

Study on Role of Integrated Farming Systems
on
Doubling of Farmers' Income in Rajnandgaon
District of Chhattisgarh



By

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“Shaping Minds to Excel”

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Foreword

Agriculture is the major source of livelihood for small and marginal farmers in the country. As Indian agriculture is predominantly dependent up on the monsoon, farmers adopt rice based cropping patterns in Kharif along with other crops like maize, minor millets, different pulses, oil seeds, cotton, etc. In the years when the monsoon is bountiful, and soil moisture is good, some farmers take the Rabi crop. There are very few farmers who have assured access to irrigation and can take the summer crop.

The fragmentation of land holdings has caused an acute shortage of green fodder thereby adversely affecting livestock and dairy farming. The rural areas are facing food and livelihood crisis, more specifically the shortage of fodder and drinking water. The declining size of landholdings without any alternative income augmenting opportunity is resulting in fall of farm income, and causing agrarian distress. A large number of smallholders have to migrate to urban areas or shift to non-farm activities to augment their incomes. Some farmers are so distressed that they take the extreme step of committing suicide.

The Government of India has set for itself a goal of doubling farmers' income by 2022 through a six point strategy. One of the options to double farmer income and mitigate risk is the adoption of Integrated Farming Systems (IFS).

The IFS is a dynamic, gender sensitive, socially responsible, environmentally sustainable, location specific, farmer oriented and holistic approach, requiring effective farmers' participation to solve problems through diversified farming enterprises to avoid risks due to environmental constraints.

Implementation of IFS would ensure minimization of risk, recycling of wastes and residues, integration of two or more enterprises, optimum utilization of all resources, maximization of productivity and profitability, maintenance of ecological balance, generation of employment, increased input use efficiency and use of end products from one enterprise as input in other enterprise. It has been seen that farmers who practice IFS have significantly higher net income and are also protected from risks on account of crop failure to a larger extent than those who do not practice it.

Based on a Study on Role of Integrated Farming Systems on Doubling of Farmers' Income in Rajnandgaon district of Chhattisgarh conducted by NBSC, this report has come out with three bankable models on IFS that can be implemented in Chhattisgarh. The report has also made recommendations on the need for encouraging farmers to take up IFS, Government to consider providing subsidy for IFS, generate awareness amongst bankers, agricultural scientists, as well as farmers, to promote financing of IFS and increase the availability of credit for IFS.

We hope that the study is of use to various stakeholders in Chhattisgarh. We also hope that similar studies be undertaken by other Regional Offices of NABARD so that bankable models suitable to other Agro-climatic zones are developed and publicized.

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Principal and CGM
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Disclaimer

This Study Report has been prepared by Shri S K Jahagirdar and Shri Subrat Kumar Nanda, Faculty Members, National Bank Staff College (NBSC), Lucknow based on the field study conducted by them from 27 February to 3rd March 2017 in Rajnandgaon district of Chattisgarh. The views expressed in the report are that of the authors. It does not necessarily represent or reflect the policy or view of National Bank Staff College (NBSC) or National Bank for Agriculture & Rural Development (NABARD). NBSC and NABARD accept no financial liability or any other liability whatsoever to anyone using this report as also for the accuracy of facts and figures quoted in the report.

Executive Summary

The pressure on Indian agriculture to provide food and nutritional security for its burgeoning population is becoming a daunting task in a scenario of plateauing genetic potential in all major crops and declining productivity of rain fed areas. The fragmentation of land holdings has also caused an acute shortage of green fodder thereby adversely affecting livestock and dairy farming. The rural areas are facing food and livelihood crisis, more specifically the shortage of fodder and drinking water. The declining size of landholdings without any alternative income augmenting opportunity is resulting in fall of farm income, and causing agrarian distress. A large number of smallholders are compelled to migrate to urban areas or shift to non-farm activities to augment their incomes.

The Government of India has set for itself a goal of doubling farmers' income by 2022 through a six point strategy. One of the options to double farmer income and mitigate risk is the adoption of Integrated Farming Systems (IFS). The principal components of IFS include soil health care, water harvesting and management, crop and pest management energy management, post-harvest management, choice of crops, farm animals and other components of the farming and information, skill, organization and management.

Sustainability is the objective of the IFS where production process optimized through efficient utilization of inputs without infringing up on the quality environment with which it interacts on the one hand and attempt to meet the national goalson the other. The advantages of IFS include pooling and sharing of resources or inputs, efficient use of family labour, conservation, preservation and utilization of farm biomass includingnonconventional feed and fodder resources, effective use of manure, animal waste, regulation of soil fertility and health, income and employment generation for many people and increased economic resources. The IFS is part of the strategy to ensure sustainable use of the natural resources for the benefit of present and future generations.

The IFS is a dynamic, gender sensitive, socially responsible, environmentally sustainable, location specific, farmer oriented and holistic approach, requiring effective farmers' participation to solve problems through diversified farming enterprises to avoid risks due to environmental constraints.

Implementation of IFS would ensure minimization of risk, recycling of wastes and residues, integration of two or more enterprises, optimum utilization of all resources, maximization of productivity and profitability, maintenance of ecological balance, generation of employment, increased input use efficiency and use of end products from one enterprise as input in other enterprise.

The practice of IFS has a positive impact on productivity by providing an opportunity to increase economic yield per unit area per unit time by virtue of intensification of crop and allied enterprises. Besides, it increases profitability by making use of

produce or waste material of one enterprise as an input in another enterprise at low or no cost. Thus, by reducing the cost of production the profitability and benefit cost ratio works out to be high.

Further, IFS results in improved soil health, availability of balanced nutrition for the farmers family, while ensuring environmental sustainability, all round year cash flow, savings in use of energy, while meeting the farmers needs for fodder, timber, while at the same time reducing deforestation, and preserving the natural ecosystem.

The IFS has the potential to give a boost to employment generation by facilitating establishment of downstream farm enterprises such as livestock, allied enterprises, food and agro-processing, etc.

Keeping in view the GoI's goal of doubling farmers' income by 2022, it is seen that in the case of farmers practicing IFS, the net annual income is significantly higher by at least 15 times as compared to farmers undertaking mono-crop cultivation of paddy.

One of the options to double farmer income and mitigate risk is the adoption of Integrated Farming Systems. Integrated farming system or integrated agriculture 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, crop production, fish, horticulture, apiary, sericulture, fungiculture, lac culture, and such other related activities may sometimes be known as integrated bio-systems. In this system an inter-related set of enterprises is used so that the "waste" from one component becomes an input for another part of the system, which reduces cost and improves production and or income. IFS ensure that wastes from one form of agriculture becomes 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 principal components of Intensive Integrated Farming Systems (IIFS) has seven pillars, which include, soil health care, water harvesting and management, crop and pest management energy management, post-harvest management, choice of crops, farm animals and other components of farming like information, skill, organization and management empowerment.

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. IFS is part of a strategy to ensure sustainable use of the natural resources for the benefit of present and future generations.

It was in this context that a Study was undertaken in Chhurriya block of Rajnandgaon district in Chhattisgarh state to study the IFS models being implemented by the farmers so that the same could be promoted for being replicated

with suitable modifications to suit the specific agro-climatic conditions prevailing in different districts of the country. The objectives of the Study were:

- i. Documentation of a few integrated farming models being practiced for feasibility of replicating them.
- ii. Identify socio-economic reasons for other farmers not adopting the IFS models practiced in the area.
- iii. Undertake a cost-benefit analysis of the models and suggest one or two models best suited for the area with the aim of doubling farmer income.
- iv. Identify core activities integral to the success of integrated farming system.
- v. Spell out steps necessary for popularisation of various integrated farming systems across the country for enhancing farmers' income.

The Study was conducted using interview method for data collection from the respondent farmers. A sample of farmers who were reluctant to adopt IFS despite being aware of the benefits, etc., were also contacted to understand the reasons for their reluctance.

The study team visited 22 farmers undertaking different types of integrated farming and also got administered questionnaire through field level workers to obtain feedback from other farmers both practicing IFS and those who were not (control farmers). The predominant models of integration practised by the farmers were as under:

- i. Cultivation of paddy in Kharif season, followed up by raising of vegetables in winter and summer season
- ii. Cultivation of paddy in Kharif season with livestock rearing throughout the year
- iii. Cultivation of paddy in Kharif season along with livestock rearing, fish farming and cultivation of vegetable in winter & summer seasons
- iv. Cultivation of paddy in both Kharif&Rabi seasons, with livestock and fish farming as supplementary activities

The study observed extremely successful examples of progressive farmers who had adopted IFS and increased their production and productivity significantly. There were farmers who had reduced the area under paddy and commensurately increased that under vegetables. They were growing paddy only to meet the food requirements of their family. This was despite the fact that Chattisgarh state has a sound system of providing Minimum Support Price (MSP) for paddy. There were a large number of farmers who were cultivating paddy twice or even three times a year. Some of these had a dairy or allied enterprise as well. Farmers, undertaking allied activities, along with cultivation of paddy, had been earning much better returns.

The farmers who were reluctant to practice IFS despite having access to irrigation, good fertile farm land, other resources and being aware of the benefits of IFS indicated that they have been traditionally cultivating paddy in Kharif season and

keeping the field fallow for the rest of the year and in the years when there was bountiful monsoon, they took up cultivation of a small portion of their field to grow a Rabi crop.

The farmers cited certain reasons for taking up single crop in a year and not being inclined to take up double cropping or integrated farming system, some of which are given below:

- i. Lack of own resources for initial capital investment and psychological barrier among farmers for approaching banks for credit (especially term credit) and simultaneous unenthusiastic attitude of bankers towards the farming community.
- ii. Un-availability of clear title of land with the cultivator, un-availability of labour on hire due to social security programmes of government, un-availability of family labour due to unwillingness of younger members of the family to continue with agriculture beyond sustenance level and concurrent fatigue amongst the older generation towards farming, un-availability of assured irrigation, prevalent practice of open grazing, etc.
- iii. Lack of awareness of various governmental development schemes, etc.

Instances of few farmers who had practiced IFS but had discontinued the same were also observed during the study. One farmer indicated that his own ill health and un-willingness of his sons to carry forward the activity was the major contributory factor.

The study team also observed that the net income of farmers cultivating only single paddy crop in a year from an acre of paddy field ranged from Rs. 12,000 to Rs. 16,500 while that of farmers undertaking cultivation of paddy in two seasons was in the range of Rs. 22,000 to Rs. 26,500 per acre. As compared to these farmers, the net income of farmers undertaking IFS, was significantly higher by at least 15 times.

The study has prepared farm models of three integrated farming systems which can be popularised in the 11 districts belonging to AEZ-VII of Chhattisgarh State, which are:

Farm Model I: Paddy + Small dairy + Vermi-compost + Hydroponics + Vegetable with drip irrigation + Fish farming

In this model, a farmer with total landholding of 2.5 acres takes up paddy cultivation in 1.0 acre in Kharif season, dairy farming in 0.2 acres, farm pond in 0.25 acres and vegetable cultivation throughout the year in the remaining. He also undertakes hydroponics to provide green fodder for rearing livestock and vermi-composting to provide low cost manure, improve soil health condition and to reduce cost of cultivation. The total capital cost is estimated to be about Rs. 4.68 lakh and recurring cost Rs. 2.92 lakh. The total net income from all activities would be in the range of Rs. 3.57 lakh to Rs. 3.89 lakh per annum. The project would give an IRR of 350%.

The bank loan (75% of project cost) can be repaid in 3 years with one year moratorium period.

Farm Model II: Paddy + Small dairy + Vermi-compost+ Hydroponics + Papaya +Vegetable (both with drip irrigation) + fish farming

In this model, a farmer with total land holding of 2.5 acres takes up paddy cultivation in 1.0 acre in Kharif season, dairy farming in 0.2 acres, farmpond in 0.25 acres, papaya in 0.5 acres and vegetable cultivation in the remaining throughout the year. He also undertakes hydroponics to provide green fodder for rearing livestock and vermi-composting to provide low cost manure, improve soil health condition and to reduce cost of cultivation. The total capital cost is estimated to be about Rs. 6.06 lakh and recurring cost of Rs. 2.92 lakh. The total net income from all activities would be in the range of Rs. 5.01 lakh to Rs. 5.52 lakh per annum. The project would give an IRR of 526%. The bank loan (75% of project cost) can be repaid in 3 years with one year moratorium period.

