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RESEARCH ARTICLE

DEVELOPMENT AND EVALUATION OF AN IMPROVED INTEGRATED FARMING SYSTEM (IFS) FOR HIGHER PROFITABILITY AND LIVELIHOOD SECURITY IN NORTHERN PLAINS OF INDIA

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ABSTRACT

The geographical area of India spreads over 329 million hectares is endowed with a complex diversity of climate and soil; flora and fauna. Integrated Farming System (IFS) is the main source of livelihood of nearly 65% rural masses dependant on agriculture. To overcome the problem of lower profitability in IFS, the concept and models of Specialized Integrated Farming System (SIFS) has been developed with 4 components viz. basal crops, medium duration cash crops, super short/short duration cash crops and value addition. The basal crop provides support to system like IFS. The present study was conducted during 2009-2012 in villages of Barabanki and Raebareli districts of Uttar Pradesh, India. Out of 42 families for whom data was recorded and evaluated, 24 families followed rice-wheat-oilseeds cropping system, reared cow /buffaloes (1-3 Nos.) and vegetables on part of land. In the SIFS models rural poultry, off-season vegetables and gladiolus were used for resource generation and expansion of the livelihood base. The novel technologies developed in the project viz. estrous induction and infertility control technology, low cost mastitis control technology, new rural poultry production technology, banana cultivation technology using bio-enhancer (CSR-BIO), vegetable cultivation using CSR-BIO were the main technological interventions in both the systems. Intercropping with mustard and wheat; pigeon pea and paddy; potato and vegetables varied farmer to farmers. In jersey crosses or in descript cows and murrah buffaloes different parameters were recorded. The lactation yield of cows was 500-600 lit. while in buffaloes it was 400-500 lits. The pooled inter-calving period was 27.8± 0.5 months. Marginal farmers readily adopted (82%) the technologies and harvested its benefits. In contrast farmers with large land holdings were less interested (46% adaption rate). The base line data reported engagements of family labour as 82 man days/per year. In mono-crop practicing farmers, it was 62 man days/yr and in SIFS model: 187 man days/yr (increased). The comparative net returns in all the 3 systems showed significant difference. The average net return in 3 years period in the area of 0.40 ha from traditional farming (control) was Rs. 96,000 whereas in integrated farming system practicing additional ventures of rural poultry and vegetables was Rs. 2,71,000/-. The profitability in specialized integrated farming system was Rs. 6,13,000/- and farmers adapted banana, rural poultry, gladiolus and vegetables. The input cost in subsequent years in traditional farming was more or less constant while it decreased by 25-35% in subsequent years in IFS models and thus especially the SIFS model proves to be profitable in the present scenario of decreased landholding.

INTRODUCTION

The geographical area of India spreads over 329 million hectares which is endowed with a complex diversity of climate and soil; flora and fauna. This offers both blessing as well as challenge for the development of the agricultural sector. The agriculture production in India and developing countries is stagnating and due to lower return and high risk, the investment is declining. Some of the problems identified are: depletion and degradation of natural resources, increasing drain of soil nutrients without replacement, increasing biotic and abiotic stresses, increasing indiscriminate use of systemic pesticides destroying the natural microbes of soil, unavailability of quality germplasms timely and overall unavailability of technical inputs like knowledge for holistic approach. Integrated farming system (IFS) is considered as solution to the problems which is practiced by numerous farmers throughout the globe. The common characteristic of these systems is that they invariably have a combination of crops and livestock enterprises and may include aquaculture and tree also. However, though it provides sustainability, the profitability is low. The attraction of mono-cropping due to higher return is more, if risks are taken care. The decreasing land holding pattern owing to urbanization and population growth made the agriculture activities less profitable and even un-economical (Jackson, 1980; Rodale, 1983; Dover and Talbot, 1987; Jacobson, 1988; Rai *et al*., 2011a,b; Rimal, 2013). Livelihood security is a complex problem and include food and nutritional security, educational security, health security, economical security and overall for its sustenance, environmental security (de Waal, 1993; Ashby, 2001; Galal *et al*., 2010; Rai *et al.*, 2011). Globally, the livestock sector is emerging as one of the most important sub-sector of agriculture in terms of value added component. This fact is reflected in FAO's growing perception. However, the fact should be clearly kept in mind that livestock cannot be a success without the success of crops and integration is the only

