for better sustainability and higher economic returns is a key step for boosting income and food and nutrition security in underdeveloped nations.

Therefore IFS is a multidisciplinary whole farm strategy and highly successful in addressing the issues of small and marginal farmers. The method aims at boosting revenue and employment from small-holding by combining different farm businesses and recycling crop wastes and by products inside the farm itself. The farmers need to be guaranteed of consistent income for living at least above poverty level. The development in production or continuous increase in output is essential to meet the difficulties presented by current economic, political and technical environment. In this context, farming system approach is one of the important solutions to face this peculiar situation as in this approach the different enterprises can be carefully undertaken and the location specific systems are developed based on available resources which will result into sustainable development[5]–[7].

The advent of Integrated Farming Systems (IFS) has allowed us to create a framework for an alternative development model to enhance the viability of small sized farming operations in comparison to bigger ones. Integrated farming system (or integrated agriculture) is a frequently and extensively used term to describe a more integrated approach to farming as opposed to monoculture methods. It refers to agricultural systems that combine livestock and crop production or integrate fish and cattle and may occasionally be called as Integrated Biosystems. In this system an inter-related collection of businesses utilized such that the “waste” from one component becomes an input for another element of the system, which lowers cost and increases output and/or revenue. IFS operates as a system of systems. IFS guarantee that wastes from one type of agriculture become a resource for another form. Since it uses wastes as resources, we not only reduce wastes but we also guarantee overall improvement in production for the entire agricultural systems.

For example, the costs of inputs and outputs frequently vary, along with dependence on external resources, farm size, farm ownership and the technique of farming, often as a cause and consequence of rising population pressures. Such variations in yield, pricing and farming techniques, within and across nations, represent temporal and geographical development of agricultural systems. Also, these represent victories (of sorts) for the primarily reductionist ideologies underlying research, which concentrated on specific commodities such as milk and grain. Due to poor agricultural production, the small and marginal farmers as well as approximately 15 to 18 percent landless households living in the rural regions are unable to produce remunerative work and about 40 percent families are forced to live in poverty. With lack of food and economic security, trans-migration whereby the impoverished families are forced to move to cities in misery, leaving their agricultural fields barren, may become a significant national problem. FSR provides the potential scope to address the technological development issues. Research organizations in several countries are moving towards agricultural system approach with significant focus on participatory on-farm research. It is also a reality that highly productive areas have been shifted from agriculture to infrastructure development, urbanization and other associated activities. Under these conditions the only alternative is to raise the production vertically. In light of these circumstances, Integrated Farming System is the only method through which the goal may be accomplished[5]–[7].

1.1.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 were much more heterogeneous than had been thought. Indeed, farmers in less favored areas (and also in countries of the South) 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: Technical scientists were increasingly sensitized to the complexity and variability of farmers" production environment. They recognized that this environment consisted of both physical and socioeconomic components, and they also saw the need to integrate the farmer, with his/her norms and values, his/her decisions rules as a component of the systems they studied.

1.2.Optimizing the Total System:

The "Farmer first and last model" (FFL) is an alternative to the "transfer-of- technology" model (TOT), and is based on the farmer's perceptions and priorities rather than on the scientist's professional preferences, criteria and objectives. The starting point is the scientific learning from and knowledge of the resources, requirements and challenges of the resource-poor farmers and that the research stations and labs play a referral and consulting role. This approach is distinguished by the use of informal survey techniques, research and development inside the farms, and with the farmers, and assessment via the technology uptake. The agricultural system must be completely integrated in order to maximize the use of locally "available alternative" resources. Strategies for sustainable livestock production in the tropics have been developed in Colombia and elsewhere[8][7].

Manure is a significant source of fuel in many Asian civilizations. It is believed that 8 to 12 percent of the world's populations rely on dung for heating and cooking. Animal dung is an useful fertilizer as well, imparting inputs to the soil above and beyond the basic chemical nutrients of N, P and K. As an input into the agricultural cultivation systems, manure continues to be the connection between crop and animal production across the developing globe. The big challenge is to find better methods of enhancing the advantages to society and to the environment that manure may provide. One method to make a better use of manure is definitely via biogas generation and growth of earthworms. Biogas is regarded one of the cheapest renewable energy in rural regions of poor nations. Production of biogas will not only conserve firewood but also be useful for integrated agricultural systems by turning waste into an enhanced fertilizer for crops or in ponds for fish and water plants. Other advantages of biodigestion include the decrease of manure smell, removal of smoke while cooking and the eradication of pathogens and thus enhancing the atmosphere in the farm[9].