Farm Model III: Paddy + Small dairy + Vermi-compost+ Hydroponics + Papaya + vegetable (both with drip irrigation) + Fish farming+ Poultry farming

In this model, a farmer with total land holding of 2.5 acres takes up with paddy cultivation in only 0.5 acre in Kharif season, dairy farming in 0.2 acres, fish farming in 0.25 acres, papaya cultivation in 0.5 acres, broiler poultry in 0.5 acres and in the remaining area, vegetable cultivation throughout the year. He also undertakes hydroponics to provide green fodder for rearing livestock and vermi-composting to provide low cost manure, improve soil health condition and to reduce cost of cultivation. The total capital cost is estimated to be about Rs. 6.67 lakh and recurring cost of Rs. 4.45 lakh. The total net income from all activities would be in the range of Rs. 5.01 lakh to Rs. 5.52 lakh per annum. The project would give an IRR of 331%. The bank loan (75% of project cost) can be repaid in 3 years with one year moratorium period.

In all the three model projects, wire mesh fencing has been included as an integral component so as to enable the farmer to protect the field from stray grazing animals and undertake cultivation of fruits and vegetables during Rabi and or summer seasons. In models II and III, as commercial crops are also to be taken up, a bore well has been included to cover a command area of about 2.5 acres.

The Study has come out with the following recommendations:

- i. The practice of IFS models requires undertaking various interlinked activities mostly on a scale much less than that presently advocated by planners and agricultural scientists. Consequently, although subsidies are available for most of these activities, the farmer practicing IFS is not able to access these as he is not undertaking the activity on a scale envisaged in the guidelines of the scheme drafted for the same. Further, it is not possible for a farmer,

undertaking integrated farming to move around various departments scouting for activity based subsidy. It is recommended that the government may consider providing subsidy for IFS models in a holistic way through a single window approach.

- ii. The activities under IFS are multiple and most bank branch managers are unable to visualize a project with multiple activities undertaken on a small scale. Consequently bank finance is unavailable in most instances for farmers undertaking IFS. Even the KCC limit is very miniscule as the traditional crop cultivation is undertaken by the farmer on a small patch of land, generally about 1 to 2.5 acres. It is, therefore, recommended that bankable IFS models may be developed by each state and provided to the banks for financing. These bankable models may be prepared by NABARD ROs taking in to account the state, region and the agro-climatic zone.
- iii. There are certain key or critical components necessary for increasing farmer's income and bringing stability to agricultural operations. The key components like livestock farming, vegetable cultivation, farm pond, hydroponics, vermi-composting, bio-pesticides, etc., have been covered in detail in the report. It is recommended that these key components should be integrated across all the models so that the farmers are able to have a steady and sustainable source of income.
- iv. Similarly, since IFS involves undertaking agriculture operations all through the year, there is a critical need to ensure that stray grazing and wild animals are not able to enter the farm. Hence there is a need to provide for fencing the plot of land preferably with barbed wire fencing.
- v. The IFS models should also promote the use of water saving devices like drip and sprinkler irrigation. It should also lay emphasis on creation of community based bore well or open well and also water budgeting through formation of water user groups, etc.
- vi. Since IFS is undertaken by the small and marginal farmers, the bankable models would require funding support. It is suggested that a dedicated subsidy fund for popularizing IFS through bank credit may be established in NABARD, which will take upon itself the task of popularizing IFS models and purveying the subsidy.
- vii. A review mechanism may be established to monitor the progress of the credit linked IFS. At the national level, NABARD may be made the nodal department with participation from all the concerned departments like rural development, agriculture, fisheries, animal husbandry, etc., with a similar mechanism being established at the state level. At the district level, the DLCC/ DCC may constitute a sub-committee chaired by the District Collector with participation from the concerned departments and leading banks in the district. The committee will also scrutinize applications received for grant of subsidy.

I. Introduction

Indian agriculture has the responsibility of providing food and nutritional security to its teeming millions in a scenario of plateauing genetic potential in all major crops and declining productivity of rain fed areas. A mismatch between the national food grain production and requirement has already crept into the system, which is further widening. The population of India has increased to 1210.2 million at an annual growth rate of 1.76 per cent in 2011 over 2001 (1028.7 million) and is estimated to increase further to 1530 million by 2030 (Census of India, 2011). On the other hand, the national food grain production for the past 3-4 years is hovering around 234 to 250 million tons. This means that the per capita food grain production is only about 193 kg per year. Simultaneously, the demand for high-value commodities such as fruits, vegetables, livestock products, fish, poultry etc., is increasing faster than that for food grains. At present, more than 20 million ha area is reported to be under horticultural crops with a total production of 207 million tons, of which major contribution comes from vegetables (30.7%) and fruits (60.8%). The fruits are grown in approximately 5.78 million ha with a production level of 63.50 million tons. Likewise, total production of vegetables is about 125.90 million tons which comes from an area of 7.80 million ha. Of the total vegetable production, more than 65 per cent comes from potato, tomato, onion, brinjal, okra, cabbage and cauliflower.

Livestock has traditionally been an integral part of farmers' household, as it plays an important role not only in the farm production but also in augmenting rural economy and in recycling of farm wastes. It is a major source of supplementing family incomes and generating gainful employment in the rural sector, particularly among the landless labourers, small and marginal farmers and farm women. India's current livestock population is 510.6 million (with 191.2 million cattle and 102.4 million buffalo) and their contribution accounts for 26% of the agricultural GDP and has close links with crop production. Estimates indicate that milk production will also increase substantially, from present 108.5 million tonnes to 175 million tonnes by 2030 (Indian Livestock Census, 2003). However, the situation with respect to feed and fodder availability may further worsen, which is already facing a shortfall of concentrate (63%), green fodder (62%) and dry fodder (22%). The poultry, 571.1 million in number, produces about 55.64 billion eggs and 1401 thousand tons of meat, and contributes approximately Rs.220 billion to our GNP and also supports the livelihood of about 2 million people. The present production of beef, buffalo meat, sheep meat, goat meat, pork and poultry meat is 1462, 1443, 232, 470, 612 and 1401 thousand ton as against a demand of 1460, 3250, 600, 850, 770 and 3930 thousand tons, respectively. During 2008-09, the total fish production was around 7.64 million tons with inland and marine fisheries contributing 61.0 and 39.0 percent, respectively. (Source: Directorate of Extension Services, IGKV, Raipur)

National scenario with respect to farm size is also not very promising and conducive to desired agricultural growth. The average size of the landholding has declined to 1.21 ha during 2009-10 from 2.30 ha in 1970-71, and absolute number of operational holding increased from 70 million to 121 million. If this trend continues, the average size of holding in India would be mere 0.68 ha in 2020, and would be further reduced to a low of 0.32 ha in 2030 (Agricultural Statistics at a Glance, 2009). This is a very complex and serious problem when share of agriculture in gross domestic product is declining; average size of landholding is contracting (also fragmenting) and number of operational holdings is increasing. Declining size of landholdings without any alternative income augmenting opportunity is resulting in fall of farm income, and causing agrarian distress. A large number of smallholders have to move to non-farm activities to augment their incomes (NCAER 2009). Research efforts so far have paid dividends, but mainly through medium and large farm holders. However, under the changing scenario, a paradigm shift in research is inevitable with more focus towards small and marginal landholders in farming system perspective.

Doubling of farmer income and Integrated farming Systems

Indian agriculture is passing through difficult times due to two consecutive drought situations in 2012-13 and 2013-14 in several parts of the country, thereby resulting in wide spread distress among farmers. The rural areas in these parts are facing food and livelihood crisis, more specifically, the shortage of fodder and drinking water. Government needs to proactively address the situation and make more long term farmers centric policies related to irrigation, farm diversification, farm profitability and community support programs so as to socially and economically empower farmers. It is important to measure agricultural progress by real income of farmers and not by gross production of agricultural commodities. It was in this context that the Finance Minister in his Budget 2016 speech mentioned about doubling farm incomes. Later the Prime Minister of India gave a call to the nation for doubling farm incomes by 2022 by spelling out a multi-pronged strategy, namely:

- i. Big focus on irrigation with large budgets, with the aim of "per drop, more crop."*
- ii. Provision of quality seeds and nutrients based on soil health of each field.*
- iii. Large investments in warehousing and cold chains to prevent post-harvest crop losses.*
- iv. Promotion of value addition through food processing.*
- v. Creation of a national farm market, removing distortions and e-platform across 585 stations.*
- vi. Introduction of a new crop insurance scheme to mitigate risks at affordable cost.*
- vii. Promotion of ancillary activities like poultry, beekeeping and fisheries.*

One of the options to double farmer income and mitigate risk is the adoption of Integrated Farming Systems (IFS). IFS or integrated agriculture is a commonly and broadly used word to explain a more integrated approach to farming as compared to mono-culture approaches. It refers to agricultural systems that integrate livestock, crop production, fish, horticulture, apiary, sericulture, fungiculture, lac culture, and such other related activities may sometimes be known as integrated bio-systems. In this system an inter-related set of enterprises is used so that the "waste" from one component becomes an input for another part of the system, which reduces cost, improves production and income. IFS ensure that wastes from one form of agriculture becomes resource for another form. Since it utilizes waste as resources, we not only eliminate waste but we also ensure overall increase in productivity for the whole agricultural system. We avoid the environmental impact caused by waste from intensive activities such as pig farming.

In IFS approach, all the components and activities that affect each other are linked. It is not sensible to look at one component by itself without recognizing how it will affect other parts of the system, what it does and what happens to it. In conventional agriculture, management practices are usually formulated for individual crop.

IFS is a complex inter-related matrix of soil, plants, animals, implements, power, labour, capital and other inputs controlled in part by farm families and influenced by varying degrees of political, economic, institutional and social forces that operate at many levels. In other words, IFS is defined as unique and reasonably stable arrangement of farm enterprises that the household manages according to its physical, biological, economic and socio-cultural environment in accordance with the household's goals, preferences and resources. Conceptually, it refers to a set of elements or components that are interrelated and which interact among themselves. At the center of the interaction is the farmer exercising control and choice regarding the type and result of interaction. It is a resource management strategy to achieve economic and sustained production to meet diverse requirement of farm household while preserving resource base and maintaining a high level of environmental quality. For example it represents integration of farm enterprises such as cropping systems, animal husbandry, fisheries, forestry, sericulture, poultry, etc., for optimal utilization of resources bringing prosperity to the farmer. The farm products other than the economic products, for which the crops are grown, can be better utilized for productive purposes in the farming systems approach.

The IFS has seven principal components or pillars, which include, soil health care, water harvesting and management, crop and pest management energy management, post-harvest management, choice of crops, farm animals and other components of farming like information, skill, organization and management empowerment.

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 concepts associated with IFS are practised by numerous farmers throughout the world. A common characteristic of these systems is that they have a combination of crop and livestock enterprises and in some cases may include combinations of aquaculture and trees. The IFS is part of the strategy to ensure sustainable use of the natural resources for the benefit of present and future generations.

Traditional Rice Farming in Chhattisgarh

In Chhattisgarh, traditionally rice and rice based farming systems are practised. Rice is grown both in upland and lowland under irrigated and rain-fed conditions. The major crop, namely, rice is rain-fed and depends on rainfall for supply of water, which is uncertain and erratic in the region. Although, the region receives abundant rainfall, drought is also known to occur in some years. The amount of rainfall is sufficient for good rice crop as well as post rice crop but distribution of rainfall is erratic. Increased moisture losses from field after monsoon and in-efficient utilization of rainwater in rice fields are the major factors for unreliability and shortage of water for rice based cropping systems. In Chhattisgarh, majority of farm families rear animals along with rice farming but these animals are unproductive owing to poor breed, poor draft power, low milk yield as well as non-availability of fodder. Fish is reared by the farmers in Chhattisgarh in ditches and ponds in addition to rice. Crops like green gram (moong), black gram (urad), pigeon pea are grown in upland areas whereas some vegetables are also being taken by farmers where water is available for irrigation. A majority of farmers are adopting varieties of crops with low input requirements, resulting in poor productivity and low income.

Integration is the need of the hour to have sustainability of a farming system but farmers are largely not aware of the same. Those farmers who are aware are not adopting integration owing to resource constraints and low risk bearing capacity. Farmers are engaged for four months in rice farming and thereafter majority of farmers have no on-farm employment opportunities. It is estimated that the rice fallow area in the country is almost equal to the net sown area of Punjab, Haryana, and Western Uttar Pradesh, and of this 82% lies in the Eastern Region (Assam, Bihar, Chattisgarh, Jharkhand, Madhya Pradesh, Odisha and West Bengal). If this area is brought under cultivation, it may usher in another green revolution in the country benefitting millions of poor, deprived and small landholders. These fallow lands represent diverse soil types and climatic conditions suitable for legumes like soybean, green gram, black gram, pigeon pea, groundnut, chickpea, lentil, lathyrus, field pea, faba bean, besides vegetables and flowers.