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way out. The growing poverty in developing countries, in spite of continuous technological innovations, is indicating towards new way of thinking and approach. Initially it was thought that boost in crop production will eradicate the mal-nutrition and poverty but it failed due to un-equal distribution of land holding (Riebsame *et al*., 1994; Theobald, 2002; Maktav *et al*., 2005). Though livestock, mainly reared by small land holders, having lower Gini Coefficient (the standard measure of equality in income distribution) i.e. around 0.15-0.20 (more equitable distribution), is one of the tool to fight mal-nutrition and poverty, but the system suiting the socio-economic penury is yet be refined. Generally it is thought that integration with crops will reduce the input cost but it alone cannot increase the profitability (Ngambeki *et al*., 1992; Mangala, 2008; Noble and Ruaysoongnern, 2002; Koutsoyiannis, 2004).

In IFS, the practice in vogue is mere integration of various components by which the input cost is reduced but optimum production cannot be assured. In the scenario, an improved IFS was conceptualized, developed, evaluated and named as Specialized Integrated Farming System (SIFS) targeting low input, optimum production and productivity and highest profitability (Rai *et al*., 2011a,b; Sonjoysha *et al*., 1998; Noble, 2009; Damodaran, *et al*., 2010; Ugwumba *et al*., 2010). SIFS has been developed with 4 components viz. base crops, medium duration cash crops, super short/short duration cash crops and value addition. The basal crop, like IFS, provides support to the system and may include cereals, pulses, oilseeds plantation crops, dairies (dung, heifers, urine etc) (Praphan, 2001; Damodaran *et al*., 2010; Rai *et al*., 2011). Medium duration cash crops, like banana, papaya, goat, pig etc. are location specific and as per the liking of farmers (Govereh and Jayne, 2003). Super short/ short duration crops are the key of the system and fully depend on the liking of farmers and include high value floriculture, seasonal as well as off-season vegetables, medicinal and aromatic plants, dairy (milk) and rural poultry (existing or new technologies) etc. This component provides continuous cash flow in short duration (Esslemont and Peeler, 1993; Dalsgaard, and Oficial, 1997; Patterson *et al*., 1998; Agbonlabor *et al*., 2003; Chaudhary, 2007; Verma, 2007; Yusuf and Malomo, 2007). Value addition concept is for both produce and system. Main focus in this component is for the system, which include value added composting, bio-enhancers etc and as a whole organic production system for sustainability. The theme of SIFS is to infuse the latest technological interventions for each component to have optimum production, unlike IFS and decrease the input cost continuously. The energy and nutrient re-cycling is more or less equal to traditional IFS (Dillon and McConnell, 1997; Topp *et al*., 2007; Meul *et al*., 2008; Damodaran *et al*., 2011). In the present study an attempt has been made to evaluate and compare the profitability of IFS and SIFS in the villages using the low input technological interventions.

MATERIALS AND METHODS

The present study was conducted during 2009-2012 in villages of Barabanki and Raebareli districts of Uttar Pradesh, India, in the World Bank Funded National Agricultural Innovation Project (Component-3) of Indian Council of Agricultural Research (ICAR). Out of a total of 5250 families associated in the project, 42 families were selected for evaluation and they practiced traditional IFS or adopted SIFS for their livelihood. The families practicing either mono cropping pattern or traditional farming were taken as control for comparison. The families landholding of 0.4 ha (one acre) was evaluated for input cost, family labour engagements, production and profitability.

Practices of IFS

Out of 42 families for whom data was recorded and evaluated, 24 families followed rice-wheat-oilseeds cropping system, reared cow buffaloes (1-3 Nos.) and vegetables on part of land.

