2017

Sustainable Agriculture: An Initiative of Sarva Seva Samity Sanstha (4S) in Bargarh, Odisha
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Abbreviation:

AGLEDs : Agriculture, Livestock and Enterprise Development Services
BYP : Back Yard Poultry
CSR : Corporate Social Responsibility
FAO : Food and Agriculture Organization
FCRA : Foreign Contribution (Regulation) Act
FIG : Farmer Interested Group
FPO : Farmer Producer Organization
IFS : Integrated Farming System
IPM : Integrated Pest Management
KVJ : Krishi Vigyan Kendra
LEISA : Low External Inputs for Sustainable Agriculture
NF : Natural Farming
NIPHM : National Institute of Plant Health Management
NPM : Non-Pesticide Management
RCOF : Regional Centre of Organic Farming
SHG : Self-Help Group
SRI : System of Rice Intensification
4S : Sarva Seva Samity Sanstha
1. **Organization Profile:**

Sarva Seva Samity Sanstha (4S) is a not-for-profit organization registered under Society Registration Act 21, 1860 in 2003. It started its journey to work with the poorest populace in difficult and far flung areas of Bihar, where it supported promotion of large number of women SHGs and their federations.

With the vision of promoting “Socially, environmentally and economically sustainable society with improved life of rural poor and vulnerable community, especially women, of unreach area”, 4S has set its mission to provide holistic services to the rural poor through strong community driven institutions in the form of Community Based Organisations (CBOs) and micro-enterprises like Village Level Entrepreneurs (VLEs) in the field of Livelihood, Health & Nutrition, Water & Sanitation as well as renewable energy solution.

With its registered office at Gaya (Bihar) and Head office at Kolkata (West Bengal), the organization has its footprints in 940 revenue villages under 21 districts of 5 states in Eastern India. Since its inception, It has been working for poorest of the poor households including small and marginal farmers, Women, Tribal and other vulnerable communities and reached 0.1 million beneficiaries directly and 0.4 million beneficiaries through SHG Federations and farmers Producer Organizations (FPOs).

Priority focus of the organization is organizing communities, ensuring entitlements and convergence, providing conceptual, technical, financial and marketing support backed with research and advocacy.

The organization has an advisory team having vast expertise in multi-disciplinary subjects. The organization is led by the Executive director with a Senior Management team consisting of professionals from premier academic institutions and having wide range of experience both in Leadership and grassroots work. The organization is associated with various networks and is associated with more than 165 FPOs, 20 women SHG Federations, and over 200 Micro-Entrepreneurs providing solutions in sanitation, agriculture and renewable energy. The organization has developed and is working with more than 500 volunteers/CRPs at the field level.

2. **Background of the initiative:**

Sustainable agriculture is the farming in sustainable ways based on an understanding of ecosystem services and relationships between organisms and their environment. It has been defined as "an integrated system of plant and animal production practices having a site-specific application that will last over the long term".

The main components of sustainable agriculture are:
Satisfy human food and fiber needs
Enhance environmental quality and the natural resource base, upon which the agricultural economy depends
Make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls
Sustain the economic viability of farm operations
Enhance the quality of life for farmers and society as a whole

The goal of sustainable agriculture is to meet society’s food and textile needs in the present without compromising the ability of future generations to meet their own needs.

In order to meet the growing demand of Sustainable Agriculture, especially in the countries like India, where more than 80% economy are based on agriculture, 4S started this initiative towards sustainable agriculture in Bargarh district of Odisha with the support of ACC Limited (Bargarh Cement Works).

ACC Limited (ACC Group) is India's foremost manufacturer of cement and ready mixed concrete with a countrywide network of factories and marketing offices. Established in 1936, ACC has been a pioneer and trend-setter in cement and concrete technology. It currently has 24 plants in India. The company is partly owned by Holcim, Switzerland since May 2010. ACC, Bargarh unit offers services in cement / marbel / ceramic / stone with annual turnover of Rs. 250-500 crore with manpower strength of 501-1000. Under Corporate Social Responsibility (CSR), a number of development activities are going on at different mines site, including Bargarh. Under its CSR activities, ACC Ltd. has been providing financial support to 4S for implementing the project named “Low External Inputs for Sustainable Agriculture (LEISA)”.