Dimensions of Modern Farming System Approach

Better income and employment opportunities round the year and sustainability are the new dimensions of farming systems. Awareness, social acceptability, risk bearing capacity, availability of capital for establishment of a system, feed, fodder, and market are the major issues of the new farming systems for adoption. The systems'

sustainability is under question in rainfed rice growing areas owing to flood and droughts. Droughts are more common in the region and occur with moderate to severe intensity once in three to four years. Although the output under IFS will also be adversely affected during drought years, it will certainly be better than that under the traditional systems. In this document, a few selected farming systems suitable for different situations are discussed.

II. Objectives of Study and Methodology

The objectives of the study were:

- i. Document a few integrated farming models being practised and examine the feasibility of replicating them.
- ii. Identify socio-economic reasons for other farmers not adopting the IFS models practiced in the area.
- iii. Undertake a cost-benefit analysis of the models and suggest one or two models best suited for the area with the aim of doubling farmer income.
- iv. Identify core activities integral to the success of integrated farming system.
- v. Spell out steps necessary for popularisation of various integrated farming systems across the country for enhancing farmers' income.

Selection of the study area

The farmers' in backward areas are most often bereft of opportunities, access to credit, information on modern agronomic practices and technologies resulting in their being economically and socially backward.

The Rajnandgaon district of Chattisgarh is a Left Wing Extremism (LWE) affected district that is predominantly tribal, socially and economically backward, with a large number of small landholdings, with poor resource base. The agriculture is predominantly rainfed, with only 23% of the land being irrigated. The soil health is also poor. The district has an average rainfall of 1100 mm and a cropping intensity of 127% with paddy, millets, soya bean and gram being the major crops and vegetables and fruits covering only a miniscule portion of the area. Climate change is also adversely affecting the environment.

Rajnandgaon was therefore selected as a representation of the backward districts of the country to study the IFS models being implemented by the farmers so that the same could be promoted for being replicated with suitable modifications to suit the specific agro-climatic conditions prevailing in different districts of the country.

Methodology

The study was undertaken in Chhurriya block of Rajnandgaon district of Chhattisgarh State from 27th February to 3rd March 2017. A total of 122 farmers who had adopted the Integrated Farming Systems (IFS) and were practising various models were purposively selected from amongst the farmers in the area from 15 villages.

For the present study, interview schedule was found to be the most convenient method for data collection from the respondent farmers.

A questionnaire was prepared to elicit responses from the identified farmers on these parameters encompassing both social and economic aspects to determine the models

that were most popular in the area. A copy of the Questionnaire is given in Appendix-I.

Information was gathered from randomly selected farmer respondents by personal interview on details of land holding, herd size and kind of livestock, family size, availability of family and hired labour, age, education, farming experience, source of information, economic motivation, innovativeness and risk orientation along with economic aspects such as expenditure for crop farming, livestock and allied enterprises, annual income from the various activities being undertaken by the farmer.

A sample of farmers who were reluctant to adopt IFS despite being aware of the benefits - in terms of increased income, better agronomic practice to maintain soil health, having access to assured irrigation, and knowledge of optimization of use of natural resources, etc., were also contacted to understand the reasons for their reluctance.

To calculate the net margin, various cost concepts used for the activities undertaken, such as crop farming, livestock, fisheries, etc., were as follows:

- Crop farming- Paid out expenses like hired labour, cost of intercultural operations, cost of seed, manure, fertilizers, irrigation, plant protection, etc. and computed value of family labour
- Livestock farming- Paid out expenses like feed cost, hired labour, medicines, computed value of family labour, etc.
- Fisheries- Paid out expenses like feed cost, hired labour, medicines, cost of fingerlings, computed value of family labour, etc.
- Poultry- Paid out expenses like feed cost, hired labour, medicines, cost of day old chicks, computed value of family labour, etc.

The Krishi Vigyan Kendra, College of Agriculture, and the College of Horticulture at Rajnandgaon were also contacted to understand the extension activities being undertaken by these institutions and also elicit the views of the concerned personnel regarding the status of the adoption of IFS by the farmer community in the district.

A visit was also made to the farm of Shri Mohammed Yunus Khan, a progressive farmer of Devgawa village, Umaria district, Madhya Pradesh to study the IFS practices he has been undertaking over the past 20 years.

The major IFS models studied were as follows:

- i. Agriculture, Dairy
- ii. Agriculture, Poultry
- iii. Agriculture, Dairying, Vegetable cultivation
- iv. Agriculture, Fisheries, Dairy, Vegetable Cultivation
- v. Agriculture, Goat rearing, Poultry

III. Field Observations (farmers undertaking IFS)

Chhurriya is a block in Rajnandgaon district of Chhattisgarh state. It is located 49 km towards the West from the district head quarter and 123 km from Raipur, the state capital towards the East. There are 208 villages in the block. Out of 208 villages, 135 villages are in the plains, having sandy loam soil and the other part of the block mostly belongs to limestone belt. The major crop is paddy. The block does not come under the command area of any major or medium irrigation project. The average annual rainfall is 875 mm. Progressive farmers mostly have bore-wells for irrigating the Rabi and summer crops.

The study team visited 22 farmers undertaking different types of integrated farming and also got administered questionnaire through field level workers to obtain feedback from other farmers both practising IFS and those who were not doing so, i.e., control farmers. The list of farmers visited is given at Appendix I. The predominant models of integration practised by the farmers were as under:

- i. Cultivation of paddy in Kharif season, followed up by raising of vegetables in winter and summer season
- ii. Cultivation of paddy in Kharif season with livestock rearing throughout the year
- iii. Cultivation of paddy in Kharif season along with livestock rearing, fish farming and cultivation of vegetable in winter and summer seasons
- iv. Cultivation of paddy in both Kharif and Rabi seasons, with livestock and fish farming as supplementary activities

Out of the 22 farmers visited, there were farmers who have put in place the integrated farming system in right earnest and were successful to a great extent. The study team also came across a few farmers who had experienced not so much success. Accordingly, the 22 farmers have been categorised into successful cases and not so successful cases. The details of activity undertaken by each farmer household undertaking IFS, their income & expenditure position, reasons for success or failure, are given in the following paragraphs.

Successful Cases

1. **Shri Suresh Kumar Yadav:** Shri Yadav, aged about 47 years, belongs to Dumardihi village of Chhurriya block of Rajnandgaon district. His family has 7 members. He owns 5.5 acres of land, all of which is irrigated by bore well. He is undertaking cultivation of paddy, both in Kharif & Rabi season, with dairy as add-on activity. He cultivates paddy in the entire 5.5 acre in Kharif and 4 acres in Rabi season. He has also established a vermi-composting unit. The field is neatly protected with wire mesh fencing. He also owns 10 Sahiwal cows. The average annual paddy yield is 20 quintals/ acre and total net annual income from paddy is Rs. 1,18,000. Dairying gives him an annual net profit of Rs. 2,80,000 through sale

of milk & surplus manure. He applies vermi-compost to his field and this has helped him in reducing the consumption of chemical fertilisers. He produces his own bio-pesticides (AmritJal). He is also keen in expanding the scope of integrated farming by excavating a fish pond. The farmer has not availed any farm loan from any financial institution.



(Shri Suresh Yadav in his lush green paddy field)

The annual income-expenditure position of the family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	2,60,000
Income from allied activities	4,38,000
Income from off-farmactivities	0.00
Total income of family	6,98,000
Expenditure on agriculture (paddy)	1,25,000
Expenditure on allied activities	2,19,000
Household expenditure	1,26,000
Total expenditure of family	4,70,000
Net income of the family	2,28,000
Net income/acre of land	24,000
Net income/member of HH	32,570

Shri Suresh Kumar Yadav is in a position to earn a net income of Rs. 41,454 for every acre of land because of integrated farming. His net income would have reduced to Rs. 25,270 had he gone in for only paddy cultivation. Shri Yadav mentioned that dairy farming has helped him to apply vermi-compost in the field and concomitant reduction of usage of chemical fertilisers.

2. **Shri Jagatram Uike:** Shri Uike belongs to Joba village of Chhurriya block of Rajnandgaon district. There are 8 members in his family. His family owns 13 acres of agricultural land. He has been supported under NABARD's wadi project, wherein he has planted mango and lemon in two acres of land. However, the growth of the plants is not very encouraging although they are four year old as the maintenance is poor. He says, it is because of the lack of water source. Recently, he has installed a bore well in his farm to take care of both orchards and agricultural fields. Being a progressive farmer, he has taken up cultivation of paddy in 9 acres and vegetable farming (through-out the year) in 4 acres. As a part of integrated farming system, he is rearing 10 cross bred cows. Shri Uike is preparing "Amrit Jal". It is a liquid organic fertiliser which enriches the nutrient level of soil. It is prepared by mixing one kg of cow dung, one litre of cow urine, 50 gm of black jaggery and 10 litres of water. The mixture is then allowed to ferment for about a month after which it is filtered, suitably diluted and used as a spray. Shri Uike and other farmers in the village, are applying Amrit Jal in their agriculture fields and they all are extremely happy and excited with the results. The use of chemical fertiliser has reduced to only one-tenth of its earlier application and even pesticide use has come down considerably. This apart, Shri Uike has constructed a 0.75 acre fish pond two years back and is getting good returns. He is using the cow dung and vegetable waste from his dairying and agricultural operations as feed in the fish pond, which is increasing the growth and yield of the fish. He also intends to dry out the fish pond next year and apply the pond silt in his agriculture field, thereby improving soil fertility.



(Shri Uike by the side of fish pond and with his cow)



(Shri Uike with his bio-pesticide tank)**(Shri Uike in his farm)**

Shri Uike has demonstrated to other traditional farmers, how integration of various sub-systems of farming, can enhance farmer income. During 2015-16, he earned a net profit of Rs. 5.60 lakh from 4 acres of vegetable farming, and Rs. 0.60 lakh from fish farming. Notably, his cost of cultivation for paddy has come down from Rs.13,000 per acre to Rs. 8,000 per acre, due to the use of Amrit jal. He claims that the paddy yield has increased from 20 quintals per acre to 25 quintals per acre on account of applying Amrit jal.

Being the President of the Adivasi Dharohar Farmers' Producer Company Ltd., Bhejra Tola, Rajnandgaon, he along with other members, has started promoting organic and integrated farming methods amongst other traditional farmers in the area. They have purchased a combine harvester to help in the timely harvest of matured crops since labour is in short supply.

The annual income-expenditure position of the family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	5,35,000
Income from allied activities	12,60,000
Income from off-farm activities	0.00
Total income of family	17,95,000
Expenditure on agriculture (paddy)	2,36,000
Expenditure on allied activities	7,00,000
Household expenditure	1,75,000
Total expenditure of family	11,11,000
Net income of the family	6,84,000
Net income/acre of land	52,615
Net income/member of HH	85,500

Shri Uike has successfully adopted the principles of integrated farming. He is undertaking commercial vegetable cultivation, dairy farming and fish farming along

with paddy. He has been highly successful in the application of Amrit Jal in his field. Being an active member of the farmer producer organisation, he is active in spreading the message of integrated farming system amongst other farmers in his area.

3. **Shri Kejauram Korram:** Shri Korram belongs to Bhejra Tolavillage in Chhurriya block of Rajnandgaon district. He is aged 42 years and has 5 members in his family. His economic growth story is fascinating. He was a tractor driver in 2003 and had only 2 acres of agricultural land as ancestral property. Not able to make ends meet with his meagre salary as a tractor driver, he decided to try his hands at allied activities in his village. With his small savings, he established a small rice mill in 2004 and has not looked back since then. Now, he owns 14 acres of agricultural land, out of which 7 acres are irrigated. Besides the mini rice mill, he has procured two tractors. Both tractors are let out for hire to other farmers. He is cultivating paddy in both Kharif and Rabi seasons, owns a pick up van, which his son uses to ferry passengers from nearby villages and is also operating the rice mill. He also is an active member of Adivasi Dharohar Farmers' Producer Company Ltd., Bhejra Tola, Rajnandgaon, a farmers' producer organisation. The FPO has purchased a combine harvester at a total cost of Rs. 16.00 lakh during 2015-16. The directors have contributed Rs. 12.00 lakh, while the balance of Rs. 4.00 lakh has come as share capital contribution from the members. The demand for the harvester is tremendous as labour during the harvest season is in short supply. Due to good management, the company earned Rs. 10.00 lakh, in the 1st year of operation itself. Now the company is promoting integrated farming (agriculture, dairy, fish farming, vermi-composting and Amrit jal) system among its members as a service activity.