Practices of SIFS

In the study, 18 farmers were included where SIF models were practiced. The constant base crop in the models was rice-wheat-oilseeds-pulses. Among these, 14 farmers opted banana (G-9) as medium duration cash crop in 0.24 ha at 1.8 X 1.8 m spacing. All the farmers had 1-2 cows/buffaloes. Hybrid Napier (CO-3 strain) was grown on available waste/unutilized land as perennial fodder (yield 200-225t/yr in north Indian climate). Out of 18 farmers, 10 adapted new rural poultry production technology using Nirbhik strain of fowl (CARI, Izatnagar), 9 off-season vegetables (tomato, bhindi- ladies finger) and 7 gladiolus as short duration cash crops. Vermi-composting and NADEP composting were adapted for improving the soil health in both the system viz. IFS and SIFS. A bio-enhancer (consortia of microbes) developed in the project (CSR-BIO) was used for basal and seed treatment along with foliar spray in both the system. Rural poultry, off season vegetables and gladiolus was used for resource generation and expansion of the livelihood base.

Technological interventions

The novel technologies developed in the project viz. estrous induction and infertility control technology, low cost mastitis control technology, new rural poultry production technology, banana cultivation technology using CSR-BIO, vegetable cultivation using CSR-BIO were the main technological interventions in both the systems. Thus, each component was optimized for its production.

Comparison of profitability and man power engagement

The family man power engagement was calculated on actual basis recorded by the farmers. Profit was calculated after deducting the external input cost viz. hired labour, seed/planting material, fertilizers, irrigation etc. from the total return and compared in both the system.

RESULTS

The project covered 5250 families during 2009-2012 to enhance the livelihood security through technological interventions. To fill the gaps, various low cost- low input- highly profitable technologies were developed or improved suiting to the socio-economic penury of the farmers. The target group has been landless (about 30% of population), marginal farmers (39%) and small farmers (26%). Out of total farmers, 24 families practicing the integrated farming system were included in the study. Traditional practices for rice and wheat cultivation were practiced. Mustard was used as inter-crop with wheat, while pigeon pea was used as inter-crop with paddy in part of the area. For home consumption in small area potato, vegetables etc. were also grown which varied farmer to farmers. The irrigation was practiced from bore wells. These farmers were reluctant for newer technological interventions. The cows were either of jersey crosses or non-descript while buffaloes were of murrah breed. The lactation yield of cows was 500-600 lit. While in buffaloes it was 400-500 lits. Suckling of calves was practiced till the dam allowed it. The milk yield recorded is actual milk recovered. The dung along with shed bio-mass was used for making compost in open pit system. The pooled inter-calving period was 27.8± 0.5 months. Varietal interventions were practiced by farmers as per the availability. Crop wastes (paddy-wheat straw) were main staple feed for animals which was supplemented with green fodder (berseem) during winter season and bajra etc. during rainy season. The data of 18 farmers who adopted specialized integrated farming system (SIFS) are presented in the Table-1

Technological interventions

The adaption of technologies varied with the status of farmers. Marginal farmers readily adopted (82%) the technologies and harvested its benefits. In contrast farmers with large land holdings were less interested and adaption rate was only up to 46%. The quick

Table 1. Comparison of total return in lakhs (in Indian Rs.) and profitability in various system in 3 years (0.4 ha)

Interventions	Mono-cropping (control)		IFS		SIFS	
Cycle	Input	Return	Input	Return	Input	Return
1.Rice-wheat cycle	0.98±0.03	1.4±0.02	0.71±0.01	1.3±0.01	0.32±0.02	0.67±0.03
2. Banana (14)	-	-	-	-	0.2±0.01	1.1±0.05
3. Rural Poultry (10)	-	-	0.1	0.7± 0.02	0.6±0.01	2.8±0.1
4. Dairy unit	0.4±0.04	1.0±0.04	0.3±0.01	1.6±0.06	0.3±0.01	1.9±0.02
5. Gladiolus (7)	-	-	-	-	0.4±0.02	0.8±0.03
6. Vegetables (9)	-	-	0.1	0.3±0.08	0.3±0.01	1.0±0.06
Total	1.39±0.05	2.35±0.03	1.21±0.02	3.92±0.1	2.13±0.07	8.26±0.2

