# Farm to Systems

The emergence and impact of Sustainable Integrated Farming System, an agroecological approach to improve small farms

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## IMPRINT

**Published by**
Welthungerhilfe India
A-3, Soami Nagar
New Delhi 110017, India

**Status**
April 2018



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**Supported by**
BMZ

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## Content

## Abbreviation

| | |
|---|---|
| **BDT** | Bangladeshi Taka |
| **CFC** | Common Facility Centre |
| **CGIAR** | Consortium of International Agriculture Research Centre |
| **DST** | Department of Science and Technology |
| **FAO** | Food and Agriculture Organisation |
| **FFS** | Farmer Field School |
| **FYM** | Farm Yard Manure |
| **GM** | Genetically Modified |
| **HEA** | Household Economy Approach |
| **HP** | Horse Power |
| **IAASTD** | International Assessment of Agricultural Science and Technology for Development |
| **INR** | Indian Rupee |
| **LEISA** | Low External Input Based Sustainable Agriculture |
| **NPR** | Nepali Rupee |
| **NTFP** | Non-Timber Forest Produces |
| **PDFSR** | Project Directorate for Farming System Research |
| **SIFS** | Sustainable Integrated Farming System |
| **SRI** | System of Root Intensification |
| **USD** | US Doller |

## Foreword

Diversity is life and life is diversity. This is true as much with regard to the health of humans as of our ecosystem. Earlier, life in rural areas was integrated, where balanced interaction between different elements of the ecosystem was common. The Green Revolution, with its focus on monocropping and cash cropping, led to the disappearance of diversity from farms, homesteads, village commons as well as from our plates. Recent evidence has increasingly pointed out the negative impact this has had on human health and the ecology. While malnutrition remains a grave problem worldwide, hidden hunger affects more than 2 billion people globally. The relation between diversity on farms and diversity on plates is direct and is the best way to combat malnutrition and micronutrient deficiency. Hence there is an urgent need to diversify and intensify agriculture through the farming systems approach.

Welthungerhilfe has been working on the Sustainable Integrated Farming Systems (SIFS) approach since 2011. The approach shifts attention from individual crop performance to increased system productivity; from monocropping to interactive relationships between different subsystems that emulate natural cycles; from dependence on external inputs to farm production of bio-inputs; from waste production to waste recycling; from overuse of agrochemicals to eco-friendly methods of pest and disease management; from market dictated production to individual farm planning based on available resources and from linear approaches to holistic closing of the loop in nature.

The impact of the SIFS approach on agro biodiversity, dietary intake, health status, farm income and ecological conservation has been very encouraging in Welthungerhilfe's intervention areas. The number of subsystems such as farmlands, homestead gardens, poultry, livestock, aquatic systems, biodigestor, forests and village commons and trees has increased up to eight over the years. About 650 hectares of fallow land has been converted to crop land and 850 hectares of single cropped land converted to double cropping. Pulses (Lentils) have been given preference in crop planning, leading to increased protein intake. The diet diversity score in Jharkhand, done in September 2014, showed about 70% women eating from at least five food groups. About 54% of the target groups showed doubling of their farm income from diversified sources.

I hope this booklet will add to the growing evidence on the importance of nutrition sensitive, biodiverse agriculture and its direct role in reducing vulnerabilities to climatic variations.

**Nivedita Varshneya**
Country Director, Welthungerhilfe, India

1

# The Emergence of Integrated Farming Approach[1]

[1]This chapter also has input from 1) 'BIOFARM : Action Research on Integrated Farming System - Ecology and Economics' edited by Parthiba Basu, Anshuman Das, Sunil K. Agarwal, KP Madhu from DRCSC/DST
2) 'Integrated Farming  an approach to boost up family farming', Anshuman Das, LEISA India December 2013

1 Back in the 1960s, the world was going through severe food crises. As we could no longer expand our production areas, the challenge was to increase the production and the productivity to feed the fast growing population. We needed to 'modernise' our agriculture and we needed new technologies. The Green Revolution ushered in with the promise of giving us more food by hiking up the productivity. It did so and it filled the granaries of India to such an extent, that the storage spaces became insufficient and food started rotting away.

In egg production, India slowly progressed to become the fifth in the world. From a poor developing country, India became an emerging economy in the early 21st century. But whether that food effectively reached the starving millions, is questionable. The high number of farmer suicides in the country bears witness to the crisis in its agrarian system and the failure of the government policies in providing decent livelihoods in the rural sector.

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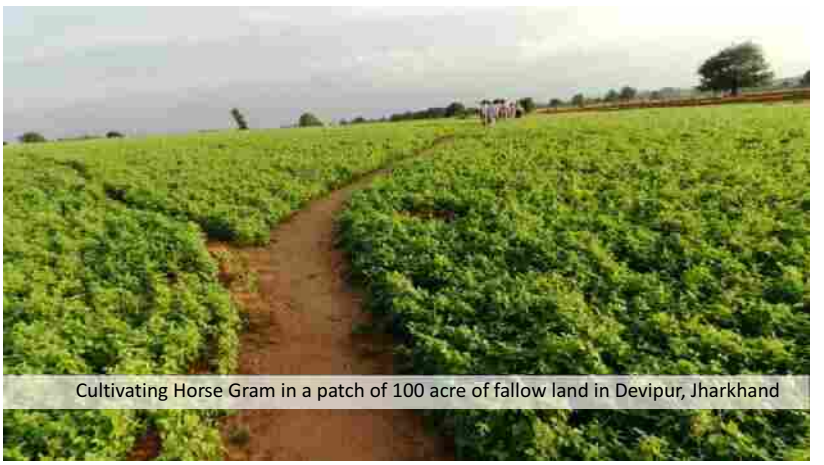
Over the past three decades, there have been a growing number of voices expressing concern about the impact of Green Revolution in agriculture. The Consortium of International Agricultural Research Centers (CGIAR), a consultative group on global agriculture and the fountainhead of an aggressive 'agricultural modernisation' in the early seventies, admitted flaws in the 'Green Revolution' strategy in a document published in 1988.

A rice field from Chittagong Hill Tracts from Bangladesh, during rain break in rainy season

The World Agriculture Report 2008, formally known as the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) report, gives a clarion call to move away from destructive and chemical-dependent industrial agriculture and to adopt environmental modern farming methods that protect biodiversity and benefit local communities. An Asian Development Bank Study (1977) found that the Wheat Revolution, at the cost of pulse and oil seeds production, has also led to nutritional imbalances among the poor. India's rich agricultural crop diversity is wiped out, thanks to the handful of high yielding and improved crop varieties that now dominate its farmlands. Those that are left, are threatened by genetically modified (GM) crops. Rampant use of chemical fertilizers has led to the degradation of soil and water, thereby drastically affecting productivity. Indiscriminate and erratic use of chemical pesticides has resulted in contaminating our food and ecosystem. Millions in the country still go hungry every day after three decades of the "green revolution". The scenario seems gloomier with the growing trend in corporatisation of agriculture towards worldwide economic restructuring has put the small and marginal farmers at a greater risk than even before.

Out of the 2.5 billion people in poor countries living directly from the food and agriculture sector, 1.5 billion people live in smallholder households. Many of these households are extremely poor: overall, the highest incidence of workers living with their families below the poverty line is associated with employment in agriculture (Smallholders and Family farmers / FAO 2012). But the smallholders play the most important role in world food and nutrition security as they produce the bulk of all food in the developing countries. Smallholders manage over 80 per cent of the world's estimated 500 million small farms and provide over 80 per cent of the food consumed in a large part of the developing world, contributing significantly to poverty reduction and food security (Smallholders, food security and environment /IFAD, UNEP 2013). They produce 70 per cent of Africa's food supply (IAASTD 2009a) and an estimated 80 per cent of the food consumed in Asia and sub-Saharan Africa together (IFAD 2011b).



Cultivating Horse Gram in a patch of 100 acre of fallow land in Devipur, Jharkhand

The small and marginal farmers own less than a hectare of land. This includes the field

and the homestead. They might own some livestock and a pond but do not have a capacity to make a living on a small piece of land. The market dictates them what to grow and sell. However, unable to produce sufficiently, some have sold off or leased out their land to big commercial farmers. Such farmers have become daily labourers or share croppers in their own land, or even migrated to cities in search of livelihood.

## Looking for options

Though the scenario seems grim, alternatives and solutions to these problems have been actively pursued in the past decades. The government, for example, is trying to cope with the bottlenecks of the Green Revolution technology, suggesting various input oriented corrective measures such as Integrated Pest Management and Integrated Soil Fertility Management, prescribed by various agricultural universities and research establishments.

Organic agriculture uses organic inputs which are respectful of the environment through all the stages of production, preparation, processing and handling. Organic agriculture can be practiced through several methods such as conservation agriculture, Vedic farming and Low External Input Sustainable Agriculture (LEISA).

Integrated farming, following agroecological approaches goes a step ahead, promoting a farm and food systems, which is concerned about the entire system that is used to produce and deliver food to the ultimate consumer. It is a production management following the agroecology principles system that attempts to provide a balanced environment, and in which a farm is viewed in a holistic manner. Practiced by traditional farmers, it not only utilises wastes and by products, but also the natural farm elements to save energy. The integration of the various farm components in a farm would ensure growth and stability in overall productivity and profitability. It also ensures recycling of residues, optimization of resources, mini-mization of risk and generation of employment.

An integrated farm in Chitwan, Nepal. The drum contains bio-pestrepellent

These options, however, have their share of criticism such as:

- These will not be able to ensure enough food to feed the world's growing population.

- There is always a lag phase during which there will be a drop in productivity when switching over to the sustainable production modes.
- The alternatives are not scale neutral as they are labour intensive, more so with the integrated systems. Such labour-intensive farming options would not be feasible on a large scale.

While the debate over the efficacy of these options continues, living conditions of farmers across various agro-ecological regions of the country remain dismal at the same level, and even worsening over time. Problems like falling productivity due to declining fertilizer efficiency, increasing pest infestation, soil degradation, along with increasing cost of agriculture input have resulted in food, nutrition, and income insecurity. Also, there is a growing concern over the effect of agrochemicals on public health have assumed alarming proportions, and are driving up the demand for safe food.

**Some Agroecological Principles**

- Sunlight is the major source of energy in farming.
- Plants can make food using sunlight, water, carbon dioxide and minerals.
- Animals, including humans, depend on plants for food.
- The food chain creates complex relationships between micro-organisms, plants, animals and the soil. This allows cycling and recycling of nutrients. Matter is not destroyed, but changes forms.
- The linkages between the components a food web create a situation where an individual that depends on other individuals or population, is also dependent on plants, animals and micro-organisms. The number of such linkages between these subsystems is a measure of the health of the system as a whole and the system's ability to survive during the crisis.
- Thus biodiversity is a measure of the strength of the ecosystem of its ability to be resilient to external shocks.

Hence the methodology of analysing a farm, whether it is ecologically sustainable and economically viable, also must depart from the conventional agronomical approach and, instead, be more ecosystem performance specific.

An initial attempt to launch such a study to test out various organic farming options through a 'Participatory Research Network' had been made, following a workshop in Pondicherry in 1997, and a subsequent workshop in Wardha, Maharashtra in 1998, under the active patronage of the Department of Science and Technology, Government of India. It ultimately culminated into the inter-regional study called BIOFARM, with a standardized methodology for implementation of such farming. 18 organisations came forward to execute the experiment. The experiment covered 14 different agro-ecological sub-regions of India with 18 Civil Society Orgnisations, between 2003 and 2008. The entire study called All India Coordinated Programme on BIOFARM, was coordinated by Development Research Communication and Services Centre (DRCSC) and supported by Department of Science and Technology, Government of India.

Meanwhile the government of India also took interest in the idea of systems approach in farming by establishing Project Directorate of Farming System Research (PDFSR), supported by the Indian Council of Agricultural Research (ICAR). It also initiated 'All India Coordinated Research project on Integrated Farming Systems' (AICRP on IFS)

A farmer in Devipur, Jharkhand, cultivating his degraded fallow land for the first time

through PDFSR and 31 on-station IFSR centres, and 32 on-farm research centres spread across length and breadth of the country. The project developed models for farmers, considering the amount of land by units in various eco-regions. But lack of resources and the fact that each and every farm is different, even within a same ecosystem limit a wide application of such models in various areas.

## The BIOFARM

The BIOFARM initiative developed and studied 300 farms in hot and humid agro-climatic zones across the country. Evidences from the field indicate that there has been an increase in crop diversity. In comparison to the baseline, 33% of the farms recorded 50 – 100% increase in species diversity. A significant increase in uncultivated macro-fauna was observed in some of the sample locations as compared to the conventional farm. An analysis of 300 farms showed an increase in net returns compared to baseline - more than 100% on 44% farms, 75-100% on 4% farms and 50-75% on 5% farms. However, on 36% of the farms, net profit declined. This was owed to initial investment in land shaping and livestock integration. More diversification of income was seen in the sub humid regions, followed by the semi-arid. Labour productivity also increased in most of the cases. It was heartening to note that the number of linkages improved significantly for most project locations. It was as high as 26 linkages in some cases. Also, the number of work days increased significantly from 4-6 months in the

Utilizing every inch of land in a paddy field by growing rice, fish and vegetables. Ranchi, Jharkhand

baseline to 9-12 months in the third year, reducing the period of stress.