(Shri Kejauram Korram along with other members of his FPO with the combine harvester and rice mill)

Shri Korram's annual net income from paddy cultivation is in the range of Rs. 2.50 to Rs. 2.80 lakh. The net annual income from rice mill and pick up van are Rs. 0.60 lakh and Rs. 0.70 lakh respectively. The two tractors, used mainly for hiring purpose, give

him a net profit of Rs. 1.00 lakh per annum. Shri Korram has a KCC with credit limit of Rs. 3.00 lakh from Chhurriya PACS.

The annual income-expenditure position of the family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	5,60,000
Income from allied activities	0.00
Income from off-farm activities	5,00,000
Total income of family	10,60,000
Expenditure on agriculture (paddy)	2,50,000
Expenditure on allied activities	0.00
Expenditure on off-farm activities	1,40,000
Household expenditure	80,000
Total expenditure of family	4,70,000
Net income of the family	5,90,000
Net income/acre of land	42,140
Net income/member of HH	1,18,000

Although, strictly Shri Koram is not undertaking integrated farming, his success is based on a proper balance between farm and off-farm income generating avenues. The per member net income and also per acre net income is higher as compared to other farmers in the area.

4. **Shri Rajesh Devnath:** Shri Devnath belongs to Hatbanjari village in Chhurriya block of Rajnandgaon district. He is a young man in early forties. There are 9 members in his family, including his aged parents. He has 5 acres of agricultural land. He has successfully established a broiler poultry farm, having 2800 birds. He manages to operate 7 batches through careful planning and marketing strategy. His net profit during 2015-16 was Rs. 5.10 lakh from broiler farming. He sells the poultry droppings to agricultural farmers. He has also set up a small dairy of 4 cows.



Another notable fact is that Shri Devnath is undertaking organic paddy cultivation in his 2 acres of agricultural land. Like other farmers in the area, the idea of application of Amrit jal, has caught his imagination and he has been applying it since the last 3 years. According to him, the production declined from 18.50 quintals per acre to 14 quintals in the first 2 years of organic farming but got stabilised at around 20 quintals last year.

The annual income-expenditure position of the family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	1,25,000
Income from allied activities	18,00,000
Income from off-farm activities	0.00
Total income of family	19,25,000
Expenditure on agriculture (paddy)	65,000
Expenditure on allied activities	10,80,000
Household expenditure	1,65,000
Total expenditure of family	13,00,000
Net income of the family	6,15,000
Net income/acre of land	1,23,000
Net income/member of HH	68,300

Shri Devnath is a successful farmer undertaking integrated farming of paddy, dairy and commercial poultry. This is reflected in his high annual net income. Even per member net income and per acre net income are very good.

5. **Shri Virendra Patel:** Shri Patel is the youngest farmer the study team interacted with. He is just 24 years old and is one of the most progressive farmers in the entire block. He belongs to Banjari village in Chhurriya block. The family,

comprising 7 members, has a total agricultural land holding of 3.5 acres. He has dug a bore well to meet the water requirement for cultivating the entire 3.5 acre plot. Despite being a small farmer, he has put in place a perfect integrated farming system. He has earmarked only 0.5 acre for paddy cultivation, which is mainly for family sustenance. He is undertaking commercial vegetable farming in 2 acres and balance 0.5 acre is utilised for a fish pond. The remaining 0.5 acre is utilised for homestead and rearing of dairy.

He is growing vegetables throughout the year, without applying much of chemical pesticides. He also sells these vegetables himself in local weekly *haats* at least 3 different days in a week. Tomato, brinjal, cabbage and cauliflower were being cultivated in his farm when the study team visited.



He is raising 10 Sahiwal cows, which give him an average daily milk yield of 30 litres after accounting for dry days. He sells the milk to the local *dhabbas*. Being a progressive farmer, he is undertaking fish farming in his 0.5 acre fish pond by resorting to multiple stocking and multiple harvesting technique. This technique is the latest technology, being practised by progressive fish farmers of Andhra Pradesh, West Bengal, Odisha, etc. This technology allows a farmer to harvest fish at least 4 times in a year. He has set up a small vermi-composting unit. He has plans to put up a solar home lightingsystem and a bio gas unit.

The annual income-expenditure position of the family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	12,500
Income from allied activities	7,50,000
Income from off-farm activities	0.00
Total income of family	7,62,500
Expenditure on agriculture (paddy)	6,500
Expenditure on allied activities	4,00,000
Household expenditure	96,000
Total expenditure of family	5,02,500
Net income of the family	2,60,000
Net income/acre of land	74,285
Net income/member of HH	37,140

Shri Virendra Patel's farming is a perfect example of integrated farming system. Unlike other farmers, he possesses only 3.5 acre of agricultural land. But due to excellent planning, he has been undertaking cultivation of paddy only to meet his family's food needs, whereas he undertakes commercial vegetable, fish farming and dairy farming which earns him an annual net income of Rs. 2.60 lakh.

6. **Shri Madanlal Netam:** He belongs to Bhejra Tola village in Chhurriya block. Shri Netam has a family of 5 members. The total agricultural land holding is 6 acres. He is a wadi farmer, supported under NABARD's TDF. He is cultivating paddy in 2 acres, vegetables in 1.5 acre and another acre for mango and aonla under the wadi project. The mango and aonla, are yet to yield fruit and give him income. Further, he has taken a fish pond of 5 acres water spread area under lease from the Department of Fisheries. However, he is unable to undertake fish farming properly due to lack of knowledge on the practices of fish farming. He has also purchased a tractor and uses it on his own farm and for hiring purpose. The total annual net income from all these activities for Shri Netam is Rs.3.5 lakh.

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	50,000
Income from allied activities	4,50,000
Income from off-farm activities	30,000
Total income of family	5,30,000
Expenditure on agriculture (paddy)	26,000
Expenditure on allied activities	2,20,000
Household expenditure	75,000
Total expenditure of family	3,21,000
Net income of the family	2,09,000
Net income/acre of land	34,830

Net income/member of HH

41,800

Shri Netam is another farmer who has been successfully undertaking integrated farming through cultivation of paddy, fish farming, vegetable farming and even cultivation of mango and aonla. The only notable core activity missing is dairy farming, which he could have undertaken. The annual net income for the family is reasonably high and is likely to increase further once the fruit trees start yielding.

7. **Shri Kheman Das Sahu:** Shri Sahu belongs to Charbhata village in Chhurriya block. Shri Sahu's journey as a daily labourer to a highly respected progressive farmer, is phenomenal. He has a family size of 10 members. Till 2005, he was earning his livelihood as a daily wage earner. However, disgusted with lack of assured earning, he focussed his attention to cultivation of paddy in 1.5 acre of land, owned by his father. He found farming very interesting. Being an innovator, he started adopting scientific farming practices for the cultivation of paddy. Encouraged with the results, within two years, he switched over to vegetable farming for better returns. Presently, he has 11 acres of irrigated agricultural land. Now his entire focus is on cultivation of vegetables throughout the year. The best part of his farming method is crop sequencing in Kharif, Rabi & summer seasons. The planning is done in such meticulous ways that at any time of the year, there is no fallow land. Besides vegetable farming, he is rearing 6 indigenous cows, mainly to get cowdung and cow urine for his own farm. The milk is used for home consumption.





He has constructed a very good *pucca* house in the village and also a farm house in the farm. His annual net income from vegetables is Rs. 10.50 lakh.

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	0.00
Income from allied activities	20,00,000
Income from off-farm activities	0.00
Total income of family	20,00,000
Expenditure on agriculture (paddy)	0.00
Expenditure on allied activities	11,35,000
Household expenditure	1,75,000
Total expenditure of family	13,10,000
Net income of the family	6,90,000
Net income/acre of land	62,730
Net income/member of HH	69,000

Shri Sahu, in a purely technical sense, is not undertaking integrated farming system as his entire 11 acre is devoted towards vegetable farming. But he is a highly successful farmer owing to his micro planning of the crop sequencing for all year round cropping and becomes a role model for other farmers. His example demonstrates one of the effective strategies in enhancing the farmer's income.

8. **Shri Bharat Patel:** Shri Patel, aged about 49 years, belongs to Bharia Tola village of Chhurriya block of Rajnandgaon district. He has a family of 7 members. He owns 8.5 acres of land, of which 4 acres (50%) is irrigated through bore well. He is undertaking cultivation of paddy, both in Kharif&Rabi season. He was sanctioned a wadi under NABARD's TDF project. He has veered towards cultivation of mango along with vegetables. His annual net income from agriculture was Rs.1,50,000 while that from sale of vegetables was Rs.50,000. The mango in his wadi, has given him a net income of Rs. 20,000 last year, although the mango plants are yet to stabilise. He

is in the process of developing his dairy with two crossbred cows, which will further augment his income. He proposes to establish a verm-composting unit, which will supply him with good quality manure. The entire plot has been protected with wire mesh fencing. The farmer has not availed any farm loan from financial institutions.



(Shri Bharat Patel standing proud in his field)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	3,20,000
Income from allied activities	1,60,000
Income from off farm activities	0.00
Total income of family	4,20,000
Expenditure on agriculture (paddy)	1,50,000
Expenditure on allied activities	60,000
Household expenditure	80,000
Total expenditure of family	2,90,000
Net income of the family	1,30,000
Net income/acre of land	15,290
Net income/member of HH	18,570

Shri Patel shows promise of becoming a successful farmer. Right now, he is undertaking cultivation of paddy, mango along with inter cropping of vegetables. He has planned to set up a small dairy unit along with vermi-compost unit to give boost to his income from paddy and improve the soil health.

- Shri Bhupendra Katlam:** Shri Katlam, aged about 36 years, belongs to Matekheda village of Chhurriya block of Rajnandgaon district. He has 5 members in his family and own 9.62 acres of land, of which 2.5 acres is irrigated through a bore well. He had been undertaking cultivation of paddy in Kharif&Rabi season. But he has since switched over to growing of paddy only in the Kharif season. In the Rabi season and summer he has started cultivating vegetables in 2.5 acres from which he

earns a net profit of about Rs. 1,10,000. He has been allotted the lease of a fish pond of about half acre by the Gram Panchayat. Although he is not well versed in the scientific management practices for rearing fish, he still earns about Rs.33,000 from sale of fish. More importantly, the fish pond helps provide him with water to provide protective irrigation for his Rabi crops. The farmer has decided to set up a 10 animal dairy unit along with vermi-composting. He also realises the importance of drip irrigation system and proposes to install one soon. The farmer has not availed any farm loan from financial institutions.



(Shri Bhupendra Katlam surveying his fish pond)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	2,05,000
Income from allied activities	5,30,000
Income from off farm activities	0.00
Total income of family	7,35,000
Expenditure on agriculture (paddy)	1,20,000
Expenditure on allied activities	3,18,000
Household expenditure	96,000
Total expenditure of family	5,34,000
Net income of the family	2,01,000
Net income/acre of land	20,900
Net income/member of HH	40,200

Shri Katlam has taken a judicious decision of limiting paddy cultivation only to Kharif season, while taking up commercial vegetable farming in both Rabi and summer seasons. He has further diversified his farming operation by taking the fish pond on lease basis. The annual net income is very sound. However the missing links are livestock rearing and water saving devices like drip. With establishment of dairy

and irrigation through drip system, the farm will take the shape of an integrated farming system.

10. **Shri Brijmohan Sahu:** Shri Sahu, aged about 68 years, belongs to Bakharutola village of Chhurriya block of Rajnandgaon district. He has a large family of 10 members and owns 10 acres of land, all of which is irrigated through a bore well and an open well. He had been undertaking cultivation of paddy in Kharif&Rabi season. But ever since he was affected with paralysis, he adopted dairying as his occupation, gradually moving away from agriculture, which involved more physical work, which he was unable to do or supervise. However, he is growing paddy in 5 acres of land only during Kharif season. He has 12 Murrah buffaloes, which give him an annual net income of about Rs. 1.90 lakh from sale of milk and production of vermi-compost. He is quite happy due to better financial position of the family and also savings resulting from reduction in the use of chemical fertiliser in his fields. The farmer enjoys a KCC limit of Rs.2,50,000 from the DCCB.