return from gladiolus and off season vegetables attracted all group of farmers, but rural poultry production, in spite of its higher profitability, attracted landless and marginal farmers, probably due to ethnic reasons. The inter-calving period was drastically reduced from the baseline survey data of 27.8 ±0.5 months to 16.1 months. The CSR-BIO, a consortia of microbes grown in our highly economical developed media increased the nutrient uptake and enhanced the production by 23.6%. All the farmers adopted vermi-composting and NADEP for improved composting and re-cycling of nutrients in the system. The use of chemical pesticides was reduced by over 90% in the area.

Manpower utilization

The base line data reported engagements of family labour as 82 man days/per year. In mono-crop practicing farmers, it was 62 man days/yr. In SIFS model it increased to 187 man days/yr.

Comparison of Profitability

The comparative net returns in all the 3 systems showed significantly difference. The average net return from traditional farming (control) was Rs. 96,000 whereas, in integrated farming system practicing additional ventures of rural poultry and vegetables, was Rs. 2,71,000/- The profitability in specialized integrated farming system was Rs. 6,13,000/- and farmers adapted banana, rural poultry, gladiolus and vegetables. The input cost in traditional farming was more or less constant while it decreased by 25-35% in subsequent years in IFS models. In SIFS models the input cost continuously declined and was only 20% of first year during III year.

DISCUSSION

The agriculture is becoming less attractive and as per the report of National Commission on Agriculture, nearly 70% farmers are practicing it because they do not have any other options. The mechanization has no doubt helped the farmers, but smaller landholdings, decreasing soil fertility and natural vagaries are posing more challenges than solutions (Choosakul, 1999; Zhang *et al*., 2006; http://www.igidr.ac.in). The attraction towards cash crop as mono-crop needs more investment and if due to some reasons, crop fails, the farmers lead towards debt trap. Integrated farming system has been considered as the best option due to sustainability and full engagement of family labour (Akinbode, 1998; Behera and Sharma, 2007; Channabasavanna *et al*., 2009). However, in the scenario of decreasing landholdings, the profitability of the system is low. As observed in the present baseline survey that nearly 30% rural population has become landless and after next 20 years or so, another 20% of marginal farmers will join this group who are nearly 40% of rural population and have less than 1 ha cultivable land. In the scenario only alternative remains that profitability of the system is enhanced so that youth can be attracted towards agricultural activities (Allen *et al*., 2007; Umeh and Odom, 2011; http://www.scizerinm.org/chanarticle.htm). The baseline survey (2009) on annual income of families, excluding outside employment (http://ruralllivelihood-ivri.org/) indicated very pathetic situations in the villages. The average annual family income for landless masses was Rs. 14,875/- whereas, it was Rs. 25,985/- for marginal and Rs. 51,275/- for small farmers, respectively.

In this scenario to face the challenge, SIFS was developed. A series of low input-highly profitable technologies utilizing the local resources and suiting the socio-economic penury were developed and integrated. This has attracted the un-employed youth and the contrast was seen in form of net return. With one acre (0.40 ha) land holdings the net return increased from Rs. 96,000/- in 3 years to above Rs. 60,0000/- The decreasing input cost made farmers more comfortable.

Conclusion

It can thus be concluded that SIFS model is profitable in the present scenario of decreasing landholding especially for the marginal farmers due to reduced input cost in subsequent years of initial investment.

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REFERENCES

Agbonlabor, M.U., Aromolaran, A.B. and Aiboni, V.I. 2003. Sustainable soil management practices in small farms of Southern Nigeria: A poultry-food crop integrated farming approach. J. Sustain. Agr., 22: 51-62.

Akinbode, A. 1998. The conceptual framework for rural development in developing countries. J. Res. Dev., 5(1-2): 8-9.