When animals are accessible, and there are appropriate circumstances, a simple and low-cost biodigester system may be created. Earthworms offer another avenue for the recycling of manure and are particularly suited for the processing of excreta from goats and rabbits which, for physical reasons, is not acceptable as a substrate for biodigesters[10]. The findings presented here show that the fundamental model has numerous variations but the principles are the same. It is essential to determine local feed supplies and the preferences of local people for various kinds of cattle. In all instances, there should be minimal "waste" in the system. By-products and residues originating in one component of the system become inputs for another "productive" activity.

1.3.Integrative Simulation Modeling in Farming Systems:

Integrative (bio-physical or socio-economical) 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 method in integrated simulation modeling is the need of the hour to solve the issue of decreasing of resource availability and rivalry to access to resources and its market economy. The strength of integrated simulation models is that of offering a platform for the integration of research methods, knowledge and data in the context of multidisciplinary or transdisciplinary processes. Under the projected climate change scenario, there is a need to optimize the multiple input factors to achieve maximum benefit with sustainability, multi-criteria decision analysis with the integration of linear programming and simulation modeling should be taken up at different scales to address the input-output flow of resources.

Cassava has one key feature, namely that it may be managed to optimize production of carbohydrate (in the form of the roots), or protein, by harvesting the leaves. For root production the development cycle is from 6 to 12 months at the conclusion of which the whole plant is collected. When maximal protein synthesis is the goal, the foliage is harvested at 2 to 3 month intervals by clipping the stems at 20” to 28” above the ground thus encouraging the plant to re-grow. In this instance the roots function as a nutrient reserve to enable the re-growth of the aerial portion. This process may continue for 2 to 3 years if the nutrients exported in the leaves are replenished by fertilizer (organic/inorganic). Dual-purpose production systems are also available wherein one or two harvests of the leaves are collected before the plant is allowed to complete the regular growth of the roots. Cassava can generate extremely high yields, particularly of protein (up to 3,563 lbs/acre/year), which makes it an excellent ingredient for taking use of recycled animal wastes. This great production potential is supplemented by the excellent nutritional value of the leaves for cattle, sheep and goats and pigs.

1.4.On-Farm Processing and Value Addition:

A significant shift has already taken place in consumer preferences for graded, packaged and processed food products of everyday use in urban market, particularly among middle and upper classes. With establishment of more and more departmental shops in townships and selling food goods at reasonable rates within next few years this trend will definitely trickle down to rural regions too. Low-cost enhanced technologies are needed to unlock potential and increase market efficiency and stay competitive concurrently. Moreover, recent developments have clearly demonstrated the increased utilization of by-products for value addition. For example, today sugarcane is not only utilized for sugar production but every by-product of it is used economically by sugar mills – bagasse for power generation, press mud for preparation of high value organic manure and molasses for alcohol manufacture. Similarly, in case of rice, husk is being utilized as highly effective source of fuel in boilers and bran for edible oil extraction. Many vegetable oils – previously thought to be non-edible now being widely utilized as food following development of refining technologies. It is clear that benefit of all these value addition technologies will be accessible to farmers aswell. “Integrated Food and Waste Management Systems” (IF&WMS) which was created by Prof. Chan and is one form of an IFS. He established this idea at the Montfort Boy Farm in Fiji, a vocational school that now serves as a model for the pupils to duplicate in local communities (A Primer on Integrated Farming Systems) (A Primer on Integrated Farming Systems). Today there are many IF&WMS or IFS models. These systems combine livestock, aquaculture, agriculture and agro-industry in an expanded symbiotic or synergistic system, so that the wastes of one process become the input for other processes, with or without treatment to provide the means of production, such as energy, fertilizer, and feed for optimum productivity at minimum costs. The principles connected with IFS are implemented by many farmers around the world. A common feature of these systems is that they include a mix of agricultural and livestock businesses and in certain instances may incorporate combinations of aquaculture and trees. It is a component of agricultural systems which takes into consideration the principles of reducing risk, boosting overall output and profitability by decreasing external inputs via recycling and optimizing the use of organic wastes and crop leftovers. In this regard integration typically happens when outputs (usually by-products) of one business are utilized as inputs by another within the framework of the agricultural systems. The distinction between mixed farming and integrated farming is that businesses in the integrated farming systems interact Eco biologically, in space and time, are mutually supporting and rely on one other.