## The Sustainable Integrated Farming System – SIFS

Based on the impressive results that emerged from the BIOFARM, Welthungerhilfe and its partners, in 2012, initiated extension of these learnings to 8000 small and marginal farm families through the Sustainable Integrated Farming Systems, (SIFS) programme, located in resource poor regions like dry areas of Jharkhand and West Bengal, terrains and hilly areas of Chitwan in Central Nepal and Chittagong Hill Tracts in Bangladesh. The focus of the BIOFARM programme was on developing the principles and tentative models, giving attention to technology development on individual farms. This phase of scaling up looked into the social capital processes intensively through the following measures:

- Mobilizing farmers into groups and extending benefits to not only farm production, but also marketing, as a collective initiative.
- Farmers are taken through a process of capacity building based on Farmer Field School (FFS) principles. This is done through sessions on crop/ tree management, soil and water management, soil nutrient management, pest and disease management, livestock management and multilayer designing. The sessions are organised in the farms of the group members on a rotational basis.
- Farm analysis and designing take priority in this phase. Each farm is analysed with the individual farmer, in the presence of other farmers of the group, to understand the existing production cycles, the available resources and the periods of scarcity of food, fodder, firewood, and drinking and irrigation water. The season wise activity plan is developed according to this.
- It also looks into the possibility of generating support from existing government schemes (in India) for creating common facilities such as irrigation.
- Common facility centre is formed to process and add value to the farm surplus, so that after value addition, products are sold in the local market.

The SIFS approach also includes science and practice of agroecology, which is a relatively new paradigm which looks in to the farm and food system from a holistic perspective. The following chapter discusses about the methodology, tools and impact of the approach adopted in the programme.

2

# The guiding principles of SIFS[2]

[2]This chapter contains input from 'A facilitators' manual on SIFS' by Anshuman Das, Welthungerhilfe. Available on www.welthungerhilfeindia.org

One can learn about diversity from natural ecosystems such as forests and rivers. Forests and aquatic systems are self-supportive ecosystems which have formed symbiotic relationships with dependent communities/components. Its main factors are diversification and proper recycling of waste. In commercial farming, only a few types of vegetables are grown and large areas are planted with only a small variety of crop. This uniformity makes it easy to manage, but also makes the production system unstable and vulnerable to pests and diseases. Diversity in plant species and crops cultivated keeps pests away and can play an important role in preserving food habits and cultural traditions.

The concept of SIFS has developed from the idea of imitating nature through collaboration, multilayer arrangements and energy recycling, by carefully combining different elements. In SIFS, overall production, income and nutrition (food and fodder) are enhanced and diversified both in terms of quantity and quality. The incidence of risk is reduced and the system becomes energy efficient as a whole. It also integrates various techniques like soil water conservation, energy security, rainwater harvesting, cropping sequence management and multitier arrangement for better management of space and utilization of time by increasing cropping intensity and decreasing fallow periods.

SIFS involves following three main principles:

### (1) Cropping sequence

An appropriate cropping methodology has to be followed so that there is:

- Less competition for food: This is achieved by a combination of low, medium (e.g. herbs) and heavy feeding crops (e.g. cereals, fruits) as well as soil building plants (legumes).
- Space available for proper root system: The roots of different plants attain different depths, so a proper combination of plants with different root depths helps minimise inter-crop competition for soil nutrients.
- Longer duration of cropping season: One of the main aims of SIFS is to minimise the lean period in the field. The intercropping should be done in such a way that the field never remains vacant or unproductive.
- Pest control: Companion crops are useful in pest control. Proper selection of some trap or pest repellent crops as part of the mixed cropping can reduce pest attacks considerably.

### (2) Multi-storey arrangement

Most natural ecosystems in tropical regions are multi-level arrangements. High levels of interaction between biotic and abiotic components and multiple

Mixing crops - Chittagong Hill Tracts, Bangladesh

energy exchange routes make a natural ecosystem resilient, self-maintaining and highly productive. Moreover, productivity improves over time, unlike, agro-ecosystems. If farms and gardens are redesigned to mimic the structures and functions of natural ecosystems, they will be more practicable and sustainable. The three rules regarding multi-storey farming are:

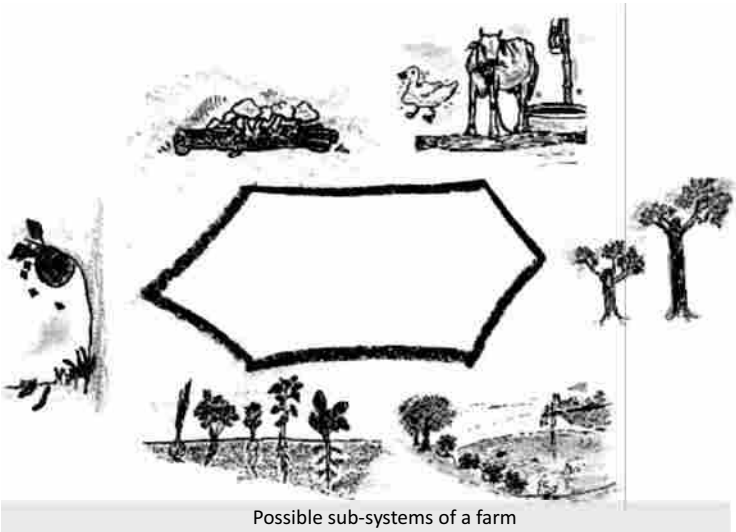
- The crops should be planted in ascending order of height from east to west, so that each plant gets equal sunlight.
- The roots of the planted vegetables should be of different types and draw water and nutrients from different layers of soil.
- The vegetables should be identified in such a manner that the food security of family is effectively maintained, i.e. combination of leafy vegetables, cereals, legumes, etc. so that:
- The total available area is effectively used.
- The cultivated crops get adequate soil sap.
- The plants get the sunlight they require.
- The plants cooperate with each other during growth.
- Soil fertility remains intact.

A garden with a multi-storey arrangement - Devipur, Jharkhand

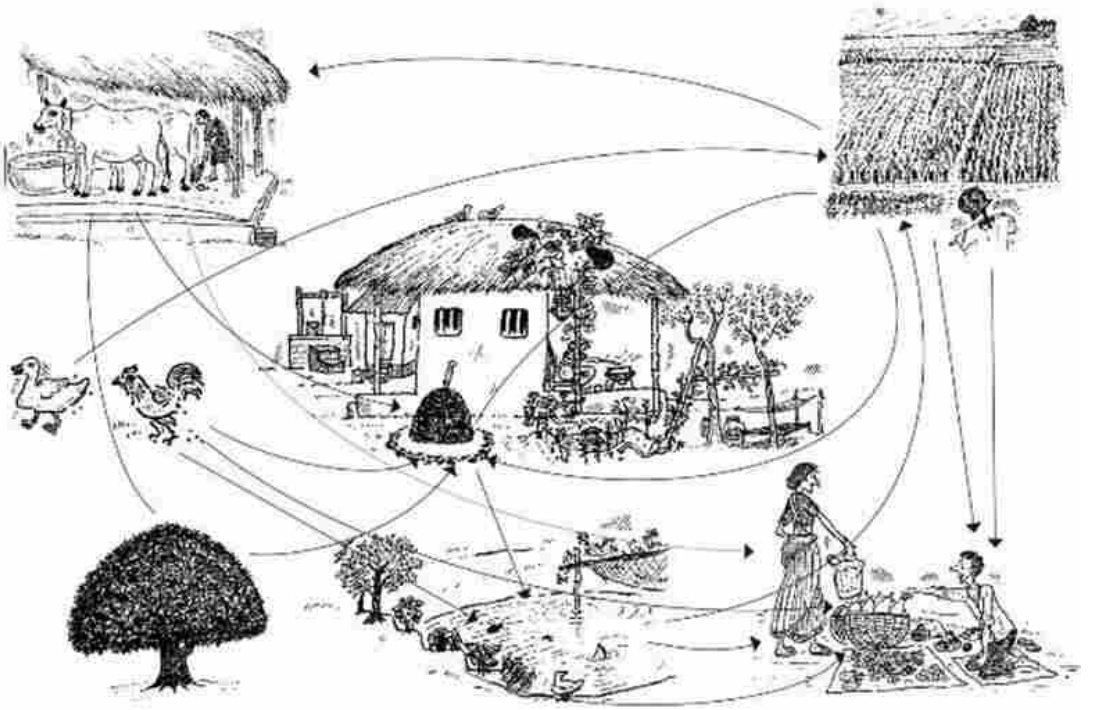
### (3) Integrating subsystems and various components

Next to diversification, integration is the most important aspect of sustainable resource management. In ecologically integrated farming systems, closer integration is attempted within each farm, garden and pond etc. at the level of nutrient exchange as well as at the functional level. Therefore, inter and intra subsystem linkages are established.

Animals such as pigs, rabbits, goats, cows, chicken and ducks can be introduced to obtain waste products as a source of nutrients and other functional inputs. It is very important to carefully select the different components so that they interact positively, e.g. chickens can be destructive in a vegetable garden, but in a fruit orchard, they can keep the pests and weeds under control. In a garden some



Possible sub-systems of a farm



The resource flow in an ideal integrated farming system

plants, birds or animals are deliberately introduced, while other living things grow by themselves or appear if a suitable environment is created or food, water and shelter are provided. The focus of SIFS is integrating the following elements into the production system:

- Birds and animals (wild and domestic)
- Perennial plants (wild and domestic)
- Aquatic plants and organisms (wild and domestic)
- Micro flora and fauna (mushrooms etc.)
- Insects (wild and domestic)
- Seasonal and annual plants (wild and domestic)

Other important principles of the SIFS model are:

(4) Replacing fossil fuels with renewable energy

(5) Treating soil as a live medium and abandoning the use of synthetic pesticides and biocides

(6) Looking for opportunities in problems, examples include trying out water hyacinth and other aquatic weeds as mulch and composting material, using termites to feed chicken and fish, utilising pond bottom silt to improve sandy soil or rice husk ash to amend clayey soil.

# 3

# Methodology

## 3 3.1. Farm Planning[1]

As discussed earlier, each farm is different from the other, even if they are physically close - because of the resource profile, the need, and the knowledge and skill of the owner which vary from farm to farm. Each farm is unique, and so is the farm planning for every farm. In the SIFS programme, a simple step by step methodology has been developed to plan each farm.

Farm planning contains a series of exercises with groups of farmers and individual farmers on:

Step 1 - Understanding Seasonality (in group)

- What is the seasonal availability and scarcity of food, fodder, firewood, drinking water, irrigation water and cash? What is the variation of disaster/shock, rainfall and temperature? How does one cope with scarcity? How does scarcity impact the nutrition status of the farmers?
- What is their opinion about new crops and new possibilities to address the scarcity?

Step 2 - Understanding Seasonal Production (in group)

- What is the seasonal calendar of production in the lowland, homestead and upland? What is the seasonal status of collection from the wild and things sold in the market and things to be processed?
- Do they see any problems now, such as insufficient diversity, large gaps or missing market links?
- Do they change/rotate crops in consecutive years?
- Do they see any change in production over the years, particularly in relation to the climatic phenomena in the previous exercise?

Step 3 - Drawing a village resource map (in group)

- Identify the lands with irrigation facilities, the lands which are common, the lands where crop grows once/ twice/thrice a year, and lands from where they collect food items and the water resources.

*"I never knew that a small piece of land could give me so much of security. I am now looking forward to transfer the knowledge to my other group members so that they too can avail the benefits of the integrated farming systems."*

- Umraching Marma, Bangladesh

- Encourage discussion and ask the participants to suggest ways to improve the situation such as changing single crop to double crop, double to triple crop or fallow land to cropland or about joint initiatives that can be taken in a common land.

Step 4 - Know your food (in group)

- Discussion about food groups
- Bringing food items and classifying according to food groups
- Identifying the gaps and exploring agricultural practices that can help address them.

[3] For details, 'A facilitators' manual on SIFS' by Anshuman Das, Welthungerhilfe. Available on www.welthungerhilfeindia.org

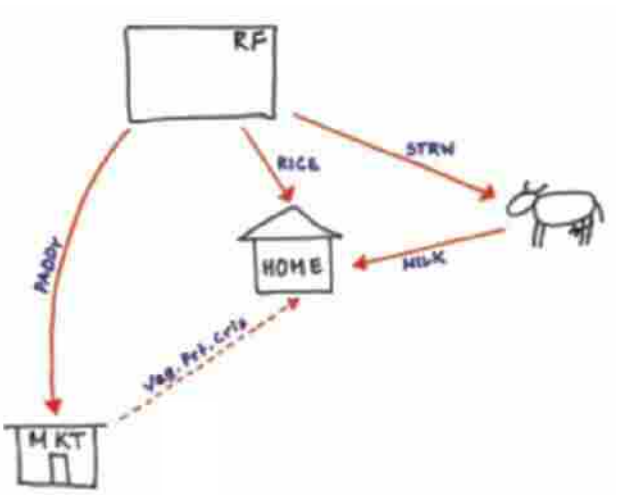
### Step 5 - Introducing the idea of SIFS through a resource flow diagram (in group)

- If waste of one component is used as input for others (through composting), the fertilizer input cost is reduced
- Even within one system (e.g. pond) many other sub systems can be introduced (e.g. : elevated structure for creepers, steps on the bank) for better space utilization
- If diversity of systems, components and species is increased, a family also is likely to get diversified nutrition, and income throughout the year.
- If planned properly, the nutritional and fodder needs should be met by such a system.
- How to plan the production system keeping the above points in mind? What are the challenges in doing it? What kind of capacity building is needed for this? What are the types of input requirements for such a system?