Allen, V.G., Baker, M.T., Segarra, E. and Brown, C.P. 2007. Integrated irrigated crop livestock systems in dry climates. American Society of agronomy. Agron. J., 99: 346-360.

Ashby, J.A. 2001. Integrating research on food and the environment: An exit strategy from the rational fool syndrome in agricultural science. Ecol. Soc., 5.

Behera, U.K. and Sharma, A.R. 2007. Modern concepts of agriculture farming systems. pp. 1-37.

Channabasavanna, A.S., Biradar, D.P., Prabhudev, K.N. and Hegde, M. 2009. Development of profitable integrated farming system model for small and medium farmers of Tungabhadra project area of Karnataka. Karnataka J. Agric. Sci., 22: 25-27.

Chaudhary, V.K. 2007. Economics, marketing and constraints of milk production in progressive dairy farms. Ind. J.Agric.Econ.,62: 482.

Choosakul, S. 1999. Challenging crisis with sustainable farming. Sustainable resource management project northeast region, Mahasarakham, Thailand.

Dalsgaard, J.P.T., and Oficial, R.T. 1997. A quantitative approach for assessing the productive performance and ecological contribution of smallholder farms. Agr. Syst., 55: 503-533.

Damodaran, T., Rai, R.B., Mishra, V.K., Sharma, D.K., Ram, R.A., Rai, S., and Kumar, H. 2011. Integrated farming system and livelihood security-An Approach. CSSRI-RRS, Lucknow, India.

De Waal, A. 1993. 'War and Famine in Africa'. Institute of Development Studies (IDS) Bullet., 24(4): 33–40.

Dillon, J. and McConnell, D.J. 1997. Farm management for Asia: A systems approach. FAO farm systems management Series 13. FAO, Rome Italy.

Dover, M. and Talbot, L. 1987. To Feed the Earth -- Agro-Ecology for Sustainability in a Changing World Order. World Resources Institute, pp. 122.

Esslemont, R.J. and Peeler, E.J. 1993. The scope for raising margins in dairy herds by improving fertility and health. Br. Vet. J., 149: 537-547.

Galal, O., Corroon, M. and Tirado, C. 2010. Urban environment and health: food security. Asia Pac. J. Pub. Health. 22 (Suppl. 3): 254S-261S.

Govereh, J. and Jayne, T.S. 2003. Cash cropping and food crop productivity: synergies or trade-offs? Agric. Econ., 28(1): 39-50.

http://rurallivelihood-ivri.org/.

http://www.igidr.ac.in.

http://www.scizerinm.org/chanarticle.htm.

Jackson, W. 1980. New Roots for Agriculture. Friends of the Earth, San Francisco, CA, pp. 294.

Jacobson, J.L. 1988. Environmental Refugees Yardstick of Habitability, Worldwatch Paper No. 86. Worldwatch Institute, Washington, DC, pp. 88.

Koutsoyiannis, A. 2004. Theory of econometrics (second edition). PALGRAVE – Replica press.

Maktav, D., Erbek, F.S. and Jürgens, C. 2005. Remote Sensing of Urban Areas. Int. J. Remote Sensing, 26(4): 655-659.

Mangala, B. 2008. Impact of integrated farming system on socio-economic status of bharatiya agroindustries foundation (BAIF) beneficiary farmers. M. Sc. thesis submitted to University of Agricultural Sciences, Dharwad.

Meul, M., Passel, S.V., Nevens, F., Dessein, J., Rogge, E., Mulier, A. and Van Hauwermeiren, A. 2008. MOTIFS: a monitoring tool for integrated farm sustainability. Agron. Sustain. Dev., 28: 321-332.

Ngambeki, D.S., Deuson, R.R. and Preckel, P.V. 1992. Integrating livestock into farming systems in northern Cameroon. Agr. Syst., 38: 319-338.

Noble, A. 2009. Potential role of Integrated Farming Systems (IFS) for Poverty Alleviation in the Mekong Basin: An Assessment of Farmer-based Networks in Promoting IFS, International Water Management Institute (IWMI). pp. 1-22.