(Shri Brijmohan Sahu with his buffaloes)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture	1,25,000
Income from allied activities	5,25,600
Income from off farmactivities	0.00
Total income of family	6,50,600
Expenditure onagriculture	68,000
Expenditure on allied activities	3,35,000
Household expenditure	1,00,000
Total expenditure of family	5,03,000
Net income of the family	1,47,600

Net income/acre of land	14,760
Net income/member of HH	14,760

Shri Sahu has reduced his area under paddy and started a dairy in his homestead primarily due to his poor physical health. However, this was a good decision as it helped him improve his financial position, besides enhancing the soil condition of his fields.

11. **Shri Dasharath Netam (Thakur)**: Shri Netam, aged about 54 years, belongs to Ghupsal village of Chhurriya block of Rajnandgaon district. He has 6 members in his family and owns 13 acres of land, of which 4 acres is irrigated through an open well. He is cultivating paddy in both Kharif and Rabi seasons. He earns about Rs. 2,10,000 from farming. The Netam community are traditionally herdsmen but Shri Netam had given up dairying as marketing of milk was difficult. However, after the Mumbai Kolkatta Highway has been four laned, a large number of *dhabas* have sprung up along the same and there is good demand for milk. He therefore restarted his dairying activity and has 4 *desi* non-descript cows and 12 Murrah buffaloes, which give him an annual net income of about Rs.2,16,000. He has also established a vermi-compost unit and a small unit for production of Amrit Jal. He is a strong proponent of use of farm yard manure and Amrit Jal in agriculture. He does not have any credit facility from any financial institution.



(Shri Dasharath Netam (Thakur) with his cattle)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	4,45,000
Income from allied activities	5,25,000
Income from off farmactivities	0.00
Total income of family	9,70,000
Expenditure onagriculture (paddy)	2,37,000
Expenditure on allied activities	3,15,000
Household expenditure	1,10,000
Total expenditure of family	6,62,000
Net income of the family	3,08,000
Net income/acre of land	23,690
Net income/member of HH	51,300

Shri Netam is undertaking integrated farming through agriculture (cultivation of paddy) and dairy. He is fully convinced of the benefits of use of vermin-compost and Amrit Jal in his field. The annual net income for Shri Netam is better compared to traditional paddy growing farmers.

12. **Shri Ghanshyam Sahu:** Shri Ghanshyam Sahu, aged about 45 years, belongs to Bakharutola village of Chhurriya block of Rajnandgaon district. He has 6 members in his family and owns 4 acres of land, of which 3 acres is partially irrigated through an open well. The well is not able to sustain the irrigation requirement of the farm. He had been undertaking cultivation of paddy in Kharif season and earns about Rs.60,000 from farming. Feeling the need for additional income, Shri Sahu increased the number of cattle he owned and also went in for artificial insemination to improve the breed quality and thereby the milk yield. He has 15 head of cattle (5 Sahiwal cows and 10 Murrah buffaloes). Earlier, marketing of milk was difficult but the increased demand for milk from the large number of *dhabaas* that have sprung up along the Mumbai Kolkatta Highway that has been four laned, has resulted in good demand for milk. The dairy business earns him Rs.4,32,000 annually. He has not availed of credit facility from any financial institution.



(Shri Ghanshyam Sahu milking his buffalo)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	1,00,000
Income from allied activities	5,76,000
Income from off farm activities	0.00
Total income of family	6,76,000
Expenditure on agriculture (paddy)	52,000
Expenditure on allied activities	3,70,000
Household expenditure	92,000
Total expenditure of family	5,14,000
Net income of the family	1,62,000
Net income/acre of land	40,500
Net income/member of HH	27,000

Shri Sahu has shown the resilience to develop into a progressive farmer. He has tried to maintain the balance between his core family occupation i.e., paddy cultivation and dairy farming. He is very keen in adopting new techniques like hydroponics, Amrit Jal as also vermi-composting, vegetable farming and farm ponds.

13. **Shri Gokul Patel:** Shri Patel, aged about 55 years, belongs to Ghupsal village of Chhurriya block of Rajnandgaon district. He has 8 members in his family and owns just 2 acres of unirrigated land, in which he is able to grow only one crop of paddy. Since the land is rocky and unfertile, the yield of paddy is also not satisfactory. His annual net income from agriculture is just Rs. 20,000. Shri Patel

has taken up rearing of goats and has a flock of about 100 goats, of which 48 are does, 15 are bucks and the rest are kids. He sells an adult goat for about Rs.3000 to Rs.3500. The butchers come to the village and purchase the live goat from him. Annually, he is able to earn about Rs.1,25,000 from the sale of goats. He complains that the veterinary care facilities for goat breeders are poor and taking a single goat to the Livestock Centre is difficult as there is no one else to look after the flock when he is gone. He has not availed of any credit facility from any financial institution.



(Shri Gokul Patel grazing his goats)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	45,000
Income from allied activities	1,95,000
Income from off farmactivities	0.00
Total income of family	1,85,000
Expenditure onagriculture (paddy)	25,000
Expenditure on allied activities	60,000
Household expenditure	55,000
Total expenditure of family	1,45,000
Net income of the family	40,000
Net income/acre of land	20,000
Net income/member of HH	5,000

Shri Patel does not possess a sound physical resource as he has only 2 acres of not so productive agricultural land. This has prompted him to go for integration with goat farming to increase the family income.

14. **Shri Gopichand Sahu:** Shri Sahu, aged about 47 years, belongs to Matekheda village of Chhurriya block of Rajnandgaon district. He has 4 members in his family and owns 8 acres of land, of which 3 acres is irrigated from an open well. He grows paddy in Kharif and Bengal gram in Rabi. His net income from agriculture is about Rs.1,00,000. Shri Sahu has taken up poultry rearing (500 bird broiler unit) as there is good demand from the *dhabhas* that have come up along the Mumbai Kolkatta four lane highway close to his village. A private company supplies him with feed and day old chicks. However, the company does not provide him with an assured buyback arrangement for the chicken. Annually, he is able to earn about Rs.85,000 from the sale of chicken, (broiler). He is interested in fencing a portion of his agriculture land for cultivation of off-season vegetables through drip system. He has not availed of any credit facility from any financial institution.



(Shri Gopichand Sahu in his deep litter poultry shed)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy& Gram)	2,36,000
Income from allied activities	1,90,000
Income from off farmactivities	0.00
Total income of family	4,26,000
Expenditure onagriculture (paddy& Gram)	1,16,000
Expenditure on allied activities	1,14,000
Household expenditure	63,000
Total expenditure of family	2,93,000
Net income of the family	1,33,000
Net income/acre of land	16,625
Net income/member of HH	33,250

Shri Sahu has diversified into poultry farming to augment his family income and it has proven to a right decision. This shows his inclination to take baby step towards going in for a full-fledged integrated farming system.

15. **Shri Puralal Mandavi:** Shri Mandavi, aged about 51 years, is a tribal farmer from Bhakurra village of Chhurriya block of Rajnandgaon district. He has 6 members in his family and owns 6.5 acres of land, all of which is irrigated from a borewell. He has been sanctioned assistance under NABARD's TDF project for establishing a wadi. The wadi has started earning him income of about Rs.50,000 from sale of fruits. He grows paddy in Kharif and wheat, gram, potato, etc., in Rabi. His income from agriculture is about Rs. 125000. Shri Mandavi has a one acre fishpond on lease from the Gram Panchayat from which he earns about Rs. 50,000. He has not availed of credit facility from any financial institution.



(Shri Puralal Mandavi by the side of his fishpond)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy& others)	2,25,000
Income from allied activities	1,08,000
Income from off farmactivities	0.00
Total income of family	3,33,000
Expenditure onagriculture (paddy& others)	1,02,000
Expenditure on allied activities	46,000
Household expenditure	85000
Total expenditure of family	2,33,000
Net income of the family	1,00,000
Net income/acre of land	15,400
Net income/member of HH	16,700

Shri Mandavi has adopted an integrated approach by cultivating paddy, wheat and gram as core activity and taking up mango cultivation and fish farming as supplementary activities. He is fully convinced about the financial benefits of this approach and would like to further expand it in future.

16. **Shri Sukhram Sahu:**Shri Sahu, aged about 44 years, belongs to Bajrangpur village of Chhurriya block of Rajnandgaon district. He has 7 members in his family and owns 7 acres of land, of which 5 acres is irrigated through a bore well. He had been undertaking cultivation of paddy in Kharif&Rabi season. Learning from his relatives, he has now started cultivating onions in the Rabiseason and other vegetables in summer seasonfrom which he earns about Rs. 50,000. He has also set up a small dairy with 6 buffaloes and a vermi-compost unit. He has heard of the benefits of biological control of pests using Amrit Jal from neighbouring farmers but is yet to try out for himself.



(Shri Sukhram Sahu with his onion crop)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy& onion)	3,95,000
Income from allied activities	2,52,000
Income from off farm activities	0.000
Total income of family	6,47,000
Expenditure on agriculture (paddy& onion)	2,37,000
Expenditure on allied activities	1,50,000
Household expenditure	78,000
Total expenditure of family	4,65,000
Net income of the family	1,82,000
Net income/acre of land	26,000
Net income/member of HH	26,000

17. **Shri Udhelal Mandawi:** Shri Mandawi, aged about 55 years, belongs to Lammeta village of Chhurriya block of Rajnandgaon district. He has 5 members in his family and owns 8 acres of land, of which 4 acres is irrigated through a bore well. Being a tribal farmer, he has been sanctioned a 01 acre wadi project under NABARD's TDF project. Earlier he was growing only paddy in his 4 acres of irrigated land in Kharif and Rabi seasons but has now moved on to cultivating vegetables. He continues to cultivate paddy in 2 acres of un-irrigated land in the Kharif season for meeting his family's food grain requirements. He is also rearing fish in a small 0.4 acre pond taken on lease from the Gram Panchayat. He earns about Rs.1,25,000 from agriculture, Rs. 50,000 from fish rearing and Rs. 50,000 from the wadi. He has not availed of credit facility from any financial institution.



(Shri Udhelal Mandawi with his brinjal crop)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	50,000
Income from allied activities (mango & vegetable)	8,50,000
Income from off farm activities	0.00
Total income of family	9,00,000
Expenditure on agriculture (paddy)	80,000
Expenditure on allied activities (mango & vegetable)	4,21,000
Household expenditure	92,000
Total expenditure of family	5,93,000
Net income of the family	3,07,000
Net income/acre of land	38,375
Net income/member of HH	61,400

Shri Mandawi's annual net income is high because he is cultivating high value commercial vegetables in 4 acres of irrigated land. He has also diversified his agriculture into horticulture and fish farming. He has been encouraging other farmers to adopt integrated farming system.

18. **Shri Shobhit Ram Uike:** Shri Uike, aged about 57 years, belongs to Pairitola village of Chhurriya block of Rajnandgaon district. He has 5 members in his family and owns 5 acres of unirrigated land. Since irrigation is not available, he has no choice but to grow only Kharif crops and is fully dependent upon the mercy of the monsoon. He has been undertaking cultivation of mostly paddy in Kharif season and earns about Rs. 67,000 from the same. Shri Uike had some non-descript cattle which were not economical. Realizing the need for additional income, Shri Uike went in for herd improvement through artificial insemination to improve the milk yield. He has 14 head of cattle (5 Sahiwal cross bred cows and 09 buffaloes). Earlier, marketing of milk was difficult but the increased demand for milk from the large number of *dhabaas* that have sprung up along the Mumbai Kolkatta Highway that has been four laned, has made dairying an attractive proposition. The dairy business earns him net income of Rs.2,60,000 annually. He has not availed of credit facility from any financial institution.



(Shri Shobhit Ram Uike with his cattle)

The annual income-expenditure position of the family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	1,25,000
Income from allied activities	6,50,000
Income from off farm activities	0.00
Total income of family	7,75,000
Expenditure on agriculture (paddy)	58,000
Expenditure on allied activities	3,90,000

Household expenditure	1,05,000
Total expenditure of family	5,53,000
Net income of the family	2,22,000
Net income/acre of land	44,400
Net income/member of HH	44,400

Not so successful Cases

- Shri Ramadhar Yadav:** Shri Yadav, aged about 60 years, belongs to Dumardihi village of Chhurriya block of Rajnandgaon district. His family has 6 persons. Shri Ramadhar's case is a contrasting one. He was a progressive farmer in his younger days, i.e., in the early eighties. Being an educated person (B.Sc in Physics), he used to apply all scientific practices in his field and used to practise integrated farming by combining cultivation of paddy, rearing cows, fish farming and raising of horticultural crops on pond dykes. But after a long illness, coupled with advancing age and no physical or emotional support from his sons, he lost his zeal for farming. Presently, his farming activity consists of cultivating 4 acres of non-irrigated land and maintaining 6 buffaloes. His present net annual income from farming is around Rs. 1,20,000. However, as he was an experienced farmer, the study team sought his opinion on how to increase the income of farming community. He suggested that integrated farming is one of the most effective ways to deal with farmers' distress as it enables farmer household to reduce cost of cultivation and at the same time, provides income from multiple sources. He, however, expressed concern at the trend of youth turning away from farming. His advice to the government is to take steps to motivate youth to take up farming activities.