### Step 6 - Assessing resources

- How many resources (low land, upland, poultry, big trees, farm equipment, family members, homestead space, pond, livestock and compost/agro waste) do they have? How do they use it? Is there a better way to utilise their resources?
- Consider ploughing frequency, distance of farming areas from household, weeding style and frequency, transport after harvest, soil water conservation techniques, existing farm inputs, role of livestock and type of soil
- What is their need? Are these resources enough to fulfill the needs?
- How can the output from these be maximized, especially in the periods of scarcity?
- Does integration of different subsystem help?

### Step 7 - Visioning exercise through discussion and drawing resource flow diagrams




Stage 1 : Current Stage

This is the current production system, which usually has a Rice Field (RF), which provides rice for household consumption. Some paddy is sold in the market and the straw are used to feed the cow. The cow gives milk which is consumed by the children of the family.

Stage 2 : The future farm

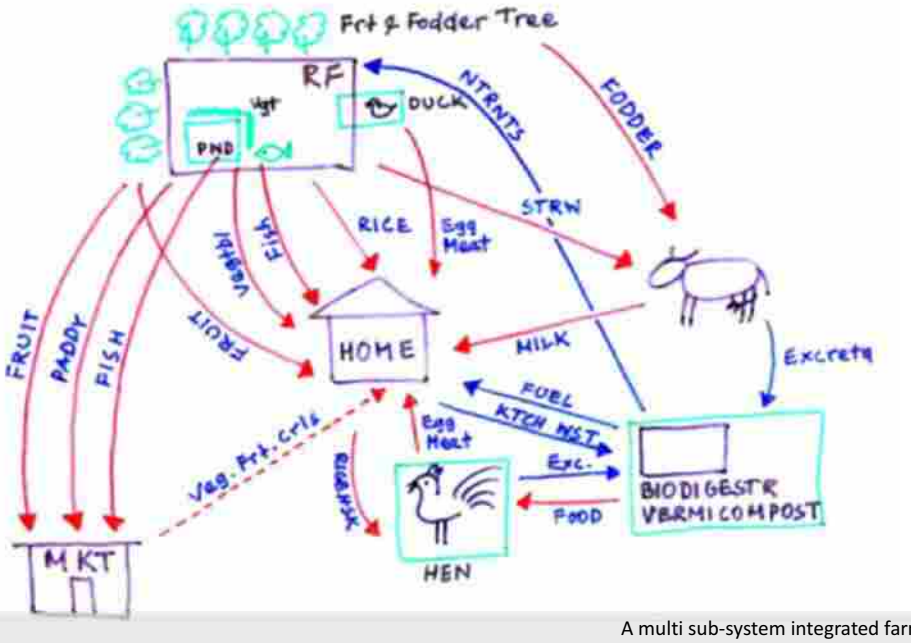
To introduce some simple changes. For example:

- Digging a small pond in the low lying area of the paddy field
- Raising the bund of that pond to cultivate vegetables
- Introducing fruit and fodder tree in the

bund of the rice field

- Introducing fish and duck in the pond
- Introducing compost pit and poultry

Explain the participants how the diversified production system can reduce the cost and increase production and earning.




A multi sub-system integrated farm

Ask the participants if they can design a similar type of production system according to their available resources.

### Step 8 - Plan of action

- Asses the stress calendar, nutritional needs and available resources from the previous exercises. The rows on the calendar denote summer, monsoon and winter. The columns denote farmland, homestead garden, wild collection, water body, poultry, livestock, orchard, food processing and marketing. Asked the participants about crops that can be grown in each category of production in each season. Link it with the seasonal calendars, scarcity and resources.
- Discuss under the following heads:

  Farm land - soil health, water management, crops, trees.

  Garden - soil health, water management, crops, trees throughout the three seasons.

  Wild collection - soil health, water management, crops, trees in common lands.

  Waterbody - fish, feed, crops on trellis, trees on bund all through the year.

  Poultry - feed, shelter, storage and use of waste products all year round.

  Livestock - feed, shelter, storage and use of waste product all year round.

  Orchard - soil health, water management, crops all year round.

Processing - What are the things that can be processed in all three seasons?
Marketing - What are the things that can be marketed throughout the three seasons?

The process is very empowering, as the farmers start to identify their resources, their strengths and stresses and learn to plan accordingly.

So far, this methodology had been tried out, with slight variations as per requirement, in all the project locations, in more than 3000 farms. During implementation, it was observed that farmers tend to talk more about agronomical problems and solutions, rather than going deeply into the planning process. However, those who did go deeper, realized and acknowledged that planning helps identify unused resources and have a holistic view on the farm. At the beginning it requires a considerable amount of time, which however reduces gradually when farmers help others in planning their farm.

## 3.2. Scaling up by Farmer Field Schools

It was often noticed that training sessions by an external trainer did not produce the expected level of learning. The main reasons observed were the lack of same energy level of the trainee and the trainer, less practical, hands on work, experience and the lack of recognition of the trainees' potential. As SIFS talks about local knowledge, and the farm design is very area specific, it was important to bring in collective knowledge. The role of the trainer was thus considered more than that of a facilitator. Experience had shown that when a farmer trains other farmers, all the pre-conditions of a

A Farmer Field School session in Devipur, Jharkhand

Community monitoring session in Chittagong Hill Tracts, Bangladesh

participatory training are met – both the trainer and the trainee were at the same level, trainings were more practical and the environment for the collective knowledge building was created. Farmer to farmer learning is a system that values the ecological and financial needs of the farmer, first and foremost, where the farmer plays a central role in the entire process.

Under the SIFS project, a curriculum[4] for farmers had been developed on i) farm planning methodology; ii) technical skill building on crop, soil and water management, farm design, pest management, livestock management and energy; and iii) community monitoring. All these were put on a flip chart to be used by a farmer trainer.

A farmer trainer was selected from a farmers' group, who was willing to conduct trials of new technologies in his own field, and has good communication and leadership skills. After getting trained by the facilitator on the same curriculum he then imparted training to the other members of the farmers group, using his own field as demonstration field. Though there were specific sessions to be followed, it was the farmers' group that decided on the date, time, and venue, as well as specific topics of discussion and sequence of topics.

The success of this approach was based on the integration of the principles of learning-by-doing, farmer-led learning activities, problem-posing and problem-solving and working together. Farmers found the training relevant because the main learning ground was field and not closed-door class room. It also increased a sense of ownership amongst farmers and ensured sustainability. All the 8000 targeted farmers under the SIFS project are now trained, as the project managed to create about 150 farmer trainers. Welthungerhilfe has a plan to

[4]For details, 'A facilitator's manual on SIFS' by Anshuman Das, Welthungerhilfe. Available on www.welthungerhilfeindia.org

Community monitoring session in Bankura, West Bengal

further scale it up to 30,000 small holders through its Green College programme in India.[5]

## 3.3. Community monitoring

Community monitoring is an already established way of tracking progress of any action and do mid-term corrections. In addition, setting a target is always helpful to ensure that one keeps going in the right direction. Keeping this in mind, a tool based on the wheel diagram was developed to help farmers set their own target and monitor it. The *Wheel* helps in visualizing and comparing multiple ratings/scoring. The technique is useful when one needs to organize information, compare the views of different parties, assess the same element or situation at different points in time, identify priorities or expectations, and evaluate the process of learning over time.

Ten criteria were initially developed for a successful farmers group and then tested with few others. Taking into account their feedback, the following criteria were finalized.

1. Group/cooperative activities: Extent to which farmers are active in groups, cluster groups, common activities and joint actions like farming in common land etc. In case of a group, the criteria refers to the overall status of the entire group.
2. Soil and Water (SW) conservation methods adopted: How SW conservation methods are integrated in the farm, from field bunds, to rainwater harvesting, mulching, using compost, semi-circular bunds, zero tillage farming, diamond bed, double digging bed, pitcher irrigation, circle bed etc.
3. Number of subsystems: The number of subsystems (Biodigestor, Poultry, Livestock, Tree, Crop, Aquaculture) owned by the farm.
4. Inter subsystems resource flow: The number of linkages (indicating integration) between the various subsystems
5. Number of biodigestors: From biogas plant, to vermicompost pit, compost Pit, liquid manure, farm yard manure, green manure etc.
6. Diversity of crop and cropping techniques: Gradation of the farm in terms of the diversified crop elements

[5]Green College programme has set up 17 colleges for the rural youth for capacitating and monitoring them to become an eco-prenuer on rural green trades under sustainable agriculture, aquaculture, NTFP, livestock, poultry and food processing.

present. Crops may include fruit, legumes, leafy vegetables, cereals, medicinal herbs, tuber crops, spices etc. Cropping techniques include mixed cropping, intercropping, crop rotation, relay cropping etc.

7. Training received: Types of training a farmer undertook. SIFS is about multiple skills - a yearlong training approach was adopted with FFS. Broadly, the skills covered are : 1) analysing stress, livelihood cycle, resources, capacities and correspondingly planning an own farm model 2) Various soil nutrient management methods 3) Water management methods 4) Horticultural component in the homestead and field 5) Backyard poultry management including feed 6) Small livestock management including fodder 7) Pest/disease management of crops/livestock throughout the stages of growth 8) Soft skills on group development and value chain
8. No external food input: The quantity of the external food input (vegetables, proteins – everything that is required for a balanced diet) purchased from the market.
9. No external farm input: The quantity of external farm inputs (including seed) purchased from the market.
10. Income by selling product: Measurement of 'how far cash need is met from market linkage income' – distress selling is not taken into consideration.

For each criteria, farmers were supposed to give a score from 0 to 5 (low to very high) and add it to the web in the diagram. The same will be repeated in 6 months.

It was observed that there was a lot of discussion and debate during the scoring part, which is the most important part of the exercise. Many shortcomings and successes were pinpointed as reasons behind that scoring, thus helping in planning for the future course of action. This activity also sets the agenda for the monthly meetings.

### 3.4. Strengthening Local economy[6]

Achieving efficiency in order to make individual profit has always been important to many human activities. The current industrial development paradigm and

Common Facility Centre managed by farmer groups in Bankura, West Bengal

[6]Has taken reference from Nayak, Amar KJR. Optimizing Asymmetries for Sustainability, Seminars at the Planning Commission, Government of India, New Delhi (Jan 2009).

Leaf plate making in Bankura, West Bengal

market focused economy re-emphasise this idea. However, it also creates a vicious circle of inequality, where wealth is increasingly accumulated by a very small section of the society. If we consider the case of the rural economy, the small holders, who form the larger part of the rural society, produce most of the food items for their family and for the market. But in general, they do not take part in the market transactions, and remain in the lowest part of the value chain only as a provider of low-cost input. The reasons behind this are:

- The markets are generally far from their villages.
- Having a simple mindset, they can not understand the complex dynamics and market relations.
- The scale of operation is also very small in case of individual farms.

The lack of clarity and understanding of the complexities of many of these issues have pushed the marginal and small farmers, along with other rural producers, out off the market system.

Through the project, we have tried out strengthening and formation of cluster level local community institutions to collectivies the farm surplus, add value and ensure marketing of the items. The project has established 10 such Common Facility Centres - CFCs so far. These are run as sustainable community enterprises, which are community owned and managed. The CFCs aggregates small holder farmers to achieve economies of scale, establishes strong market linkages, and strengthens value chains, thereby boosting the rural economy.

A market shade for SIFS farmers in Chittagong Hill Tracts, Bangladesh

# 4

# Case Studies

## Renupada Bagdi, Birbhum, West Bengal, India (DRCSC)

The district Birbhum in West Bengal has close associations with Rabindranath Tagore. Here, the Nobel laureate poet and social reformer tried out his ideas of rural development and cooperative. Renupada Bagdi hails from the same district, about 50 kilometers away from Tagore*'s* university town Santiniketan.

As rent for utilizing a two acre land, he shared half the profit with his landlord. It came to around 20,000 INR / 300 USD a year. With the other half of his income and some additional earnings, he had to maintain a family of five, invest in 1/6 acre of land for cultivating some rice once a year and feed his only cow and 2 bullocks.

In a desperate attempt to overcome his challenging situation, Renupada adopted the techniques of integrated farming in 2012, using the advantage of linking multiple resources and recycling every drop of biomass generated out of his production system.

Initially it was difficult for him to convince his landlord to switch to organic methods of cultivation; but last year, he successfully persuaded him, and sowed single stick paddy, which gave better production. He, then, also tried grass pea on 1/3$^{rd}$ acre of the shared land as relay crop without any investment for water or fertilizer. He not only got fodder from the plant but also 1.5 kg of grass pea for his own consumption.

In 1/6$^{th}$ acre of land, which was once mono-

Renupada and his wife is harvesting organic tomato

cropped, he now cultivates paddy and black gram, and soya bean in the field dyke in rainy season. In winter, he grows lentils, linseed and mustard as mixed crops. As, in both seasons, he uses only organic input, the water retention capacity of the soil has improved. His nutrition garden, growing in less than 1/6th acre, on a fallow land by the railway track, is now productive throughout the year, with no cash investment. The entire farm input, in terms of fertilizer and pest repellents, comes from recycling the biomass he is getting from his livestock, plants and other agro-wastes. He cultivates ten to fourteen varieties of crop every season and most of the production goes for consumption. This enriches daily diet intake as well as nutritional status of the family, and also saves 20 to 25 INR/ 0.4 USD daily on daily vegetables.