Noble, A.D. and Ruaysoongnern, S. 2002. The role of indigenous technology and science in rehabilitating degraded light textured soils using high activity clays and bioremediation. International Water Management Institute (IWMI) and Khon Kaen University (KKU), Thailand.

Patterson, P.H., Lorenz, E.S. and Weaver, W.D. 1998. Litter Production and Nutrients from Commercial Broiler Chickens. J. Appl. Poult. Res., 7: 247-252.

Praphan, N. 2001. Resilient of indigenous knowledge, fight to world crisis. Isan alternative farming network, Ubonratchathani, Thailand.

R.B. Rai, Damodaran, T., Dhama, K., Ram, R.A., Kumar, A., Singh, B., Ali, H. and Rai, S. 2011c. Low input agricultural technologies for better profitability and poverty alleviation. NAIP-3 Project Publication (Technical Bulletin), ICAR, IVRI, Izatnagar (U.P.). pp: 1-32.

Rai, R.B., Damodaran, T. and Rai, S. 2011b. Livestock based specialized integrated farming system for livelihood security and self employment in island eco-system. International conference on "Tropical island eco-system: issues related to livelihood, sustainable development and climate change", March 23-26, held at CARI, Port Blair.

Rai, R.B., Damodaran, T., Dhama, K., Chakraborty, S., Singh, B., Ali, H., Rai, S. and Saminathan, M. 2013. Evaluation studies on tri-sodium citrate based novel formulation for prevention and treatment of bovine mastitis. Int. J. Curr. Res., 5(7): in press.

Rai, R.B., Dhama, K., Damodaran, T., Rai, S., Verma, V., Singh, B. and Ali, H. 2011a. Integrated farming system and livelihood security. Monograph, Indian Veterinary Research Institute, Izatnagar, pp1-30.

Riebsame, W.E., Parton, W.J., Galvin, K.A., Burke, I.C., Bohren, L., Young, R. and Knop, E. 1994. Integrated modeling of land use and cover change. Biosci., 44: 350-356.

Rimal, B. 2013. Urbanization and the decline of agricultural land in Pokhara sub-metroplitan city, Nepal. J. Agri. Sci., 5(1): 54-65.

Rodale, R. 1983. Breaking new ground: the search for sustainable agriculture. Futurist, 17(1): 15-20.

Sonjoysha, H., Sinhababu, D.P., Poonan, A. and Jha, K.P. 1998. Integrated farming systems models for integrated and rain fed lowland small farm of coastal Orissa. First Int. Agron. Cong., India, pp. 415-416.

Theobald, D.M. 2002. Land-use dynamics beyond the American urban fringe. The Geographical Rev., 91(3): 544-564.

Topp, C.F.E., Stockdale, E.A., Watson, C.A. and Rees, R.M. 2007. Estimating resource use efficiencies in organic agriculture: A review of budgeting approaches used. J. Sci. Food Agr., 87: 2782-2790.

Ugwumba, C.O.A., Okoh, R.N., Ike, P.C., Nnabuife, E.L.C. and Orji, E.C. 2010. Integrated farming system and its effect on farm cash income in Awka South agricultural zone of Anambra state, Nigeria. American-Eurasian J. Agric. Environ. Sci., 8(1): 01-06.

Umeh, G.N. and Odom, C.N. 2011. Role and constraints of youth associations in agricultural and rural development: Evidence from Aguata L.G.A of Anambra state, Nigeria. World J. Agric. Sci., 7(5): 515-519.

Verma, A.R. 2007. Economics of production, marketing and constraints of buffalo milk in Indore district of Madhya Pradesh. Indian J. Agric. Econ., 62: 452.

Yusuf, S.A. and Malomo, O. 2007. Technical efficiency of poultry egg production in Orgun state: A data envelopment analysis (DEA) approach. Int. J. Poultry Sci., 6(9): 622-629.

Zhang, W.J., Qi, Y.H. and Zhang, Z.G. 2006. A long-term forecast analysis on worldwide land uses. Environ. Monitoring and Assessment, 119: 609-620

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