1.5.Empowerment of women through IFS:

Women have a very significant part in home management including agricultural activities. This is particularly true for hilly and tribal regions. There is a huge potential to enhance the home profitability by carefully using family labour using innovative methods and guaranteeing multiple applications of different household resources. This is achievable via women‟s empowerment through site specific trainings and crucial need based assistance. With the increase in educational level in the years to come, the role of women in agriculture and management of family resources will be more significant. Since such, feminization of agriculture in the long term is anticipated and creating women-centric farming system models would be a major challenge as males are moving to rural non-farm industries.

2. DISCUSSION

There is now 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 approach to create feeding systems based on the utilization of local resources needs to go along with the socio-economic factors. The focus should be on small livestock such as chickens, ducks, pigs, goats in line with the "ladder idea", but should accept variations in nations and cultures. Addition of organic residues in the form of animal and plant wastes may also assist in enhancing the soil – health and therefore production over a longer period of time with fewer environmental risks. On-farm research is an ongoing process. Farmers have long tried to develop locally-adapted technology. Farmers are frequently great "researchers" and "extensionists". In this manner, research and extension go together which is the ideal method. When the research is done on-farm, the process is quicker and there is a "natural selection" of technologies and goals. Therefore, there is less waste of time and money. In certain areas, particularly when new technologies are being created or adopted, it is beneficial if on-farm research is supplemented by "on station" research. It increases space use and boosts production per unit area. It offers diverse goods. It increases soil fertility and soil physical structure through proper crop rotation and utilizing cover crop and organic compost. It decreases weeds, insect pests and illnesses through proper crop rotation.

3. CONCLUSION

Integrated agricultural systems provide unique possibilities for preserving and expanding biodiversity. The focus in such systems is on maximizing resource consumption rather than maximization of individual components in the system. The welfare of impoverished farmers may be enhanced by bringing together the experiences and efforts of farmers, scientists, researchers, and students in various nations with comparable eco-sociological conditions i.e. via Integrated Farming System. Empowering today’s young is our biggest duty. Providing a platform to develop professional and commercial focused agricultural systems for kids would be extremely essential. Further, the function of highly educated and talented young will be very helpful in managing the knowledge heavy agricultural systems. Capacity development of young population via advanced trainings would further enable them to move for establishing input-output supply chains for primary and secondary agriculture. The sole option of keeping youngsters in agriculture is via establishing micro-business models in farming since it provides opportunity for regular sustained revenue. The highly productive, economically lucrative, environment friendly and sustainable effective models of agricultural systems may pave way to entice the youngsters to work in rural regions even from metropolitan areas having connections to the rural system.

REFERENCES:

1. P. K. Nayak et al., "Ecological mechanism and diversity in rice based integrated farming system," Ecol. Indic., 2018, doi: 10.1016/j.ecolind.2018.04.025.
2. S. Al Mamun, F. Nasrat, and M. R. Debi, "Integrated Farming System: Prospects in Bangladesh," J. Environ. Sci. Nat. Resour., 2012, doi: 10.3329/jesnr.v4i2.10161.
3. C. Morris and M. Winter, "Integrated farming systems: The third way for European agriculture?," Land use policy, 1999, doi: 10.1016/S0264-8377(99)00020-4.
4. D. W. Archer, J. G. Franco, J. J. Halvorson, and K. P. Pokharel, "Integrated farming systems," in Encyclopedia of Ecology, 2018.
5. L. Lindawati, M. B. Sibuea, D. Novita, M. I. Riyadh, and A. Hasibuan, "A comparative analysis of economic farming activity of farmers rice-livestock integrated farming system (RLIFS) and non RLIFS," Int. J. Eng. Technol., 2018, doi: 10.14419/ijet.v7i2.29.14258.
6. B. O. Asante, R. A. Villano, I. W. Patrick, and G. E. Battese, "Determinants of farm diversification in integrated crop-livestock farming systems in Ghana," Renew. Agric. Food Syst., 2018, doi: 10.1017/S1742170516000545.
7. R. P. Soni, M. Katoch, and R. Ladohia, "Integrated Farming Systems - A Review," IOSR J. Agric. Vet. Sci., 2014, doi: 10.9790/2380-071013642.
8. C. Morris and M. Winter, "Integrated farming systems: The third way for European agriculture?," Land use policy, vol. 16, no. 4, pp. 193–205, 1999, doi: 10.1016/S0264-8377(99)00020-4.
9. M. Jastrzębska, W. P. Jastrzębski, C. Hołdyński, and M. K. Kostrzewska, "Weed species diversity in organic and integrated farming systems," Acta Agrobot., 2013, doi: 10.5586/aa.2013.045.
10. S. Kumar, S. S. Singh, M. K. Meena, Shivani, and A. Dey, "Resource recycling and their management under integrated farming system for lowlands of Bihar," Indian J. Agric. Sci., 2012.