*"Yes, I got little less paddy in my organic field in kharif, compared to the two acres of chemical farming (11 quintals as opposed to 13.5 quintals) – but my net income is huge(7400 INR per 1/3rd acre as opposed to 1430 INR), as I have no direct cash investment"*

He now has two cows, two bullocks, one calf, two goats, a sheep and fifteen ducks. The feed for three livestock and birds comes from the straw, mustard cakes, pulses and agro-waste from his own production. He collects every drop of the dung/droppings and recycles through vermicompost and biogas plant, which are the key elements of success. The eggs are often sold to the market. With the support of DRCSC, the bio-gas plant saves 50 INR per day towards fuel consumption and also reduce the drudgery of the women from cooking in the smoky kitchens. The slurry is used in the vermicompost. When one compares the output of biogas in economic terms, it is almost 4 times the value of its recurring input cost. About 109 quintal of cow dung has been recycled annually by Renupada through biogas for producing fuel for cooking, Vermi-feed (for vermicomposting) and organic inputs for the farm. He is also involved in aquaculture with a group of farmers in a leased pond and his share of earning is 4250 INR / 65 USD annually.

His approach of looking into the production as a holistic system with multiple resources, and carefully linking them through biomass recycling, has resulted in ensuring sufficient nutrition for the family and sustained production. His annual profit is now 62,222 INR / 930 USD from 6 various sources. He saves 19 types of vegetable seeds for future use.

## Khepu Hembram, Bankura, West Bengal, India (DRCSC)

Khepu Hembram, belongs to one of those indigenous communities who were traditionally hunter-gatherers and coexisted in harmony with nature. However, over the

[7]While looking into more details, it was noticed that the major cost of production incurred in the chemical plot was for agro-chemicals (581 INR per 1/3rd acre), tractor and water (860 INR) and labour (3000 INR).

Khepu integrates livestocks in his farming

past 300 years, his ancestors were unfortunately drawn into the quagmire of two 'anti nature' trends of agriculture – the first being, adopting the mono-cropping system and adopting food habits based on rice and wheat; and the other, to get involved in a conflict with nature by cutting down trees for making room for agriculture with chemical inputs. Khepu, who lives with his wife and two sons, was also living in this dilemma of whether to accept or reject these two prevailing trends.

*"I have harvested good amount of vegetables for my food and feed for my animals and birds. I also came to know about livestock care and their usefulness for improving agriculture."*

For a subsidiary income, he was largely dependent on his livestock which comprised of four cows, two bullocks, two calves, three ducks, three hens and twenty one sheep. He also had about an acre of ricefield, which was cultivated twice with chemical inputs.

In 2012, he attended training sessions by DRCSC and became a member of the farmers' group. After being introduced to the concept of single stick paddy cultivation[1] with organic manure, Khepu tried it on 1/12$^{th}$ acre of land. Satisfied by the result, in 2013, he extended organic paddy cultivation in the entire land during monsoon season, with a most of the area by single stick. Earlier, Khepu needed 6 kg of seeds to get 5 quintals of paddy per 1/3$^{rd}$ acre. In case of single stick, he used only 350 grams seeds in the very first year and got 4 quintals of rice. The yield increased in the consecutive years.

Khepu was very keen on learning mixing crops of different families so that they can benefit each other. He learned and managed it so well that in the winter of 2013, he produced 1758 kg of 19 types of vegetables on 1/3rd of an acre. For seedlings, he spent 210 INR. The rest of the cost (fertilizer, seed and labour), amounting to 6000 INR / 90 USD, was generated from his own farm. He earned 24000 INR / 360 USD during that season. He continued through the summer of 2014, with earnings of 3500 INR / 53 USD. He stored all his seed and exchanges within the farmers' group.

Livestock remains his key source of income. For farm animals, he does not purchase any feed from outside. He manages it from straw, mustard cake, pulses, agro-waste, and even food waste and leftovers. He collects cow urine and uses it in the field for preparing fertilizer and bio pesticide. His cow shed has been structurally improved for better collection of waste and well-being of the animals. He sells milk, chicken meat and egg regularly and sheep and cow occasionally. From these, in 2013, he earned about 47,500 INR / 710 USD. The value of his existing livestock is around 1,66,700 INR / 2500 USD. Khepu also has biogas plant, which recycles cow dung to produce slurry and fuel. According to him, Vermicompost, is the most economic component of his farm, which produces quality fertilizer (6Q on average, 4 times a year) and healthy feed for chicken and duck in the form of earthwarms harvested in the pits.

According to his calculations, he has worked 317 days in his farm, which is a measurement of labour days generated. After including this imputed cost, his net profit is 78456 INR / 1200 USD annually. It is also interesting to note that the entire cost of production (barring a few seedlings), is generated from his own farm.

## Krishna Bahadur, Shaktikhor, Chitwan, Nepal

Krishna Bahadur harvesting four season beans

Krishna Bahadur has the responsibility of making provisions for the upkeep of four family members including two school-going children. He owns 0.26 hectare of land. Due to limited farm size and income opportunity, his family often faced hard times to manage their basic needs of education, health and other cash requirement. He even used to take food grain as loan from the money lenders and return it after a new crop with high interest.

Integrating kitchen fishery in farming in Nepal

Krishna received trainings on nursery management, foliar fertilizer, pesticide preparation, kitchen fishery, improved livestock shed construction, seasonal and off-season vegetable production, and fruit farming through the SIFS project. He received support for small irrigation by plastic insulated pond. He initiated vegetable farming on a small block. Later, he was supported with the improved variety of vegetable seeds and technical support. In the first year of the project, he cultivated beans (var. *Chaumase*), and in the second year he also grew Yardlong beans and kitchen fishery[8] on the farm. Krishna, himself, through various trials, has solved the problems he faced in vegetable farming – he started producing his own seeds on his farm and prepared organic liquid fertilizer and pest repellents.

Before joining the farmers' group, Krishna used to apply chemical fertilizers and pesticides. He now uses foliar fertilizer and pest repellents prepared from the goat droppings and locally available weeds and gets healthy products with increased production. For household consumption, he now gets various vegetables in sufficient quantity from his garden. He also produced 450 kgs of bitter gourd in winter season of 2013 from which he earned 9,000 NPR / 85 USD. During the September-November of 2014, he earned 72,500 NPR / 684 USD from beans. He is now the chairman of the farmers' group in the village and trains other farmers on the technologies and ideas about improved vegetable farming. Krishna has also started saving money after spending on basic household needs and has saved 60,000 NPR / 566 USD over the last three years. Continuing his endeavour, and wishes to focus more on vegetable farming as he thinks that vegetable farming is more profitable than cereals production.

## Usha Gurung, Shaktikhor, Chitwan, Nepal (Forward)

Usha Gurung is a young farmer. Her husband works abroad as a migrant labourer. Farming in 0.33 hectare of land was her main source of income to feed her two children. Besides, she has fifteen goats and two oxen for ploughing. Through traditional subsistence farming, it was difficult to maintain these assets and cash need.

Usha showed interest in becoming a

[8]A small pond within the homestead garden to raise fish for nutritional need and for critical irrigation during summer to vegetable garden.

Usha starts vegetable cultivation on her farm

member of the Dhanbari Multipurpose Farmers Group. She actively participated in trainings such as nursery management, foliar fertilizer, organic pest repellent preparation, kitchen fishery, improved livestock shed construction, vermicompost preparation, goat farming, seasonal and off-seasonal vegetable production, and fruit farming. Through the SIFS project, she received improved vegetable seeds and technical support.

In the first year of the project, she grew beans (var. *Chaumase*) and tomato. In the second year, she cultivated cauliflower, cabbage, onion and chilly as cash crops. In the third year, she started seed production of beans (var.*Chaumase*) and planted the improved variety of forage and fodder in her land for feeding livestock.

A farm on the terrace in Nepal

Usha, who used to buy vegetables, is now selling them. However, she thinks that the production is not up to her expectations.

*"In three years, I am able to enhance knowledge and skills in vegetable farming, and have been able to generate profit. So, I will extend the area of vegetable farming, which will be the major source of my household income"*

She earns almost 40,000 NPR / 380 USD from vegetables and 80,000 NPR / 755 USD from livestock annually. Because of better quantity and quality of feed for her livestock, her income has improved considerably. After covering all expenses, she has also managed to save certain amount of money in the cooperatives. Today, she is one of the most successful vegetable farmers in the village and the chairperson of a farmer group. Being a leader of the farmer group, Usha also provides trainings to the group members and motivates them to get involved in farming by adopting modern technologies. Usha is planning to enhance numbers of livestock and the area under vegetable production by adopting SIFS technologies. To her delight, her husband is planning to come back from Qatar and become a full-time farmer again.

Improved cowshed for collecting urine

## Nandlal Singh, Sonaraithadi, Jharkhand, India (Pravah)

Nandalal Singh is a marginal farmer living with five family members. He owns 2.5 acre of land. Till 2011 he had practiced chemical intensive traditional monoculture of paddy, maize during the rains and wheat and potato in winter. Most of his upland remained uncultivated. As a result, the profit margin from his farm remained negative and he was unable to recover his investment in the farm. In the year of 2011, his situation worsened, when he had to marry his daughter off, by mortgaging his 1 acre of land. In the same year, Nandalal left his house and migrated to Chennai to work in a factory.

In 2012, during holidays, he came back for a while and attended SIFS orientation in the village and decided to adopt and practice integrated farming system in his

farm. He received training, ten ducks and support for the extension of his farm pond, biogas (partly), compost pit and a zero energy cool chamber[9].

*"I want to develop an agro horticultural model on near about 6 acres of waste land of our village with my other colleagues of SahyaogKishan Club and want to do voluntary service for scaling up IFS concept by providing capacity building training to other farmers of my area."*

In the rains of 2012, he started practicing improved Kharif Paddy Stabilization[10] technique on 0.5 acre of land and introduced intercropping of Maize and Pigeon pea on 1 acre and traditional crop of finger millet on 5 decimal of land using line sowing method. He produced 11 quintal paddy, 4 quintal maize, 5 quintal pigeon pea and 20 kgs of finger millet. He increased the intervention area in the next year. After introducing cow pea, rosselle and pearl millet as new crops, in the third year, he produced 20 quintal of Paddy, 1.5 quintal each of maize, finger millet and pigeon pea, 1 quintal of cow pea, 40 kgs of rosselle and 70 kgs of pearl millet. This shows that he had really embraced the idea of diversification. In the same plot, he started practicing System of Root Intensification (SRI) with wheat in 2012 and gradually went on to produce 6.5 quintals of wheat on 60 decimal of land, 55 kgs of chick peas and 50 kgs of mustard through intercropping on 20 decimal of land. His homestead garden now produces a variety of vegetables throughout the year such as bottle gourd, ridged gourd, cucumber, maize, brinjal (aubergine), chilli and leafy vegetables. The land which remained permanently fallow, has been slowly converted to cropping land, with intercropping of maize, pigeon pea, roselle and finger millet in rainy season. In winter season with the help of Lift Irrigation[11] and farm pond (supported by the SIFS Project), he cultivated wheat and mustard on 20 decimal lands through mixed cropping and chickpea and oilseed on 0.15 acre land through intercropping. In the third year, he also increased his area of cultivation to wheat on additional 0.3 acre using SRI.

The importance of livestock is now realized by Nandlal. He renovated his cowshed[12] - so that he can collect 4-5 liter cow urine per day and use it for preparing fertilizer and bio pesticide. His cows are also safe from diseases, as they now live in a cleaner environment and are vaccinated regularly. He even started using the droppings of his pet pigeons in his farm. Further, 10 ducks, which gave about 350 eggs in the first year, began to lay up to 550 eggs in the third year. To supply good quality fodder, he started

[9]Zero energy cool chamber is a double walled chamber created for providing cooling effect to keep vegetables fresh for long.
[10]Refer good practice document in SIFS by Welthungerhilfe
[11]A pumpset is attached to a collection/intake well beside a river to irrigate the nearby land. The water percolates from the river to the intake well.
[12]Improved cowshed is a major good practice in the project, visit www.welthungerhilfeindia.org

growing fodder grass on 0.1 acre of land and also azolla, an aquatic fern.

His farm pond has changed into an integrated production unit with duckery unit over the pond, fodder trees and vegetable on the bund for his own consumption. Apart from providing 1.5 quintal fish in the 3rd year, the pond also provides life-saving irrigation for six acres of land.

Chicken shed over a pond to recycle poultry waste

To be self sufficient in fertilizer, Nandlal started with one vermicompost unit and produced 6 quintal compost in the first year. In the Second year, he produced 15 quintal vermicompost and 10 quintal of pit compost. He added biogas in the third, with subsidy from the government, which helped reduce fuel cost for cooking twice a day for the entire family. He also sold 20 quintal vermicompost and 2000 earthworms.

Nandlal's family now gets 2-3 kinds of vegetables throughout the year. There is no shortage of food now. They also get animal protein at least twice a week.

His cost of production (cash needs for production) has reduced to about 27% to 14500 INR / 217 USD in the 3rd year, whereas cash income increased by 77% to 82725 INR / 1235 USD.