The current initiatives are being implemented in the nearby villages of ACC plant area.

3. Phases-wise initiative:
The project was started with an initial survey followed by three implementation phases:

<table>
<thead>
<tr>
<th>Phases</th>
<th>Time Period</th>
<th>Detailing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey Phase</td>
<td>Oct’13 – Mar’14</td>
<td>A preliminary survey was carried out to know different prominent economic activities along with the constraints of the villages. Data also was collected about the status of different village level institutions. From the survey, it is found that a majority of the villagers are involved in paddy cultivation and vegetable cultivation followed by dairy, goatery and Back Yard Poultry (BYP). The wage labour work plays a substantial role in many villages during off season as well as regular activity for poor households. There is a good number of SHGs but there is a need to build their capacity for their sustainability. Though majority of the households are involved in agriculture</td>
</tr>
</tbody>
</table>
activities but there is lack of farmers’ institution at village level. The process is yet to be initiated.

The study suggested that there are many small holders who can take up some additional income generation activities. Most of the farmers are engaged in cultivating rice twice in the year. The cost of cultivation is increasing every year making less return from rice. There is a need to reduce cost of cultivation. In vegetable, the high pesticide uses not only is increasing the production cost but also is causing environmental hazards.

### Implementation phase

<table>
<thead>
<tr>
<th>Phase- I</th>
<th>Apr’14 – Mar’15</th>
</tr>
</thead>
<tbody>
<tr>
<td>The first phase of intervention was taken up with introduction of income generation activities like mushroom, back yard poultry, goat plus services(^1) and reduction in cost from the existing activities like vegetable by Integrated Pest Management, rice by System of Rice Intensification etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase- II</th>
<th>Jul’15 – Dec’17</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the second phase of the project, the activities were scaled up adding more customers. Focus was given on marketing of the products. In vegetable, Non-Pesticide Management (NPM)(^2) was introduced and the products were sold at various markets exclusively created for such type of products including organic products. Commercial approach was initiated for the products like mushroom and back yard poultry. Banana is introduced as a better remunerative crop. The customers are grouped into FIGs for aggregation of produce and for better bargaining power. Finally 25 FIGs are federated into FPO at cluster level to support farmers. There are 13 entrepreneurs at village levels called Village Level Entrepreneurs (VLEs). One model farm is developed on the concept of Integrated Farming System which combines different components like duckery, fishery, vegetable cultivation, fruit crops along with production of vermin-compost, vermin wash etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase- III</th>
<th>Apr’17 – Mar’18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on the learning and inputs from the farmers and the beneficiaries, the third phase was intensified on strengthening FPOs; individual as well as commercial cultivation of Mushroom and BYP, System of Rice</td>
<td></td>
</tr>
</tbody>
</table>

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\(^1\) *They are already engaged with Goatory services. The initiative of SSSS is to additional doorstep services to increase production and decrease mortality. It is, therefore, named as “Goat plus service”.*

\(^2\)*Non-Pesticide Management means the agricultural production without using chemical pesticide*
Intensification (SRI), Crop diversification through banana cultivation, Integrated Farming System (IFS), NPM, and with a special emphasize on Bio-product and Botanical product

4. **Geo-coverage of the initiative:**

The work has been going on in all the villages under following four Gram Panchayats (GPs) of Bargarh Block of Bargarh district:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Gram Panchayat</th>
<th>Villages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Baragaon</td>
<td>Baragaon</td>
</tr>
<tr>
<td>2</td>
<td>Bardol</td>
<td>Bardol, Dang, Pipilipali, Tentala</td>
</tr>
<tr>
<td>3</td>
<td>Kantapali</td>
<td>Kantapali</td>
</tr>
<tr>
<td>4</td>
<td>Khaliapali</td>
<td>Khaliapali</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4</strong></td>
<td><strong>7</strong></td>
</tr>
</tbody>
</table>

5. **Products and Support Services for Sustainable Agriculture:**

With the aim of working towards sustainable livelihood, the organization has been providing support service to the villagers on both:

- Sustainable Agriculture
- Sustainable Livestock

As the case study is based on the sustainable agriculture only, the livestock activities have not been included here.