(Shri Ramadhar Yadav with his buffaloes)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	1,00,000
Income from allied activities	2,50,000
Income from off-farm activities	0.00
Total income of family	3,50,000
Expenditure on agriculture (paddy)	56,000
Expenditure on allied activities	1,30,000
Household expenditure	70,000
Total expenditure of family	2,56,000
Net income of the family	94,000
Net income/acre of land	23,500
Net income/member of HH	15,700

Although a strong votary of integrated farming system, Shri Yadav is unable to continue with IFS primarily because of old age and failing health. His children have not shown interest in farming to carry forward his dream. That is why he strongly feels that youth power needs to be channelized for the success of agriculture.

- 2. Shri Dinaram Dhankar:** Shri Dinaram is a farmer, belonging to Pinkapar village of Chhurriya block of Rajnandgaon district. He has a joint family with 32 members. The family has land holding of 48 acres, out of which 20 acres are irrigated. Until 2013, the family used to raise only one crop of paddy in Kharif season when the farm was in the hands of his father. With the responsibility of farming shifting to young Shri Dinakar, he has shown the way, as to how effectively agriculture and livestock complement each other. He started rearing 20 cows of Sahiwal breed during 2014-15. The stock has now increased to 50 animals (adults and calves). He resisted the temptation to rear cross bred Jersey cows on account of higher maintenance cost and problem in selling milk locally as there is a preference for desi cow milk. Besides, the income from selling milk, he made a good profit of Rs. 15,000 last year through sale of cow dung and cow urine to local farmers, after meeting the requirement of his own farm. He is also rearing a stock of 250 goats. He has dug three bore wells in his field. This has ensured that he has a perennial source of irrigation in both Kharif & Rabi seasons. He has also protected around 20 acres of his farm with wire mesh fence. As a result, he is able to raise hybrid paddy in Rabi season. Further, integration of agriculture with livestock and fish farming, has enabled him to reduce consumption of chemical fertilisers and pesticides. Ironically, the family does not have KCC and the entire expenditure is met from its own source.



(Farm wire mesh fenced by farmer for paddy cultivation)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	16,55,000
Income from allied activities	10,95,000
Income from off-farm activities	Nil
Total income of family	27,50,000
Expenditure on agriculture (paddy)	9,64,000
Expenditure on allied activities	6,57,000
Household expenditure	4,68,000
Total expenditure of family	20,89,000
Net income of the family	6,61,000
Net income/acre of land	13,750
Net income/member of HH	20,656

Shri Dinaram's case is an example of over dependence of a large family on only two earning members. Shri Dinaram and his younger brother are supporting a large family of 32 members only through farming. This is despite the fact that Shri Dinaram has diversified his farming from traditional paddy cultivation to dairy and goat rearing. The family is not earning from off-farm or other business or service related activities.

- 3. Shri Aasharam Dhangar:** Shri Dhangar, aged about 67 years, belongs to Nawagaon village of Chhurriya block of Rajnandgaon district. He heads a big joint family having 32 members. Together, the family owns 40 acres of farm land, out of which 32 acres are irrigated through bore well. The family cultivates paddy in the entire 40 acres during Kharif season, while 32 acres are put under Rabi paddy cultivation. However, the water table of the 4 bore wells, has been on the

decline during the last decade. Despite having a depth of 250 feet, these wells go dry during the summer months. This comes as a big limitation for summer vegetable farming. He has a small dairy unit of 10 milch animals but management is poor.



(Shri Aasharam Dhangar with cows) (Lush green paddy field)

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	17,50,000
Expenditure in allied activities	3,25,000
Income from off-farm activities	0.00
Total income of family	20,75,000
Expenditure on agriculture (paddy)	8,54,000
Expenditure on allied activities	1,30,000
Household expenditure	3,25,000
Total expenditure of family	13,09,000
Net income of the family	4,41,000
Net income/acre of land	11,025
Net income/member of HH	13,780

Net income for every one acre of land for the family is Rs. 11,025. This is primarily because of the large family depending heavily only on income from cultivation of paddy.

4. Shri Humman Lal Dhangar: Shri Dhangar belongs to Ghupsal village in Chhurriya block of Rajnandgaon district. He is a marginal farmer, owning only one acre of agriculture land. His family size is 5 persons. The major livelihood is goat farming.



His total average stock of goats remains at 140. Each goat takes about 8-10 months to attain an average marketable weight of 10 kg. He takes out the goats to the forest area for foraging. Other expenses include, concentrate feed in monsoon months and vaccination. The mortality is high during monsoon months. Shri Dhargar earns, on an average, Rs. 100 per day after netting off all expenses. He expects loan facility for purchase of concentrate feed during monsoon months, as the earning through sale of goat, dries up during that period.

The annual income-expenditure position of family is presented in the following Table:

Particulars	Amount (Rs)
Income from agriculture (paddy)	20,000
Income from allied activities (goat)	1,25,000
Income from off-farm activities	0.00
Total income of family	1,45,000
Expenditure on agriculture (paddy)	11,000
Expenditure on allied activities (goat)	40,000
Household expenditure	35,000
Total expenditure of family	86,000
Net income of the family	59,000
Net income/acre of land	59,000

Net income/member of HH	11,800
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Shri Dhangar's financial position is weak mainly on account of un-availability of physical resource i.e., land and his lack of financial resources and knowledge towards diversification of integrated farming.

An Outstanding Example of Integrated Farming Implemented by Shri Mohammed Yunus Khan, a Progressive Farmer

Shri Mohammed Yunus Khan, a resident of Devgawa village, in Umaria, Madhya Pradesh owns 5 acres of rocky undulating farm land given to him in lieu of land acquired by the government in 1991, about 25 years ago. It was very difficult for Shri Yunus to make ends meet with his meagre salary as a primary school teacher. He had a large family with 8 members comprising his wife, 4 children and his parents to support.

Left with few options, he started to till the land and grow paddy like all the other farmers in the area. However, due to the poor fertility of the land and in the absence of irrigation facility, he was able to cultivate only one crop of paddy in the Kharif season. The resultant yield and income was not adequate to take care of the needs of his family.



Shri Yunus began to explore options and in 1993 felt that rearing poultry would offer him additional income. He began rearing chicken as a backyard poultry unit. Encouraged with the results, he increased the number to 500 birds and then progressively went on increasing them. While rearing chicks, he observed that the mortality rate was less for coloured birds and they also fetched a higher price being preferred over White Leghorn birds. Today, he has two poultry units in a deep litter system with a total capacity of 4000

improved *desi* fowl. He uses one unit to rear one day old chicks, from purchase till they are about a month old and the other unit for older fowl till they are sold. By this method he is able to take as many as 8 cycles in a year. The poultry unit fetched him Rs. 4,00,000 and after expenses gave him a net return of Rs.1,50,000 during 2015-16.

Since the land is rocky and infertile, as he needed to increase the organic matter, he began to keep cattle. He erected NADEP compost units and began to make good quality manure. Over a period of time he increased his livestock to comprise 04 bullocks, 03 local breed cows, (which he uses for breed improvement using AI), and 02 cross bred Jersey cows. He lays great emphasis on Indian breeds and feels that besides being hardier, requiring less care and expenses, they are also more beautiful and affable! From the sale of milk alone, he earned a net profit of about Rs.40,000 during 2015-16. He now uses the dung and urine from these cattle to make nutrient rich vermi-compost valued at Rs.1,00,000. The vermi-compost helps Shri Yunus increase the soil fertility besides reducing the expenditure on chemical fertilizers. He now has six NADEP compost units and fills these with leaves from the forest and other farm waste to make good quality compost. He also has a bio-gas unit to meet the cooking fuel needs of his household.

Although his farm had a well, it had little water, barely sufficient for meeting the drinking water needs of the family. The well was also being accessed by villagers staying in the vicinity for their household requirements. The well would dry up in the summer months and Shri Yunus used to face hardship on account of acute shortage of even drinking water. Faced with an acute need of water for irrigation, in 1995, he decided to excavate a small tank in his field. He and his sons worked using pick axes, shovels and spades to excavate a small tank. The monsoon brought bountiful rains and filled the same. He was able to grow wheat and gram in the Rabi season. Encouraged with the results, he decided to increase the size of the pond every year. Today he has two ponds admeasuring about 1.25 ha. He releases fingerlings of fish like rohu, katla, mrigal and earns gross income of about Rs.4,80,000 from sale of fish. More importantly, the water is used to provide irrigation for the vegetables, fruits and high value cash crops like soya, ground nut, chilli, etc., that he grows all the year round. The ponds have also helped recharge the ground water and water is now available in the wells of other farmers too!

Today, Shri Yunus has two open wells, a sprinkler set with 10 nozzles, a tractor with trolley and other farm equipment, and grows fruit trees like mango, jackfruit, lime, guava, aonla, banana, papaya, ber, etc., on the bunds, around the fish pond and near the pucca house that he has constructed on the farm itself. He also practices agro-forestry and has given great emphasis on planting forest trees like eucalyptus, bamboo, neem, and timber trees like teak, which too yield him good income.

The IFS Model that Shri Yunus has developed includes, cultivation of food grains (to meet his family's requirements of food grain and pulses), vegetables all-round the year, fruits, fish rearing, poultry rearing, and dairying. All these activities together give him a gross income exceeding Rs.15,00,000!

The annual income-expenditure position of the family is presented in the following Table:

Particulars	Gross Income	Expenditure	Net income
Income of family from field crops (paddy, wheat, pulses, etc)	45200	12500	32700
Income from vegetable cultivation	325000	65250	259750
Income from fruits	148000	25800	122200
Income from dairying (milk)	297000	40000	257000
Income from sale of calves and improved cattle	75000	2500	72500
Income from poultry unit	400000	150000	250000
Income from sale of fish	480000	80000	400000
Income from subsidiary activities	0	0	0
Vermi-compost (notional basis)	50000	5000	45000
Timber, bamboo, etc.	20000	500	19500
Total income of family	1840200	381550	1458650

IV. Interaction with Control Farmers

One of the objectives of the study was to identify the reasons for farmers not adopting Integrated Farming System as a practice although other farmers in close vicinity have adopted the same with encouraging results in terms of increased income, and reduced risks.

To determine the reasons, the study team interacted with 100 control farmers in three group meetings. The interaction was conducted through Focussed Group Discussion (FGDs) method. Care was taken to see that all types of farmers (marginal, small & large) attend the FGDs and express their opinion in free and frank manner. The following leading questions were asked and their opinion was sought:

- Are they happy with cultivating a single crop in a year, if yes, why?
- If no, what prevented them from replicating IFS models being practiced by some of the farmers in nearby villages
- Are they willing to adopt IFS, if technical and financial support are provided

Observations:

It was indicated by these farmers that they have been traditionally cultivating paddy in Kharif season and keeping the field fallow for the rest of the year. In the years when there was bountiful monsoon, these farmers also took up cultivation of a small portion of their field to grow a Rabi crop.

The Study team also observed that there were some farmers who had access to all year round irrigation but continued to grow only paddy all through the year.

The farmers cited numerous reasons for cultivating only a single crop in a year and not showing interest towards double cropping or integrated farming systems. The major reasons are:

- a. Lack of own resources for initial capital investment.
- b. Psychological barrier among farmers for approaching banks for credit (especially term credit) and simultaneous unenthusiastic attitude of bankers towards the farming community.
- c. Un-availability of clear title of lands in favour of loanees in most cases.
- d. Un-availability of labour on hire due to social security programmes being implemented by the Government, such as, supplying 35 kg rice per person per month at Rupee One per kg, the MGNREGP, which assures a minimum of 150 days of employment in a year at a wage of Rs.230 per day, etc.
- e. Un-availability of family labour due to unwillingness of younger members of the family to continue with agriculture beyond sustenance level and simultaneous fatigue due to losses amongst the older generation towards farming.

- f. The purchase of the entire paddy cultivated by the farmer at attractive minimum support price of Rs.1410 per quintal for common varieties and Rs.1450 for fine varieties, saving the farmer from the trouble and risks of marketing acts as a disincentive to take up IFS or shifting from paddy cropping.
- g. Un-availability of assured irrigation.
- h. Prevalent practice of open grazing after the main Kharif crop is harvested acts as barrier for farmers having access to irrigation to take up Rabi or summer crop.
- i. Lack of awareness of various governmental development schemes.