## Ghanshyam Singh ,Sonaraithadi, Jharkhand, India (Pravah)

Ghyansam Singh is a small farmer having only 0.6 acre of land and 1 acre of leased land and 6 family members are dependent on him. He did not have the capacity to buy livestock, so he had to depend on chemical fertilizer from the market. He used to grow paddy and maize during rainy season and wheat on 0.2 acre land during Rabi. Practicing of mono cropping on the same piece of land throughout the year was resulting in degradation of soil and increased pest attack and diseases. On other side, increased market price of fertilizer, seed and pesticide was directly affecting his cost of production. In 2012, it became very difficult when government reduced the subsidy on chemical fertilizer. High cost of fertilizers made his condition extremely vulnerable.

During orientation of the SIFS Farmers' Club

in his village, he came to know about the concept of SIFS, and was willing to give it a try. He learnt about farm planning and different techniques like SRI, SWI, intercropping, preparation of organic manure and biopesticides. But cow dung and urine – one of most important materials

*"Life has truly changed for us. Until a few years ago, we were not making enough to even feed our children but these days we are successfully managing our field, cultivating a flourishing kitchen garden and have learnt superior techniques of growing food. Also, making compost has proved to be a real boon."*

for organic fertilizer was not available to him. He started collecting cow dung from the field and grazing area and established a vermicompost unit. Till the 3rd year he was producing 24 to 27 quintals of vermi-compost per year.

Since 2012, he has significantly reduced the use of chemical fertilizer on his land and increasingly adopted diverse farming practices as well as homestead and kitchen garden. From kharif 2013, he started cultivating paddy in Kharif Paddy Stabilisation method at his own 0.4 acre land and 1 acre of leased land and intercropping of Maize and cow pea with live fencing of roselle on 0.1 acre lands.

Through a common lift irrigation system, Ghanshyam converted his seasonal fallow land by intercropping of chick pea and oilseed, mixed cropping of wheat and mustard in rabi, and mixed cropping of finger millet, pearl millet, sorghum and pigeon pea in kharif.

Within three years his situation improved. Earlier he used nearly 1.5 quintal of DAP and urea and pesticides of 250 INR / 4 USD throughout the year in his own 0.6 acre land. In 2012, he used only 75 kg urea and DAP. Since 2013 he has totally stopped the use of chemical fertilizers. After consumption, he sells surplus products in the market and earned an extra 10000 INR / 150 USD per annum. Introduction of kitchen garden has helped him to reduce the annual expenditure on green vegetables. Now he is utilizing his land fully for raising suitable field crops and vegetables. He is recycling all farm wastes and crop residues in the system. He has recently bought a cow and two goats, and has begun to cultivate fodder on 0.05 decimal of land and produce azola for feeding his livestock.

## Chuduwa Bediya, Ranchi, Jharkhand, India (SPWD)

Chuduwa Bediya is a farmer who belongs to a tribal community. The produce from his farm was not sufficient to maintain his livelihood throughout the year. He often had to work in stone mines in a nearby town to earn his living. Like others, his land also has uneven and rolling topography, consisting of uplands and lowlands. It had low fertility and was generally dependent on monsoon. Chuduwa has two acres of lowland, two acres of upland, 1.5 acres of homestead land and few livestock. Lands remain fallow most of the time after kharif due to unavailability

Chuduwa working on his vegetable farm

of water and open grazing.

Chuduwa used to cultivate traditional variety of paddy in low lands with an average yield of 3 quintal/acre, for his own consumption. In the upland he was growing maize with pumpkin. In winter, he cultivated rapeseed and tomato in the upland. The soil nutrient management was only from Farm Yard Manure (FYM) which was inadequate for his entire land. Poor water holding capacity of the soil, lack of irrigation facility and high cost of cultivation further exacerbated his woes, forcing him to migrate regularly in search of livelihood, particularly in summer (February to May).

Through the SIFS project's, he has started using better seeds. He now grows multiple crops in the same field, cultivate cash crops like pea, potato, and off season vegetables like tomato as summer crop, and does mixed cropping in kharif (rainy season), like maize with beans. Chuduwa has also slowly adopted organic practices such as FYM, Biodung, vermicompost, vermiwash, liquid manure. He has gradually started giving importance to livestock and aquaculture as well.

Before adopting integrated practices, his crop production was limited to maximum four to five quintals/acre of paddy, which was barely sufficient for his own consumption, and to few vegetable which gave him only 4000 INR / 60 USD by selling in the market, and was hardly sufficient for his family. Presently he is getting eleven to twelve quintals/acre of paddy from low land and medium land during kharif, which is used for his own consumption. He also sells surplus beans, tomatoes and bitter gourds which he grows on the 0.3 acre of upland, after taking out portions required to feed his family. During 2014 winter, he got INR 25000 / 380 USD

*"Earlier I used to get very low price for the produce from the farm, but now I am getting more price and my produce gets sold as soon as they are brought to the market. The quality of my farm produce showed me the path."*

profit from 0.6 acre of homestead land by cultivating potato, cabbage, tomato, pea, with organic practices. He used the money to purchase a pump set of 1.5 HP for irrigation purposes in his crop field. His field's soil profile has improved in terms of water holding capacity and humus content. He doesn't have to work in stone mines any more.

*"I am now a happy man as I can see my children going to school and I can feed my family, livestock and birds without taking loan from the money lender."*

## Prabin Hansda, Purulia, West Bengal, India (SPWD)

Prabin Hansda is a resident of village Brawadih with three acres of agricultural land. There are 15 members in his family. To feed his big family, he migrated to different places, with his family members, in search of livelihood after the kharif season. Agriculture was rainfed and lack of irrigation facilities could not ensure him regular produce. Climate hazards like drought every alternate year, intensified the uncertainty of getting a regular crop yield.

He had trees in his farm, but was not aware of using the trees to generate farm income. He reared livestock, but during migration he was forced to give them away to other people. He could only cultivate paddy on his two acre of land in kharif season. His total cost of cultivation for paddy was INR 8000 / 120 USD and production was 20 quintals which supported his family for 6-8 months.

In 2012, he became part of the farmers' club when SPWD started to implement Sustainable Integrated Farming System. After group formation and training, he started preparing compost, both solid and liquid manure, at his farm to supply nutrient to his soil regularly and slowly changed his monocropped farm to mixed crop. He started using trees as fodder, mulching and making bio-pest-repellents. He also introduced lac cultivation. He reared

Azolla, a green manure, is also used as fodder and feed for animals.

livestock earlier, too, but after the intervention, care for feed, health and housing of his livestock improved. The rearing of birds has accentuated the farm income. The sale of eggs from birds has ensured cash flow to his household. The cultivation of azolla as feed has improved the health condition of his livestock and birds.

Since 2013, Prabin has been using SRI techniques on his one acre of land. As a result his yield doubled compared to the previous years. He uses crop residue such as straw as feed for cow and also as an ingredient in vermi bed and biodung. Apart from this, with the support from the project, he has made a small water reservoir for irrigation, particularly during the rabi season, when he practices mixed cropping of pigeon pea and ground nut. He has now reared four cows, eight goats, nine ducks and thirty hens. The farming components support one another; and reduces external inputs. For instance, the crop provides animal feed for the livestock, and the livestock dung is converted into different forms of fertilizers (manure) for the crop. Moreover, their waste is also used in a biogas plant to produce fuel for household cooking.

Now the members of Prabin's house do not suffer at the time of crisis as they are now keeping reserves for the crisis period. Prabin doesn't take lone from money lenders any more, rather he supports other farmers in times of crisis.

## Sulochana Devi, Deoghar, Jharkhand, India (AVF/CWS)

Farming in India is a male dominated sector, where women are hardly recognized for their work, despite their regular and intensive involvement in the field and at home. Sulochana Devi, a mother of 3 girls has broken the stereotype and become one of the popular farmers in her village. The project SIFS has brought a significant change in her life.

Sulochana's tough times began a few years ago, when her husband Maheshwar, got mentally ill and was unable to work. It had been difficult for her to take care of the family and manage her 1.6 hectares of farm and about 0.2 acre of homestead land and 0.6 acre of fallows. Apart from the farm, she had one cow, one ox, one goat and 8 trees.

Sulochana gets 22 kinds of vegetable from her farm

She had hardly any resources to invest in the farm to improve production. In addition to the small piece of paddy farm, she had to work in the fields of others, as wage labourer, to earn living for her family. Often she wished to grow more crops on her field to feed her family well and earn regular income, but she realized that farming in its present form required higher inputs and money which she didn't have.

*"We don't buy anything from outside, other than salt and sugar to eat. Small changes in my farm have put the things together, and presently I am getting more than 22 kinds of vegetables, spices and fruits from my backyard."*

The SIFS orientation started with her engagement in Jyoti Sakhi Samuh, a self - help group formed in her locality for thrift and credit activities and sustainable agriculture practices. The idea of SIFS, as illustrated in the Farmer Field School learning material, appealed to her and subsequently, she attended several training activities of the programme and learnt to prepare compost, liquid manure and pest repellents using plants and bio mass available in the locality. She has now set up 5 bio digesters that include one vermicompost pit, two heap method compost units, two circle gardens, and liquid manure and green manure preparation units. A farm pond has also been developed and a trellis system has been established which is a regular source of vegetables for home. The surplus is sold to open market. She has also bred livestock mostly through small saving investments. In the shadow area, Sulochana, along with other women of the village, has for the first time taken up group initiative for cultivation of turmeric and ginger in about 6 acres of land. The surplus production has helped them establish a micro enterprise in self-help mode for production and marketing of turmeric powder, gram flour and puffed rice using the services of a common facility centre set up in the nearby Goslidih village.

The project SIFS has changed Sulochana's attitude and outlook towards farming and helped her to establish herself as one of the successful farmers in the village. With successful installation of all six subsystems and integration among these subsystems, she has been able to ensure year long food availability at home from her own farm production. Inspired by the initial success, she has invested in small livestock and plantation at home, putting some of the group savings to scale up the enterprise. Her annual income from agriculture and selling of produce developed at home has increased from zero to INR 42000 / 630 USD and this, she says, has helped her to marry off her youngest daughter last year. Further, by reducing external input in her farm, she is able to save INR 9000 / 135 USD per year. As a farmer trainer, She has trained about 20 women in the locality on SIFS approach and encouraged them to follow the practices. The journey was never easy, she recalls, "Two years ago, when I learned about SRI method of rice cultivation and applied it in my fields, everybody at home was angry with me as the initial growth was very slow, and the field looked empty, but the end result was encouraging, as it almost

increased rice production at my home by 1.6 times, which was the highest ever. This time during the sowing session, I was away from home and everyone waited for me to return to show them how to sow paddy with line sowing method." The rice parboiler[13] has further helped her to parboil about 2.5 tonnes of paddy single-handedly without much fuss.

Sulochana, now, plans to utilize all her fallow plots by using energy efficient measures, like pitcher irrigation and plantation to retain soil moisture over longer period. She wants to focus more on improving the production and finding solutions to the manure requirement using bio mass available, as the cow dung is limited. She also looks forward to grow some fodder crops for steady supply to the animals. The micro enterprise of turmeric and roasted chick pea flour has generated sustained income in lean season and she looks forward to increasing the volume of production and better marketing of these produces.

## Basudeo Singh, Deoghar, Jharkhand, India (AVF/CWS)

Basudeo Singh, a marginal farmer and a father of eight children had been struggling to cope with the food and income challenges. Despite his hard work, the production was not enough to feed his family throughout the year with a total wage and agriculture income of INR 28000 / 420 USD per annum. Often, he used to migrate to nearby towns with local transporters for 4 to 6 months every year. But SIFS has changed his outlook to the farming approach and provided the much needed solution to income and food security at home.

Basudeo was introduced to SIFS in 2012 through the SRI Farmers' Club. There he learnt about components of sustainable integrated farming approach through training and exposure to nearby demonstration farms. This motivated him to start these interventions at home. With project support and his own labour, he

Mix cropping of millet-maize-pigeonpea

[13]See good practices of SIFS at www.welthungerhilfeindia.org

constructed a farm pond with duck house near his house. Later on, he also constructed vermicompost and heap compost units near the pond, and added fish in the pond with a light trap. The process increased the number of linkages instantly, as the waste from every component was converted as feed to other subsystem. This also helped him take up all season crops around his farm pond. The farm pond success further encouraged him to adopt various cropping techniques such as line sowing, mix cropping and integrated pest management which also improved the crop diversity. Compared to the two major cereal crops, and 4 to 5 kinds of vegetables he produced earlier, he now produces three major crops (rice, wheat, maize) with pulses (pigeon pea, horse gram and split green gram) and oilseeds now. He has introduced new crop varieties like sunflower, fenugreek, cluster beans and kidney beans adding to the diversity of diet at home. He has also taken up cultivation of turmeric and elephant foot yam in his farm, under the shades of trees and vegetable creepers over the duck house to fully utilize the space.

*"While working away it was difficult for me to take care of children and it was a lot of burden on my wife to run a household with little savings I could manage to send her. The SIFS approach has not only improved the income and production but it has ensured good food for children at home. This has given me a new recognition, farmers from nearby and distant locations frequently come to visit my farm and learn from it. I feel happy to help them with my understanding and experience."*

In the uplands, Basudeo has about 30 trees, from which he used to collect fuel wood for home. Often when he burnt wood, he saw colourful flashes because of the presence of lac inside. Realising that So, he could identify that the trees were natural host to the lac insects, he began to breed them to ensure better production of lac. SIFS approach has changed the life of Basudeo in many ways. He has completely dropped the idea of migrating to other locations in search of work and is now continuously working to increase his production and income from farms. The earlier idea of increasing production through high inputs has now been replace by increasing diversity of farms and reducing the cost of farming by increasing recycling of waste materials.