The organization has been providing agriculture support services (also called extension services), which are directed towards the agriculture practices and procedures. These services cover the entire life cycle of a farmer’s business, from assistance with improved input procurement, to technologically improved production processes, to improved market access for their crops and other revenue-generating food products. The expert’s advices in every stage help farmer generate higher revenues at reduced cost hence generating value for the customers.

<table>
<thead>
<tr>
<th>Service principles</th>
<th>Service deliverables Crop</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Productivity Enhancement</strong></td>
<td>Soil testing</td>
</tr>
<tr>
<td></td>
<td>Seed Identification</td>
</tr>
</tbody>
</table>
The work has been done taking into consideration on the following points:

5.1. Integrated Farming System (IFS)

**Concept and Purpose:** Integrated Farming is a whole organic farm management system which aims to deliver more sustainable agriculture. It involves attention to detail and continuous improvement in all areas of a farming business through integrated management processes. Integrated Farming combines the best of modern tools and technologies with traditional practices according to a given site and situation. In simple words, it means using many ways of cultivation in a small space or land.
**Intervention:** In Integrated Farming, the main focus of the initiative is given on integrating different components with maximum synergy from others. It is the integration of crop/vegetables, mushroom, fruit crops, dairy, goatry, poultry, fishery etc. to take the residual benefit from each other. As different activities are practiced in the target area without taking benefit from each other, a model farm at village level (owned by a progressive farmer) was established that has become a learning centre for the villagers of the nearby villages. In the model farm the following activities have been taken into consideration:

- System of Rice Intensification (SRI)
- Mushroom Unit
- Duckery
- Pisciculture
- Banana Cultivation
- System of Water for Agriculture Rejuvenation/SWAR (Irrigation System)
- Drip Irrigation System
- Orchard Management
- Bio-Input Production Centre
- Non-Pesticide Management (NPM) practices

A crop rotation module is developed, which is economically and environmentally suitable for the area. Concept of using available water in most efficient way was also demonstrated with the beneficiaries. Component-wise descriptions on intervention, adoption by the beneficiaries and the outcome of the intervention have been given below:

### 5.1.1. System of Rice Intensification (SRI):

**Concept and Purpose:** Bargarh is a rice dominant area having 2 times rice grown in a year. The cost of cultivation is increasing day by day due to disease-pest problem, increasing in labour cost and increasing the cost of other inputs. Thus SRI has a good potential in the target area on promoting rice based farming families.

SRI is a methodology aimed at increasing the yield of rice produced in farming. It is a low water, labor-intensive method that uses younger seedlings singly spaced and typically hand weeded with special tools.

**Production process:** The central principles of SRI are:

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3 Crop rotation is the practice of growing a series of dissimilar or different types of crops in the same area in sequenced seasons. It is done so that the soil of farms is not used for only one set of nutrients. It helps in reducing soil erosion and increases soil fertility and crop yield.
- Rice field soils should be kept moist rather than continuously saturated, minimizing anaerobic conditions, as this improves root growth and supports the growth and diversity of aerobic soil organisms.
- Rice plants should be planted singly and spaced optimally widely to permit more growth of roots and canopy and to keep all leaves photo-synthetically active.
- Rice seedlings should be transplanted when young, less than 15 days old with just two leaves, quickly, shallow and carefully, to avoid trauma to roots and to minimize transplant shock.