The study team further tried to find out whether the farmers in the control group were aware of the benefits of the IFS. Majority of them opined that they were aware of the financial benefits but owing to reasons indicated above, they are unable to pursue IFS.

They further mentioned that IFS requires dedicated management of various sub-components and also marketing arrangements. Therefore, scope and benefit of IFS may be popularised among youth through government support.

Out of the 22 farmers undertaking IFS visited during the study, it was observed that one farmer (Shri Ramadhar Yadav), had abandoned IFS although he had adopted it earlier. He attributed the reason to his own ill health, advancing age, and unwillingness of his sons to carry forward the activity.

The study team also discussed the cost-benefit stream of agricultural and other occupations with these control farmers. The farmers cultivating only single paddy crop in a year mentioned that the net income from an acre of paddy field ranged from Rs.12,000 to Rs. 16,500. The farmers undertaking cultivation of paddy in two seasons, have been earning a net profit in the range of Rs. 22,000 to Rs. 26500 per acre. As compared to the net income of control farmers, the net income of farmers undertaking IFS, was significantly higher by at least 15 times. The details are given in Chapter V, i.e., Popular Integrated Farming Models in Rajnandgaon.

V. Summary of Observations

The study team visited 22 farmers, as depicted above and also interacted with 100 control farmers (traditionally undertaking paddy cultivation, without much diversification) through Focussed Group Discussion (FGD). Based on the observations and also interactions, the summary observations are indicated below:

- The control farmers are content with only traditional paddy cultivation in Kharif season, if no source of irrigation available. Some of them, although having assured source of irrigation, mainly bore well, are going for paddy cultivation in Rabi season.
- The annual net income of the control farmers under un-irrigated condition ranges from Rs. 9,000 to Rs. 13,000 per acre.
- The annual net income of the control farmers under irrigated condition in Rabi season ranges from Rs. 12,500 to Rs. 17,000 per acre.
- The major reasons for traditional farmers not switching over to integrated farming are lack of resources for capital investment (own & bank credit), arrangements for backward and forward linkages and lack of willingness of next generation to farming within the family.
- There are farmers who have reduced the area under paddy and diversified agriculture through better remunerative activities like vegetables, fish, mango, aonla, etc.
- There are farmers who have reduced the area under paddy considerably. They are growing paddy mostly to meet the food requirements as also fixed expenditure of their family. Fixed expenditure of the family is met out due to the sound system of MSP for paddy in Chhattisgarh.
- There are a large number of farmers who have started striking a reasonable balance between cultivation of paddy and other allied activities like dairy, vermi-compost, horticulture crops (fruits, vegetables), fish farming.
- Farmers, undertaking allied activities, along with cultivation of paddy, have been earning much better returns.
- The annual net income of farmers undertaking integrated farming ranges from Rs. 45,000 to Rs. 75,000 per acre.
- These progressive farmers who have benefitted from IFS have been promoting the concept among fellow farmers with the help of Agriculture University and KVK, Rajnandgaon.
- The intervention and association of governmental departments was found to be minimum.
- The role of banks in promoting integrated farming system or any better farming system through purveying of credit, was practically absent as the study team did not find a single farmer, undertaking IFS by availing credit.
- These progressive farmers undertaking IFS, indicated that they would up-scale their activities, if governmental developmental support and credit support from banks, are made available in a hassle free manner.

VI. Popular Integrated farming Models in Rajnandgaon

Rajnandgaon district falls in 'Chhattisgarh Plains' under the Agro Ecological Zone-VII, along with other districts like Raipur, Bilaspur, Korba, Raigarh, Janjgir-Champa, Kabirdham, Rajnandgaon, Durg, Dhamtari, Mahasamund, and Kanker. The average annual rainfall is 1028 mm during South-west monsoon. The rainfall during North-east monsoon is meagre. The major soil is red sandy loam type. About one third of net sown area is irrigated with canals and bore wells being the major sources. Paddy is the dominant crop in the district. Drought is common to the district.

Keeping in view the above agro-climatic condition and the prevalent integrated farming practices among some of the farmers in Chhurriya block of the district, the study team has prepared three farm models of integrated farming systems which can be popularised in 11 districts belonging to AEZ-VII of Chhattisgarh State, which are :

1. Paddy+Small dairy+ Vermi-compost+ Hydroponics+Vegetable with drip irrigation+fish farming
2. Paddy+Small dairy+Vermi compost+ Hydroponics+papaya+Vegetable (both with drip irrigation)+fish farming
3. Paddy+Small dairy+Vermi compost+ Hydroponics+papaya + Vegetable (both with drip irrigation)+fish farming+poultry farming

These three models are only illustrative and there can be many more variations in the IFS models, other than these, depending on the specific micro agro-climatic suitability, willingness and skill set of farmers for specific activity, governmental support, marketing arrangements, etc.

The purpose of depicting these three farm models is to showcase a sound template of coverage of activities under IFS and working out the financial viability and bankability. Based on the above, state specific models suitable for agro-climatic conditions and other factors may be developed.

These three models are worked out and shown in Annexure I, II&III. Important features of each of these farm models is indicated below:

Farm Model I: Paddy + Small dairy + Vermi-compost+ Hydroponics + Vegetable with drip irrigation + Fish farming

Integrated farming is taken up in a total land of 2.5 acres in this model. The farmer shall take up paddy in 1.0 acre in Kharif season, mainly for sustenance of his family. He shall be encouraged to diversify to dairy farming in 0.2 acres, farm pond in 0.25 acres and vegetable cultivation throughout the year. He also undertakes hydroponics to provide green fodder for rearing livestock and vermi-composting to provide low cost manure, improve soil health condition and to reduce cost of cultivation. Wire mesh fencing shall also be done in 2.0 acres to encourage vegetable cultivation during Rabi and summer seasons. There is no provision for bore well in this model.

The farmer would harvest rainwater in his farm pond and micro manage the water requirement of crops judiciously. The total capital cost is estimated to be Rs. 4.68 lakh and recurring cost of Rs. 2.92 lakh. The total net income from all activities would be in the range of Rs. 3.57 lakh to Rs. 3.89 lakh per annum. The project would give an IRR of 350%. The bank loan (75% of project cost) can be repaid in 3 years with one year moratorium period.

Farm Model II: Paddy + Small dairy + Vermi-compost+ Hydroponics + Papaya + Vegetable (both with drip irrigation) + Fish farming

Integrated farming is taken up in a total land of 2.5 acres in this model. The farmer shall take up paddy in 1.0 acre in kharif season, mainly for sustenance of his family. He shall be encouraged to diversify to dairy farming in 0.2 acres, farm pond in 0.25 acres and vegetable cultivation throughout the year. Papaya, being a commercial horticulture crop, shall be taken up in 0.5 acres. He also undertakes hydroponics to provide green fodder for rearing livestock and vermi-composting to provide low cost manure, improve soil health condition and to reduce cost of cultivation. Wire mesh fencing shall also be done in 2.0 acres to encourage vegetable cultivation during Rabi and summer seasons. As commercial crops are taken up, a bore well shall be dug to cover a command area of 2.5 acres. The surplus water may be provided to adjoining farmers at a price. The total capital cost is estimated to be Rs. 6.06 lakh and recurring cost of Rs. 2.92 lakh. The total net income from all activities would be in the range of Rs. 5.01 lakh to Rs. 5.52 lakh per annum. The project would give an IRR of 526%. The bank loan (75% of project cost) can be repaid in 3 years with one year moratorium period.

Farm Model III: Paddy + Small dairy + Vermi-compost+ Hydroponics + Papaya + Vegetable (both with drip irrigation) + Fish farming+ Poultry farming

Integrated farming is taken up in a total land of 2.5 acres in this model. The farmer shall take up paddy in only 0.5 acre in kharif season, mainly for sustenance of his family. He shall be encouraged to diversify to dairy farming in 0.2 acres, fish farming in 0.25 acres, papaya cultivation in 0.5 acres, broiler poultry in 0.5 acres and vegetable cultivation throughout the year. He also undertakes hydroponics to provide green fodder for rearing livestock and vermi-composting to provide low cost manure, improve soil health condition and to reduce cost of cultivation. Wire mesh fencing shall also be done in 2.0 acres to encourage papaya and vegetable cultivation during Rabi/ summer seasons. As commercial crops are to be taken up, a bore well shall be dug to cover a command area of 2.5 acres. The total capital cost is estimated to be Rs. 6.67 lakh and recurring cost of Rs. 4.45 lakh. The total net income from all activities would be in the range of Rs. 5.01 lakh to Rs. 5.52 lakh per annum. The project would give an IRR of 331%. The bank loan (75% of project cost) can be repaid in 3 years with one year moratorium period.

VII. Critical Interventions in Integrated Farming Systems

There are certain components which play a pivotal role in ensuring the success of the farming system and to the farming community. These also help the farmer to reduce the cost of cultivation. Any reduction in cost of cultivation, in turn, helps the farmer in increasing the income. Any integrated farming system would be incomplete without the inclusion of the following components:

1. Livestock rearing

Livestock plays a critical role in the share of rural income in India, particularly, that of small and marginal farmers and landless persons.

Livestock rearing should be used as the fulcrum of any integrated farming model. The cow dung and urine have their applications in the field as manure as also in fish ponds as feed. Application of cow dung, cow urine in the field helps in improving the soil health status and also in reducing the cost of cultivation. This activity also gives the farmer the required cushion to tide over in the likely event of agricultural crop failure due to natural calamity or other factors.

The classical Indian farmer has a large number of non-descript cattle, including buffaloes, which fetch him poor income. The normal practice in villages is to set the cattle free in the morning for open grazing. The cattle find their way through scrub forests and wastelands foraging on poor quality grass. Their nutritional needs are not met and consequently the average milk yield ranges from as low as 250 ml to about 2200 ml per day. The total lactation period is also less than 280 days. No efforts are made for stock improvement.

For IFS to be successful, the farmer needs to reduce the number of poor yielding non-descript cattle and maintain only a few high yielding pedigree animals. However, the good quality animals are very expensive and the average small and marginal farmer is not in a position to acquire such animals. Also with a ban on slaughter in place in most states, culling of the existing animals is not an option.

To overcome these issues, it is suggested that a comprehensive breed improvement programme be put in place and the existing livestock may be improved through techniques like artificial insemination, embryo transplant, etc., which would be a cheaper and more effective way than replacement.

2. Farm Pond

The objective of doubling of farmer income requires availability of water for irrigation, undertaking pisciculture and meeting the drinking water requirements of livestock, namely cattle, poultry. Farm pond of suitable dimensions should be made an integral component of each IFS model to ensure availability of water. It has been observed that the farm ponds are used more like storage structures and ground water is pumped in to these. This practice should be strictly discouraged

and the farm ponds should be constructed such that the rain water is harvested and the surface run-off should be channelized in to these farm ponds. This practice will also help recharge the depleting ground water levels.

3. Fish pond

Fish pond, like livestock, gives desired vitality to the farming operation. The availability of water will help farmer to cultivate in the Rabi and summer season if critical irrigation is available. The farm pond can be used to rear table fish. A very lucrative proposition is to use the fish pond as a nursery to raise fish seed to produce fry, fingerling, yearling, etc., which fetch very high returns. Besides, the pond silt which has to be removed from the pond once in 3-4 years, can be used as excellent manure for farm crops. The top, inner and outer dykes of ponds as well as berm can be utilised for raising horticulture crops. Fruit plants like mango, banana, papaya, coconut, lime of dwarf stature can be cultivated around the pond. There is also scope for growing crops like pineapple, ginger and turmeric as intercrops in between fruit trees and also seasonal vegetables and flowers.

4. Hydroponics

Green fodder is one of the most important input in a dairy and plays a major role in ensuring feed for milch animals. The feed cost is about 70 to 75% of the total milk cost wherein green fodder constitutes 13 to 35% of the total input feed. Good dairy practices recommend that milch cattle be fed green fodder ad-lib, i.e., as per their wish. The National Dairy Development Board recommends that a cow yielding 8 to 10 litres of milk per day is to be fed 25 to 30 kg of green fodder during lactation, 4 to 5 kg of dry fodder and 4.0 to 4.5 kg of concentrate per day.