The integrated model with pond fetches him an annual income of INR 34000 / 510 USD from sale of ducks, duck eggs, fish and vegetables. Presently, he sells duck for INR 300 to 350 / 6 USD and duck eggs at INR 10 per piece, which has become a regular source of income for him. Ducks are very popular in his locality as some of the communities do not eat chicken and prefer duck by habit. With composting, he has

been able to save about INR 6800 / 101 USD that he earlier spent on purchase of fertilizers.

With early successful experiences and farmer club engagement, Basudeo was able to mobilize a 5 HP diesel irrigation pump and a paddy thrasher at 50% subsidy under Mukhyamantri Kisan Khushhali Yojna, a scheme by the state government. The farmers' club also helped him get 25 fruit plants from National Horticulture Mission and he invested on his own for more plantations. He has expanded the lac cultivation to 12 more trees and increased the number of ducks from 4 to 30.

Basudeo is now a successful farmer and people treat him with respect. He has recently become Chairman of the local School Managing Committee.

## Happy Marma, Khagrachhari, Chittagong Hill Tracts, Bangladesh (Anando)

Happy Marma has elderly parents and three brothers and sisters. She has studied up to grade 12 and earns her livelihood by farming. Happy has 30 decimal of homestead land and 80 decimal of crop land. Earlier she had planted vegetables but not in a planned manner. Later, through the project support, she planted 20 lichi plants, 19 m*ehgoni,* 38 lemon, 38 betel nut, and 150 pineapple plants with a contribution of 20% from her side, in a planned approach. Along with these, she also started growing mixed vegetables such as radish, spinach, pumpkin in a planned way. 15 banana plants were integrated with this as cash crop.

Currently, using various agriculture technologies, she reported that her production has increased. For example, in 2014, she earned BDT 3000 / 39 USD from banana, BDT 4000 / 51 USD from vegetables, BDT 10,000 / 130 USD from fruits and BDT 19000 / 245 USD from paddy. She could also prevent land erosion by planting bamboo and saved her land from going into the river. She earned BDT 10,000 / 130 USD by selling bamboo and bought a cow. Selling goat, hen and pigeon has added BDT 17500 / 225 USD to her last year's income. Now she owns 4 cows, 10 pigeons and 8 goats and 6 hens. In future, she wants to raise fish in a small pond within her farm, so that her income is multi-sourced.

Happy in her farm

## Pulak Narayan Tripura, Khagrachhari, Chittagong Hill Tracts, Bangladesh (Anando)

Pulak Narayan Tripura, is an educated youth but could not manage to get a job. And he was ashamed of doing farming. Anando, after seeing his homestead, which was lying fallow, encouraged him to take part in the initial orientation of SIFS approach. Slowly, motivated and involved, Pulak started growing crops in his fallow land, roof, and boundary of the house. Bamboo brought an income of BDT 15000 / 200 USD, planted in the fallow land.

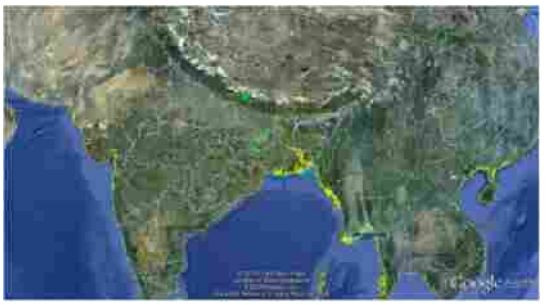
He also reared cows, pigs, hens and ducks and took interest in fish cultivation and earned BDT 10000 / 130 USD last year, by selling fishes. 20 decimal of his land is being used for gardening of fruits. Through the support of SIFS Project he now has 40 lichi, 38 betelnut, 38 lemon plants and 19 trees of mehgoni. He planted papaya and banana on his own and started growing vegetables too. He earbed BDT 30,000 / 385 USD by selling a cow and a pig. All these initiatives have helped him become self-sufficient.

He plans to expand his fruit orchard and plant trees such as mango, wood apple and banana and buy a pump to irrigate his land.

Cow shed with manure production unit in Bangladesh

5

# The analysis of outcome and impact



The outcome and impact reported here are contributed by the participating organizations in India, Nepal and Bangladesh and Welthungerhilfe South Asia. The data used for drawing conclusion are generated from the primary sources through regular project monitoring, self-evaluation by the farmers and diaries maintained by the farmers. Along with the technical support from Welthungerhilfe, the main implementing organisations in the project were:

1. Anando, Bangladesh
2. FORWARD, Nepal
3. Development Research Communication and Services Centre (DRCSC), India
4. Society for Promotion of Wasteland Development (SPWD), India
5. Centre for World Solidarity (CWS), India
6. Pravah, India

In the process, the project also involved

- Keystone Foundation as a resource organisation for promotion of organic certification for the farmers
- Association for Sustainable and Holistic Agriculture (ASHA) for developing web platform for marketing of produce
- In Nepal, FORWARD co-partnered with Himalayan Bio-dynamic Trust (HBDT)
- In India, CWS co-partnered with Abhivyakti Foundation

The project targeted 8000 small and marginal farmer families, in dry areas of eastern India and hilly areas of Nepal and Bangladesh. During the project period, we could cover 8495 families (total area covered 4144 Hectare) grouped into 315 farmer groups (70 in Nepal, 170 in India and 75 in Bangladesh). 29 federated structures with represen-tatives of these farmers group with similar interest (marketing, processing) had also been formed in all the 6 project areas.

| | Households | Farmer Trainers | Women Farmer Trainers | Farmer Groups | Cluster Groups | Area covered (ha) | Fallow land converted to crop land (ha) | Single crop to double crop (ha) |
|---|---|---|---|---|---|---|---|---|
| Forward Nepal in Shaktikhor and Siddhi VDC of Chitwan | 1513 | 70 | 34 | 70 | 6 | 666 | 120 | 60 |
| SPWD in Ranchi District in Jharkhand and Purulia in West Bengal, India | 1000 | 24 | 3 | 34 | 6 | 230 | 30 | 82 |
| Anando in Rangamati and Khagrachhari Sadar in Chittagong Hill Tracts, Bangladesh | 2158 | 12 | 4 | 75 | 4 | 459 | 238 | 149 |
| CWS in Devipur block in Deoghar, Jharkhand, India | 1524 | 21 | 4 | 21 | 2 | 826 | 78 | 72 |
| DRCSC in Bankura and Birbhum District of West Bengal, India | 800 | 17 | 2 | 65 | 2 | 363 | 34 | 54 |
| Pravah in Sonaraithadi block of Deoghar district of Jharkhand, India | 1500 | 25 | 1 | 50 | 9 | 1600 | 150 | 453 |
| **Total** | **8495** | **169** | **48** | **315** | **29** | **4144** | **650** | **850** |

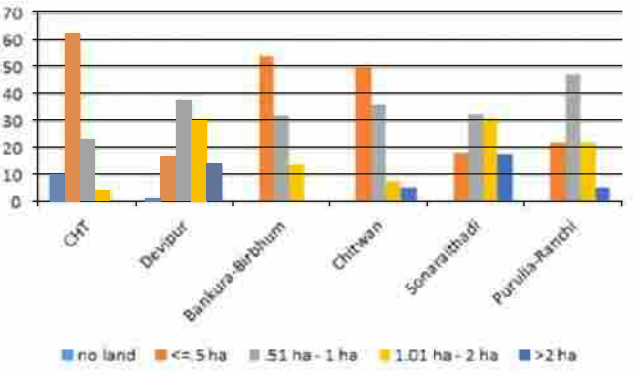
## 5.1 Before the intervention

Using the Household Economy Approach (HEA), 6 analyses were conducted in 2012 in different project areas to understand the condition of the available resources, their utilization and other related problems, particularly with reference to livelihood. The baseline suggested that most of the project areas were dominated by poor to very poor people from Schedule Caste and Tribes, belonging to small and marginal farming communities, who owned not more than 0.3-0.45 acres with overall productivity of 1000 kg/acre on average. Lands were mostly infertile and non-irrigated; rainfed rice was the only crop with insufficient availability for consumption. Focus on paddy limited the diversity of diet, even in the complementary feeding of the children. To cover the food shortage, seasonal migration and daily wages were the major options as per the income pattern. The analyses showed limited input of primary production such as agriculture and livestock in the income package. In hilly areas, all the households had some farm products to sell in the market, though not following any regular pattern. Often illegal trading of wood was also reported in poorer section. The habit of saving and taking loan was also quite evident from the study. There were

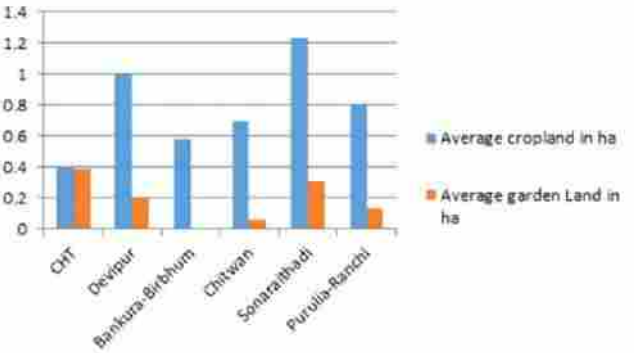
families who were food insecure throughout the year with a peak in the time when there was no harvest. During that time, a large part of the community consumed less than 1800 Kcal in a day (as an example, in Bangladesh, 88% of the very poor households in valley and 70% in hill had less than 1800 Kcal). Collected meat/fish as food had been reported in some areas, though it's intake showed a reducing trend with the steady degradation of forests and common lands. The contribution of agriculture in the total income was as low as 6.1% in Jharkhand (India), 7% in West Bengal (India), 13% in Chitwan (Nepal) and 5% in Chittagong Hill Tracts (Bangladesh).

## The asset status

The distribution of land (X axis) in a particular location, with the % of farmers in Y axis is shown in the Graph 1. Landlessness was an issue in Chittagong (10%) where no one had more than 2 hectares of land. The dry area of Jharkhand (Devipur, Sonaraithadi, Ranchi) followed a similar distribution pattern with most of the people (37%, 32%, 47%) having land between 0.5-1 ha, while some owned more than 2 ha. Whereas, in the areas where water situation was better (CHT, Bankura-Birbhum, Chitwan), a large population has less than 0.5 hectares of land and very few owned a large amount of land.



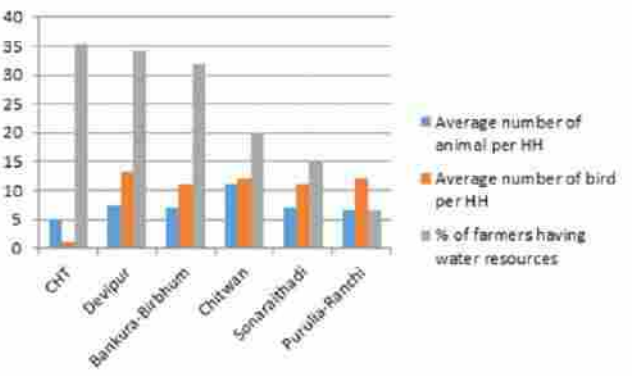

Graph 1: Land distribution across project areas




Graph 2: Land use pattern across project areas

The Graph 2 shows average amount of cropland and land along with homestead, with Y axis showing the amount of land in hectares. It shows amount of land in CHT was less and homestead land and cropland were same. This also suggests that horticulture and vegetable had a larger role to play. In Bankura-Birbhum, people didn't have homestead land at all or they were not using the homestead land for the purpose of production. Bringing those fallow lands under cultivation was designated to be a major task. Dry areas had larger land where major crops grown were cereals, pulses and oilseed with vegetables on the homestead.

Graph 3 shows average number of animal (goat/cow/pig) and poultry bird per household and the percentage of household with access to water resources with Y axis showing the number as per legend. It was evident that unlike CHT, livestock had a major role in economy in dry areas of India and Nepal. In CHT, the main focus had been on agriculture, while Chitwan (Nepal), in spite of having a good amount of rainfall, has less number of water bodies, perhaps due to sloppy nature of the land. In general, it was notable that only 25-35% farmers on an average had access to water there.

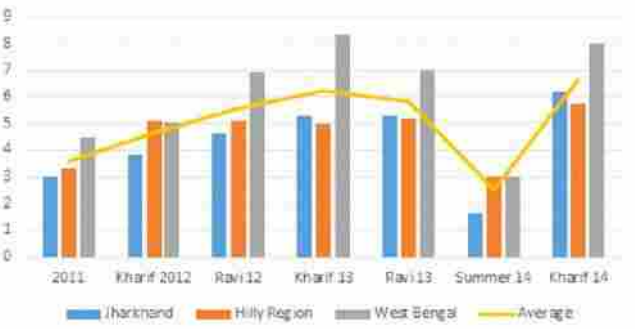



Graph 3: Animal, bird and water use

## 5.2 Impact

According to their similarities, for analysis, we have clubbed:

1. Devipur, Sonaraithadi and Ranchi districts as 'Jharkhand' which has more natural forest, is tribal dominated, water scarce region with lateritic soil and undulated terrain.
2. Bankura, Birbhum and Purulia districts as 'West Bengal' which is in between the plateau and the fertile Bengal plain with a semi-arid condition.
3. Chitwan, Nepal and Chittagong Hill Tracts as 'Hilly area' with hilly terrain, good amount of rainfall and rich biodiversity. Hilly tribal communities like Chepang, Tamang, Tripura, Chakma, Marma etc, dominate this region.