However, availability of green fodder is declining day by day due to various reasons. Hydroponic technology takes the pressure off the land to grow green fodder for livestock. The benefits and advantages of cultivation of green fodder using hydroponics are:

- **Nutritional benefits:** The green fodder grown from hydroponics systems is highly nutritious and of better quality as compared to conventionally grown fodder. In comparison to conventional green fodder, hydroponics green fodder contains more crude protein (13.6% v/s 10.7%) and less crude fibre (14.1% v/s 25.9 %).
- **More appetizing:** The green fodder is more succulent and tasty and animals relish it. The intake of hydroponics green fodder by dairy animals is more as compared to conventional green fodder and this results in dairy animals being in better health and resultantly giving higher milk yield.
- **Water savings:** The hydroponics system requires only 2-3 litres of water to produce one kilogram of quality green fodder as compared to 55 to 75 litres of

water required in the traditional or conventional system of green fodder cultivation. Apart from this, there is no wastage of water as the available water is also recycled.

- **Wider temperature range:** It allows green fodder to be grown at a wider temperature range of 15-33 ° C and relative humidity range of 70-80% without any fungal growth. The technology is environmental friendly.
- **Land requirement minimal:** Generally, the hydroponic system requires space of only 10 m X 5 m to grow 600-650 kg of fodder per day whereas to produce the same quantity of green fodder, one hectare of land would be required.
- **Easily scalable:** The hydroponics system can easily be scaled down to cater to the needs of farmers owning just two head of cattle!
- **Less labour requirement:** In hydroponics, the labour requirement is just 2-3 hours per day whereas under the conventional system the labour requirement is much more.
- **Less time to grow green fodder:** The nutritious green fodder cultivated under the hydroponics system is fed to cattle when the plants are at the optimal growth stage of just 7-8 days from seed germination when they are about 20 to 30 centimetre in height.
- **Higher bio-mass conversion rate:** In hydroponically grown fodder, the biomass conversion ratio is as high as 6-7 times that of the conventional fodder grown for 65 to 80 days.
- **Round the year production:** As the cultivation is under semi-protected conditions, green fodder can be produced all around the year using the hydroponics system to meet the requirements of the dairy unit.
- **Minimal losses:** Under the hydroponics system, as the plants are very tender, i.e., just 7-8 days old, the entire plant comprising roots, leaves, grain and the stem is fed to the animal and is also relished by it as it is very succulent!
- **Organic or natural green fodder:** The production of green fodder through hydroponic systems is completely natural no other inputs like pesticides that could contaminate the fodder are used in the production except plain water. This also results in the milk being of higher quality.
- **Faster growth and higher yield:** The hydroponic systems can produce the green fodder at a faster rate and result in high yield of fodder as compared to the conventional system of cultivation.

Simple cost effective strategies developed locally by the farmers by taking advantage of the basic principle of the seed germinating and growing for about 7 to 8 days using only water to small plants about 20 cm tall are available.

The cost of a wooden shade net hydroponic unit with daily fodder production potential of 30-350 kg fodder is about Rs.6000 to Rs.50000 while that of a GI pipe/ angle bar/ MI steel shade net unit with a daily fodder production potential of 150-750 kg is about Rs.25,000 to Rs.1,50,000.

Hence, for a 2 cow unit proposed for the IFS model, the unit cost for the wooden shade net hydroponic unit with daily fodder production potential would be about Rs.12,000 while that for a GI pipe/ angle bar/ MI steel shade net unit it would be about Rs.25,000.

Dairying has been included in all the models prepared for the small and marginal farmer as it not only provides income all through the year, but also helps reduce and even eliminate the expenditure on expensive inorganic fertilizers and pesticides as the farmer is encouraged to adopt organic farming practices including preparation of vermi-compost, Amrut Pani, Amrut Jal, bio-pesticides, etc., using cow urine and dung.

Farmers are encouraged to go in for the hydroponics system of cultivating green fodder especially in the summers so as to ensure a steady supply of green fodder all through the year for the dairy animals.



5. Fencing:

A common scenario in Indian villages is that cattle are released for free grazing, with some restraint being exercised during the Kharif season. These stray cattle intrude in to farm land and graze upon the standing crops being cultivated wherever water is available. If IFS is to be promoted, fencing the area taken up for commercial crops like vegetable, fruits, flowers, livestock and fish farming etc., is a necessity.

Fencing is generally undertaken by live fencing by planting thorny or bushy plants, constructing walls of stone, brick or concrete, wire mesh, using barbed wire, using strands of GI wire, electric wire, etc.,

It was observed by the study team that wire mesh fencing was the most common and economical fencing adopted by farmers in Chhurriya block.

6. Drip system:

Many areas in the country are water deficient and not having an assured source of irrigation. 'Save Water Campaign' is being aggressively propagated among the farming community. However, under the integrated farming system, water is required not only for agricultural crops but also for livestock and fish. Therefore, the farmer undertaking integrated farming system, has to undertake judicious use of the available water. The water saving devices like drip and sprinkler irrigation systems, would facilitate this process effectively.

7. Vermi-composting:

Vermi-composting is the usage of earthworms to convert vegetable and animal waste to a 100% natural manure. Vermi-composting benefits plants in several different ways. The most significant benefit is that the nutrients in earthworm compost are very easily absorbed by the roots of plants. Further, as the compost is passing through the body of the worms, it is enriched with bacteria and microbes. This helps plants become more disease resistant and also repel some plant pests. Also, as the compost works on the plants and they become healthier, the need for pesticides is reduced. On the contrary, continued use of chemical fertilizers and pesticides inevitably leads to a breakdown of the soil. Ammonia and salts build up which attack the plants making them less able to withstand disease. Also, earthworm compost contains hormones that help plants to grow. Germination of seeds is encouraged, the growth of the plant is stronger and the crop yield improves.

8. Bio Pesticides:

Pests and diseases account for huge losses in agriculture. Farmers are compelled to use expensive chemicals for pest control, which are more often turning out to be ineffective due to resistance being developed in the insect pests. To counter this, scientists are advocating Integrated Pest Management (IPM), which involves the use of mechanical, chemical, biological methods to control the pest population rather than eliminate it completely. Some of these methods are use of light traps, picking of larvae, planting of host crops, release of natural predators, release of bacteria and virus causing diseases in the pests, use of pheromone traps, use of sticky films, etc. Nowadays, a large number of farmers are adopting traditional pest control methods in which pesticides are being concocted using

extracts from plants, cow dung and urine, which are bitter or poisonous to pests. The composition of these concoctions vary from region to region as they made using locally available material. In Chhurriya block, ***Amrut jal*** is being made using extracts of Euphorbiaceae spp, neem leaves, neem oil, cow dung, cow urine, jaggery, Bengal gram (chana) flour, and water. The concoction is allowed to ferment for a month and then sprayed on the crops after being diluted.

VIII. Recommendations

1. The IFS model requires undertaking various interlinked activities mostly on a scale much less than that advocated presently by planners and agricultural scientists. Consequently, although subsidies are available for most of these activities, the farmer practising IFS is not able to access these as he is not undertaking the activity on the scale envisaged in the scheme guidelines drafted for the same. Further, it is not possible for a farmer, undertaking integrated farming to move around various departments scouting for activity based subsidy.

It is recommended that the government may consider providing subsidy for IFS models in a holistic way through a single window approach.

2. The activities under IFS are multiple and most bank branch managers are unable to visualize a project with multiple activities undertaken on a small scale. Consequently, bank finance is unavailable in most instances for farmers undertaking IFS. Even the KCC limit is very miniscule as the traditional crop cultivation is undertaken by the farmer on a small patch of land, generally about 1 to 2.5 acres.

It is, therefore, recommended that bankable models may be developed by each State and provided to the banks for financing. These bankable models may be prepared by NABARD taking into account the State, region and the agro-climatic zone.

3. There are certain key or critical components necessary for increasing farmer's income and bringing stability to agricultural operations. The key components like livestock farming, farm pond, hydroponics, vermi-composting, bio-pesticides etc., have been covered in chapter VI in the report.

It is recommended that these key components should be integrated across all the models so that the farmers are able to have a steady and sustainable source of income.

4. Similarly, since IFS involves undertaking agriculture operations all through the year, there is a critical need to ensure that stray grazing and wild animals are not able to enter the farm.

Hence there is a need to provide for fencing the plot of land preferably with barbed wire fencing.

5. The IFS models should also promote the adoption of water saving devices and promote the use of drip and sprinkler irrigation. It should also lay emphasis

on creation of community based bore well or open well and also water budgeting through formation of water user groups, etc.

6. Since IFS is undertaken by the small and marginal farmers, the bankable models would require funding support. It is suggested that a dedicated subsidy fund for popularizing IFS through bank credit may be established in NABARD, which will take upon itself the role of purveyor of the subsidy and popularizing IFS models.
7. A review mechanism may be established to monitor the progress of the credit linked IFS. At the national level, NABARD may be made the nodal department with participation from all the concerned departments like rural development, agriculture, fisheries, animal husbandry, etc., with a similar set up at the state level. At the district level, the DLCC/ DCC may constitute a sub-committee chaired by the District Collector with participation from the concerned departments and leading banks in the district. The committee will also scrutinize applications received for grant of subsidy.

IX. Conclusions

The pressure on Indian agriculture to provide food and nutritional security for its burgeoning population is becoming a daunting task in a scenario of plateauing genetic potential in all major crops and declining productivity of rain fed areas. The fragmentation of land holdings has also caused an acute shortage of green fodder thereby adversely affecting livestock and dairy farming. The rural areas are facing food and livelihood crisis, more specifically the shortage of fodder and drinking water. The declining size of landholdings without any alternative income augmenting opportunity is resulting in fall of farm income, and causing agrarian distress. A large number of smallholders have to migrate to urban areas or shift to non-farm activities to augment their incomes.

The Government of India has set for itself a goal of doubling farm incomes by 2022 through a multi-point strategy. One of the options to double farmer income and mitigate risk is the adoption of Integrated farming Systems. The principal components of IFS include soil health care, water harvesting and management, crop and pest management energy management, post-harvest management, choice of crops, farm animals and other components of the farming and information, skill, organization and management.

Sustainability is the objective of the farming system where production process optimized through efficient utilization of inputs without infringing on the quality, environment with which it interacts on one hand and attempt to meet the national goals on the other. The advantages of IFS include pooling and sharing of resources or inputs, efficient use of family labour, conservation, preservation and utilization of farm biomass including nonconventional feed and fodder resources, effective use of manure, animal waste, regulation of soil fertility and health, income and employment generation for many people and increased economic resources. IFS is part of the strategy to ensure sustainable use of the natural resources for the benefit of present and future generations.

IFS is a dynamic, gender sensitive, socially responsible, environmentally sustainable, location specific, farmer oriented and holistic approach, requiring effective farmers' participation to solve problems through diversified farming enterprises to avoid risks due to environmental constraints.

Implementation of IFS would ensure minimization of risk, recycling of wastes and residues, integration of two or more enterprises, optimum utilization of all resources, maximization of productivity and profitability, maintenance of ecological balance, generation of employment, increased input use efficiency and use of end products from one enterprise as input in other enterprise.

The practice of IFS has a positive impact on productivity by providing an opportunity to increase economic yield per unit area per unit time by virtue of intensification of crop and allied enterprises. Besides, it increases profitability by making use of produce or waste material of one enterprise as an input in another enterprise at low or no cost. Thus, by reducing the cost of production the profitability and benefit cost ratio works out to be high.

Further, IFS results in improved soil health, availability of balanced nutrition for the farmers family, while ensuring environmental sustainability, all round year cash flow, savings in use of energy, while meeting the farmers needs for fodder, timber, while at the same time reducing deforestation, and preserving the natural ecosystem.

The IFS have the potential to give a boost to employment generation by facilitating establishment of downstream farm enterprises such as livestock, allied enterprises, food and agro-processing, etc.

Keeping in view the GoI's goal of doubling farmer income by 2022, it is seen that in the case of farmers practicing IFS the net income is significantly higher by at least 15 times as compared to farmers undertaking mono-crop cultivation of paddy in a year.

To encourage farmers to take up IFS, there is a need for the Government to consider providing subsidy for IFS models in a holistic way through a single window approach. There is also a need to generate awareness amongst bankers, agricultural scientists, as well as farmers to promote financing of IFS and increase the availability of credit for the different components under IFS being adopted by individual farmer. There is also a need for bankable projects to be prepared for each agro-climatic zone and popularized for adoption. Since IFS is undertaken by the small and marginal farmers, the bankable models would require funding support. It is suggested that a dedicated subsidy fund for popularizing IFS through bank credit may be established in NABARD, which will take upon itself the role of purveyor of the subsidy and popularizing IFS models.