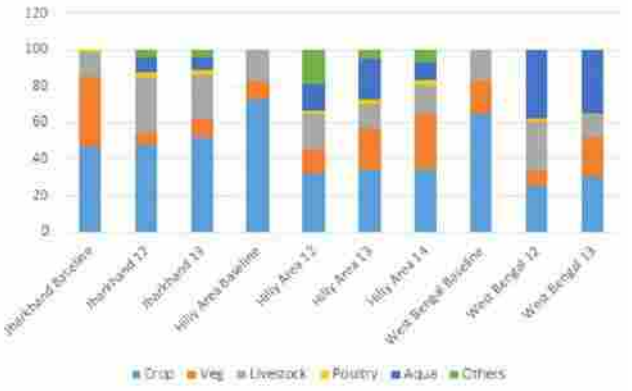

Graph 4: Number of Subsystems

Diversification is considered to be the most important phenomena in the integrated farming system (IFS) model for small holders. The subsystem diversification (number of subsystem in Y axis - Graph 4) signifies that the source and frequency of income diversified throughout the year compared to concentration of income depending only on one crop, once a year. The subsystems were cropland, garden, poultry, livestock, aquatic systems, biodigestor, forest/commons, tree and group business of value addition. The graph shows that between 2011-14, the subsystem diversity increased to 8, in case of West Bengal, (where water probably played a major role) and stabilized to 5 subsystems in Jharkhand and Hilly areas from 3.5 on an average (range 3 to 4.5). This trend

was also seen during rabi season. Summer, which generally remains fallow, had also marked biomass output from 2.54 subsystems on an average from 2014 onwards. Overall, 45% of the farms had recorded that the growing season extended to 3 from 1 in the baseline in Jharkhand. 89% in hilly region, and 60% in West Bengal, recorded the same. More than 2 subsystems were noted growing excess biomass for market as well, in general.

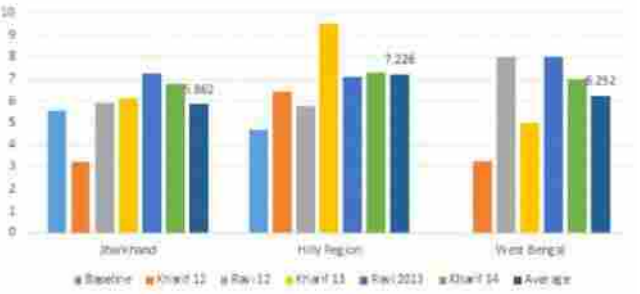
Having more than one subsystem had also influenced the distribution of income pattern (Graph 5). As noticed, 65 to 85% of the income of the family from the farm used to come from crops and vegetables which are dependent on monsoon directly. But within 3 years, the intervention had successfully reduced the dependence of the families on the climate dependent source, by creating space for livestock, poultry, aquaculture and others. For example, in Hilly area, in 2012 Kharif season, the distribution was 32.26% crop, 13.12% vegetable, 19.77% livestock, 1.32% Poultry, 14.91% aquaculture and 18.60% value added products. In West Bengal, aquaculture played a major role in improving incomes.

This is one of the reasons, where IFS is also considered to be a climate adaptive practice as it reduces dependency on climate dependent income source, hence reducing vulnerability or risk.

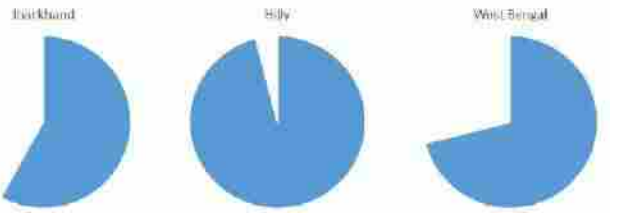



Graph 5: Distribution of Income

Because of the limitation of data, no correlation could be established between income enhancements with increased number of subsystems, but income was noticed to be more evenly distributed over the year, which means cash availability throughout the year had also improved.

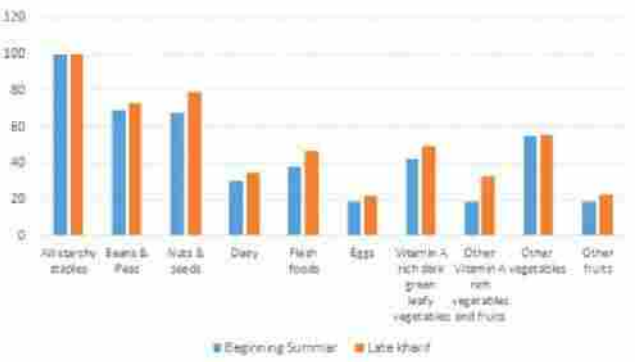



Graph 6: Diversity of vegetables in the garden




Graphs 7: Percentage of families whose vegetable need are met from the garden

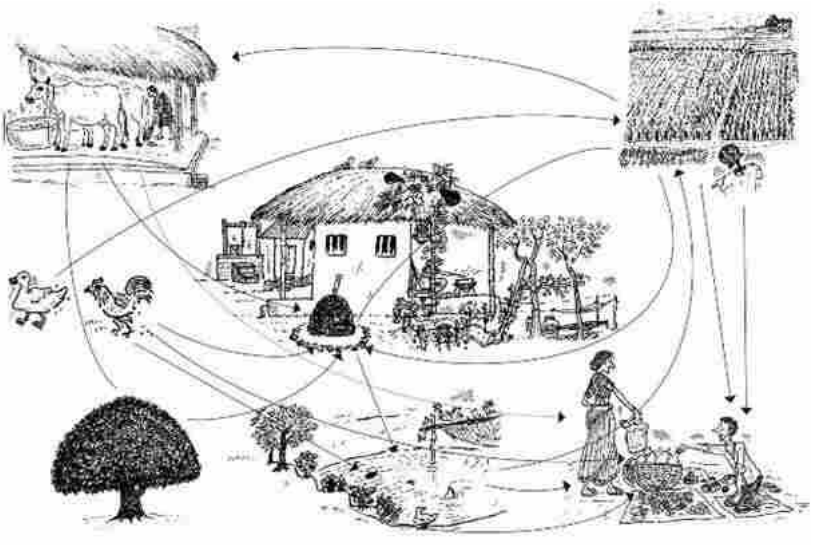
Whereas the major crop diversity changed from minimum 2 to 3 to maximum 4 to 5 in the crop land, the home gardens seem to be more diversed in (Graph 6),which stabilised to 6 to 7 on an average. This had a big impact on diet diversity (referred later). Following diagrams (Graphs 7) shows the percentage of families whose vegetable need are completely met from their own garden. Hilly areas shown best result in this aspect followed by West Bengal. Apart from quality of food, diversity also affected quantity as mixed diverse product had been grown in the permanent and seasonal fallow. 650 hectares of fallow had been converted to crop land and 850 hectares of single crop area were converted to double crop. Pulses were given preference in transforming the character of the land.



Graph 8: Diet diversity score in Jharkhand

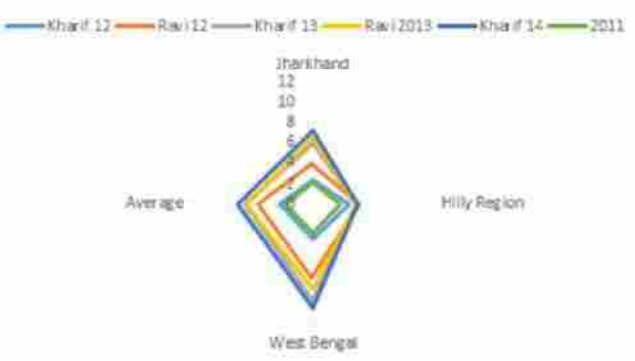
Diet diversity score was done in Jharkhand India in 2014, which showed that about 70% women were eating at least 5 food groups (Graph 8). At the beginning, in 2011 the majority were consuming mostly variations of starchy staples. The 2014 status are described in Graph 8 (x axis - percentage of HH, y axis - food groups). Being a vegetarian dominated state, the progress is remarkable.

Inter-subsystem linkages, which reflect energy/biomass flow between the subsystems, within the entire farming system, indicates the closeness and efficiency of a system, which had been referred in the diagrams below.

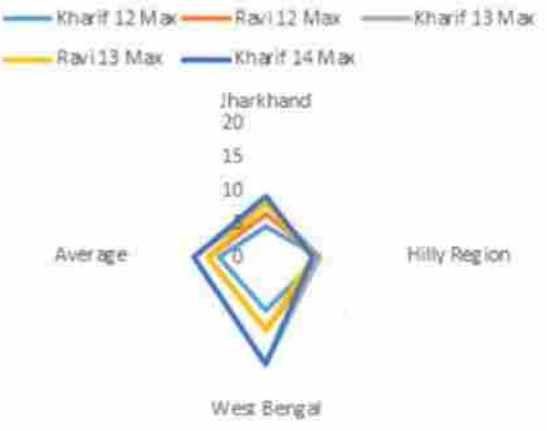


[15] Crops are mainly cereals like rice/wheat/finger millet; pulses like black gram/lentil oilseeds like niger/mustard/ flax seed and vegetables like potato/mixed vegetables which are grown in larger patch.

Generally speaking, the more the number of linkages that a system has, the more efficient it is. The average linkage, which was little more than 1 in 2011, had gradually become nearly 8 in 3 years, with maximum going up to 12 as shown in the Graph 9 and 10. In the case of West Bengal, the results were much better probably because most of the people belonged to farming community there, whereas in hilly areas the result was comparatively poor. The probable reason behind this was, the low requirement of biomass recycling as plenty of biomass were already available in the wild. But the recycled amount of biomass was showing increasing trend with the increased of number of linkages. The average amount of biomass recycled within the subsystems in a farm in 2015 kharif was 7738 Kg.

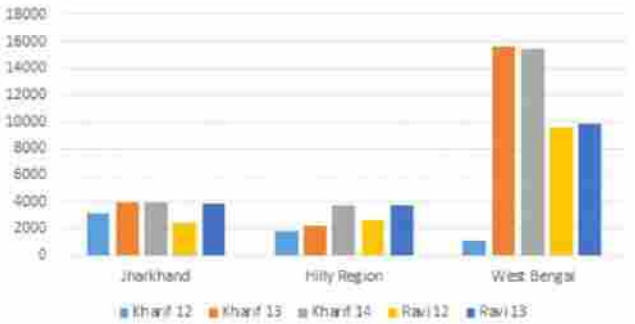


Graph 9: Average inter-subsystem linkages



Graph 10: Maximum inter-subsystem linkages

This recycling helped reducing the external input. It was noticed that the biomass recycling was better during kharif season (Graph 11) and best in the case of West Bengal. During baseline, it was noticed that the community was recycling biomass only in terms of collecting cow dung from the cowshed. The definition of biomass had been extended during the project to crop waste, livestock dung, urine, faeces of poultry, crop residues, weeds etc. The processes involved were heap and pit composting, bio dung, NADEP composting, vermi-composting, liquid manure, mulching, utilization as fodder etc. If this amount of biomass was not recycled, it would have to be bought from outside, or this would have been the shortage amount.



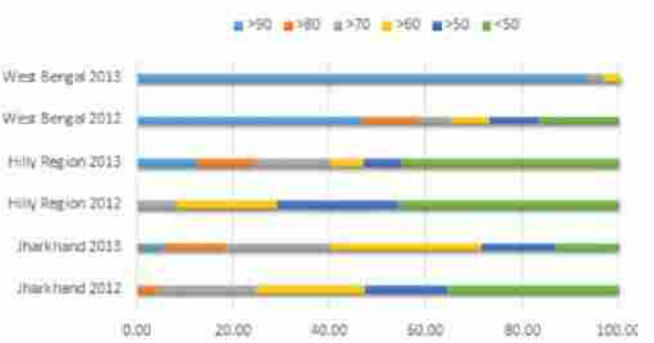
Graph 11: Recycled biomass per farm in kg

The Graph 12 shows the percentage of required farm input that was met internally. For example, in 2012, 35% of the farmers got less than half of their farm input internally in Jharkhand. In 2013 5% farmers had registered more than 90% internal farm input.

Farms in West Bengal shown better results, because of higher number of linkages and greater recycling of biomass. It is evident from the Graph 13 that the number of link (Axis X) is proportionate to percentage of internal input (Axis Y). Generally, from the graph and the data, it was also evident that the farmers were moving towards self-sufficiency, though there was still huge scope of improvement.

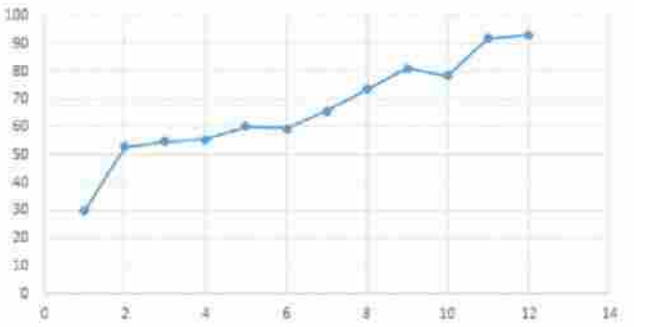
From the food security aspect, as most of the farm families were in the food insecurity level, the challenge was to take them to sufficiency level and graduate them to surplus level. Graf 14 shows percentage of farmer families getting food from own sources. In 2013, 48% farmers were at a surplus level. Gradual shifting was also noticed from lower to upper side.

Classically, productivity refers to a single crop. The idea of SIFS, however, deals with the productivity of the entire farm including food for self-consumption and market, fodder, fuel and biomass that is recycled. In the case of rabi in 2013, the hilly areas and Jharkhand showed a growth upto 12000 Kg/ha and 9000 kg/ha respectively, whereas in West Bengal, the kharif

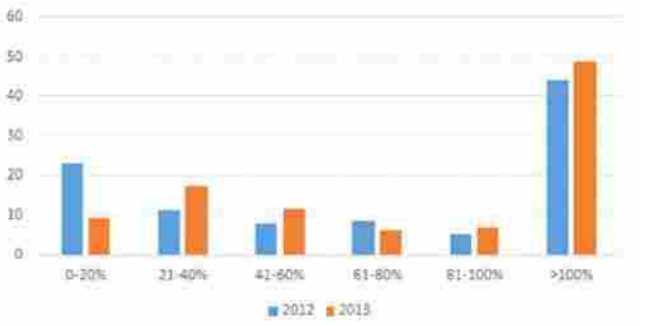



Graph 12: Percentage of farm input met by recycling

| | The percentage of farmer achieving internal farm input by | | | | | |
|---|---|---|---|---|---|---|
| | >90% | >80% | >70% | >60% | >50% | <50% |
| Jharkhand 2012 | 0.00 | 4.17 | 20.45 | 22.88 | 16.86 | 35.64 |
| Jharkhand 2013 | 5.26 | 13.23 | 22.27 | 30.78 | 15.53 | 12.93 |
| Hilly Region 2012 | 0.00 | 0.00 | 8.33 | 20.83 | 25.00 | 45.83 |
| Hilly Region 2013 | 12.36 | 12.36 | 15.73 | 6.74 | 7.87 | 44.94 |
| West Bengal 2012 | 46.67 | 11.67 | 6.67 | 8.33 | 10.00 | 16.67 |
| | | | | | | |

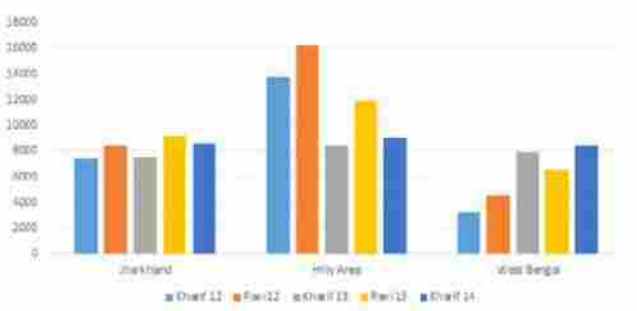



Graph 13: Relationship between internal input and linkages




Graph 14: Percentage of food from own source

productivity increased up to 8100 kg/ha as shown in the Graph 15. An interesting trend of land biomass productivity was noticed where it was reduced in 2013 from 2012 in hilly areas. This was probably due to less fallow as fallows contain high amount of unused biomass.




Graph 15: Land biomass productivity

Alternative practices of rice farming

Rice is a major food crop (also cash crop) in India, specifically in project areas. But rice farmers are facing many difficulties due to current trend of climatic changes. Such as

- Delayed onset of monsoon
- Long dry spell in between monsoon
- Erratic rainfall.

Major adaptation strategy that the farmers usually follow is improving soil organic matter, so that the water holding capacity increases. They have also followed certain agronomic practices like:

*Single stick paddy cultivation in West Bengal and Jharkhand* - Farmers of rain fed area are often compelled to transplant the saplings as late as 45 to 50 days with 7-8 stick/saplings together due to late onset of monsoon. This practice suggests, that farmers can transplant one sapling of age up to 48 days with 10 inch x 10 inch distance. The land can be prepared with Farm Yard Manure (750 Kg for 1 acre) by flooding it for eight days. It is treated further with vermicompost (350 kg) and neem cake (450 kg). After two days it is ploughed and made ready for sowing. It needs 1.2 kgs of paddy seed per acre. With an indigenous variety, named *Kabirajshal*, average numbers of tillers per plant was 55, height of the plant was 3 feet, number of seeds per tiller was 120, number of mature good quality grains per tiller was 82. Weight of 100 grains are 2.5 grams. Total production was 1145 kg rice, 380 kg rice husk and 2800 kg of straw per acre.

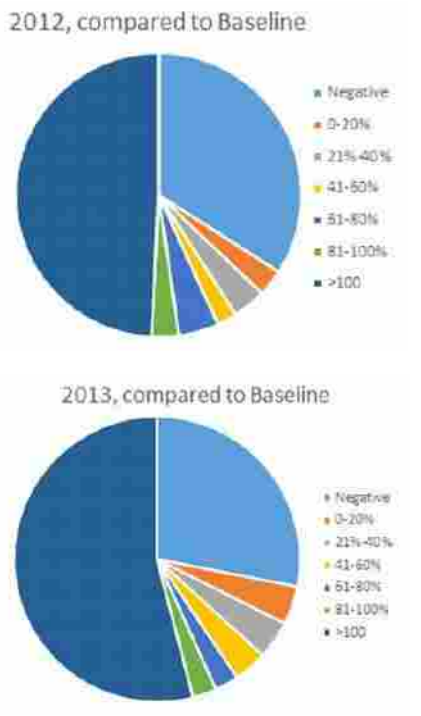
Under the project 400 farmers had adopted this method as a climate change adaptive measure. According to this approach, one can wait till 48 days for transplantation, in case of delayed monsoon, with an added gain of reduced seed cost, 30% increase in yield. The plants, as reported were also strong to withstand shock of storm. In Jharkhand, for instance, the result was little better with Swarna and Lalat Kranti (High Yielding Varieties) with the output comprising 1650 kg of rice per acre with 2300 kg of straw. This had been adopted by 150 farmers in the project area of Jharkhand with double stick rice showing, which increased the yield slightly but with higher amount of seed.

*Kharif Paddy Stabilisation in Jharkhand* - Jharkhand receives less rainfall in the middle of the monsoon, and often, rice plants are burnt due to over use of fertiliser and inadequate watering. The paddy stabilisation method involves a practice, using both chemical and organic fertilizer initially with other technologies and then gradually reducing the chemical fertiliser. Though the cost is higher than the first method, it is very systematic and can control the water requirement due to controlled fertiliser application. 300 farmers have adopted this method in Jharkhand.

*System of Rice Intensification* (SRI) is a method which is standardized and adopted in many parts of India. It focuses on single stick paddy transplantation with alternate drying and wet condition in the paddy field. During the wet condition, 0.5 inch to 1 inch water level is required.

We couldn't generalise labour productivity because of lack of authentic data (it was difficult to calculate the time spend for production activities by the families). But case by case analysis revealed that

1. Integrated Farming is labour intensive and it often increases pressure on women member of the family as it greatly depends on the livestock management in farming.
2. Integrated farming boosts family farming and involves family members in productive labour days in their own farm rather than working outside the farm as a labourer. Most of the farmers, who have been successful, have described the labour intensiveness as positive, giving the similar logic.




Graphs 16: Net income pattern

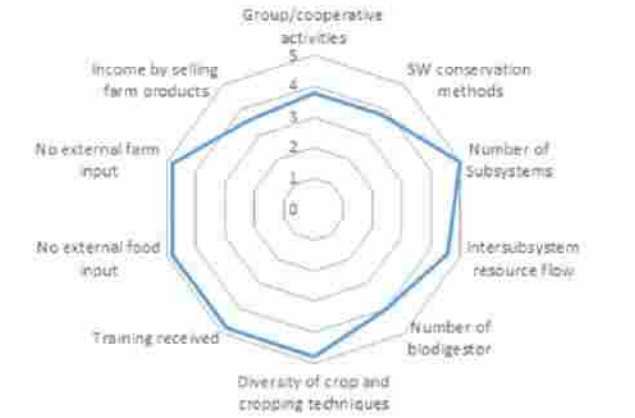
Net income pattern as described in Graph 16, has shown positive impact as the cost of production had reduced and market linkages had increased. However, in the first year about 45% showed negative income, probably due to the less recovery cost of the investment. The negative income had reduced to 30% in 2013. An increase of income was noted in 70% of the cases in 2014 with 54% showing double net income.

Animal shed with urine collection chamber and liquid manure

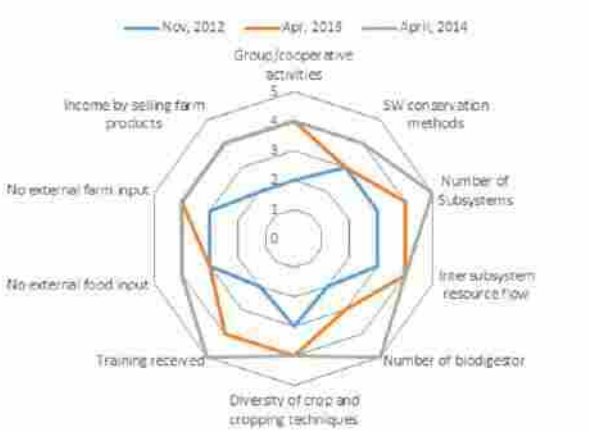
## 5.3 The summary of community monitoring exercise

Each group had monitored their own work through a community monitoring exercise with a set of 10 indicators. The exercise also helped them identifying weak points and plan further. The exercise was also carried out with individual farmers by the project staff. Following is the summary of the final exercise done by the groups at the end. This shows further scope for improvement in group activity, biodigestor installation and marketing.

The consecutive exercise with a farmer, Kali Singh of Madanpur, Jharkhand, India shows (Graph 18) a definite improvement, but also shows room for improvement on many parameters.




Graph 17: Community monitoring exercise




Graph 18: Monitoring Kali Sing's farm

# 6

# Way forward

Enhancing quantity, quality and diversity of production, is the first step to a decentralized local economy for and by the small-holders within an ecological boundary. This agroecological approach of brining ecological knowledge in agriculture, had been tried out through field trial in BIOFARM project, and extensively replicated with fine tuning in The SIFS programme. When we looked back, we realized that, in the process, the farmers became innovative, self-reliant, analytic and technologically sound to assess their own resources, strength and stresses and equipped to design their own farm. 150 farmer trainers, who can train other farmers, was major outcome of the programme. Eventually, the learning outcome of this, had also been replicated in Banswara, Rajasthan[14]. The major impact can be summarized in the following way:

1. During baseline, 77% of the farms had only one crop in the cropland, homestead lands were hardly used. The average type of crops grown are 4 and average vegetable grown on the homestead land is 5 to 7 now. 45% of the farms have recorded extension of growing season to three from one in the baseline in Jharkhand. In the hilly region and West Bengal the figures were at 89% and 60% respectively. All these have helped in increasing diet diversity. For example, in Jharkhand, the result showed that about 70% women were eating at least five food groups.
2. A majority of farms got their required input by recycling wastes, which also denotes reduction in the input cost. The earlier project, BIOFARM, had already indicated improvement of soil health through such input recycling.
3. The concept of productivity, which is described classically of a single crop, had been redefined. The SIFS focused on the productivity of the entire farm including food for self-consumption, market, fodder, fuel and biomass that was recycled. Rabi in Hilly (12000 Kg/ha in 2013) and Jharkhand (9000 kg/ha in 2013) had shown better result, whereas Kharif was better in West Bengal (8100 kg).
4. 70% farmers have recorded increased net income, where 54% have doubled their net income. For all the farms, about 50% of the cash need for food was coming from within the farm.
5. The programme had generated widespread interest and attracted

'Kishan Panchayet' - A forum of small holder farmers across India

[14] By Vaagdhara

investment of 300,000 euro during the implementation period for development of infrastructure mostly from government schemes and support.

Collection centre for farm produce to take it to market collectively

However, there are challenges beyond productivity regime. Smallholder agriculture is suffering due to i) sharp price rise in external agricultural inputs, ii) climate fluctuations like long dry spell in between rainy season but heavy rainfall in a very short span, iii) complex market dynamics of large buyers and unfavourable terms of trade offered by the traders and intermediaries, and iv) migration of people and its implications on agricultural activities. As small holder farming is mostly subsistence in nature, very few value added products go to market. Advance selling of farm-products directly by the farmers, often when the price is the lowest in the market, is very common. There is no farmers' organisation operating locally to deal with such issues. Farmers have limited access to capital and credits. High transaction costs due to poor market and infrastructure development, and insufficient transport systems are key factors responsible for farmers' poor access to market and getting a low price.

Few small trials were done in terms of Common Facility Centre, to collectivize few products for better market access. However in order to make the communities further self-reliant, it is important that the Common Facility Centres are gradually developed as Sustainable Community Enterprises for a single window service provision for farm input and output processing. These centres should be community owned and managed, and should aggregate small holder farmers to achieve the appropriate scale of operation, establish strong market linkages and strengthen value chains, thereby boosting the rural economy. The process, in a limited scale is being tried out now in Nepal and Bangladesh. In future, this result will further strengthen the theory of achieving decentralized local economy through integrated farming systems linked with market and social system.


Annual Review Meeting and product exhibition by SIFS farmers from India, Bangladesh and Nepal.





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