**Intervention:** As before intervention SRI method was not practiced in any of the target villages, the project team had to work hard to motivate the paddy farmers and introduce the method. The main interventions are:

- Theoretical and practical training of the interested farmers
- Demonstration at village level on early transplanting of single plant with specific water and weed management practices.
- Motivating other farmers to practice SRI enabling to reduce to cost of cultivation and increasing the yield
- More focus was given on scented variety / fine grain variety of rice to fetch better income for rice farmers.
- Linkage was done for Rubber huller milling of rice
- Linkage was done for manual Weeding Machine

**Marketing of the product:** Marketing of the product is being done through the FPO formed under the project. Marketing of the product has not been an issue, as there is huge demand in local Bargarh market.

**Adoption of farmer:** 150 farmers have been adopted it in around 75 Acre of land

**Economics of SRI method:** SRI is a methodology where optimum space is provided to a single planting system to explore the maximum possible yield level. This way reduces the seed quantity from 30 kg to 2 kg per acre. It also reduces the labourer numbers and thus the labour cost. It reduces the water consumption quantity. Thus this is a sustainable practice of rice cultivation reducing cost of cultivation (Rs. 1500-2500 per acre) and increasing the yield (20-30%).

The comparison between conventional paddy cultivation and SRI cultivation has been given below:

<table>
<thead>
<tr>
<th>Input needed</th>
<th>Conventional cultivation</th>
<th>SRI cultivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed</td>
<td>25- 30 Kg per Acre</td>
<td>2 Kg per Acre</td>
</tr>
</tbody>
</table>
### Spacing

<table>
<thead>
<tr>
<th>Closer spacing:</th>
<th>Wider spacing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 cm X 10 cm</td>
<td>25 cm X 25 cm</td>
</tr>
<tr>
<td>20 cm X 10 cm</td>
<td></td>
</tr>
</tbody>
</table>

### Transplanting

<table>
<thead>
<tr>
<th>Seedling of 30 days old</th>
<th>Seedling of 8-14 days old</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of seedling per hill</td>
<td></td>
</tr>
<tr>
<td>2-3 seedlings</td>
<td>1 seedling</td>
</tr>
</tbody>
</table>

### Plant protection

<table>
<thead>
<tr>
<th>Application of herbicide to control week</th>
<th>Weed management by weeder machine. Minimal pesticide application based on needs and mostly by bio or botanical pesticides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spray of Insecticides 5-6 times</td>
<td></td>
</tr>
</tbody>
</table>

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5.1.2. **Mushroom cultivation:**

**Concept and Purpose:** Edible Mushrooms can be used both as food and for medicinal purposes. It is rich in Vitamin C and B complex. The protein content varies between 1.6-2.5%. Mushrooms contain long-chain polysaccharides, specifically alpha- and beta-glucans, which have beneficial effects on immune system. Mushrooms are not plants. It requires different conditions for optimal growth. Paddy straw is main input that is required for mushroom cultivation.

Most of the villages in Bargarh block are dominant under paddy crop. More than 2,000 HHs are cultivating paddy having availability of huge quantity of straw, which is the raw material for mushroom cultivation. Mushroom cultivation using these straws is a good opportunity here for earning additional income.

**Cultivation process:** All mushroom growing techniques require the correct combination of humidity, temperature, substrate (growth medium) and inoculum (spawn or starter culture). Two types of mushroom were introduced under the project- Oyster mushroom and paddy straw mushroom.

**Oyster mushroom** (*Pleurotus species*): It grows naturally on the decaying wooden logs or paddy straw. It may also grow on decaying organic matter. It can grow at moderate temperature ranging from 20-30°C and humidity 55-70% for a period of 8 months in a year. It can also be cultivated in summer months by providing the extra humidity required for its growth. In plane land, the best growing season September/October to Feb/March.

**Paddy Straw Mushroom** (*Volvariellavolvacea*): The cultivation of paddy straw mushroom can be done in a thatched house and also under the shade of a tree. The growing period is from April month to September month. During high temperature when temperature exceeds 420C, production hampers and the ideal period is July to September. Fresh disease free paddy straw (10-15 Kg per bed) is the ideal substrate. It is cultivated inside plastic film houses to maintain the temperature of 25-35°C and relative humidity of 75-80%. The success of cultivation depends upon the temperature and moisture in the bed. The mushrooms start appearing from all sides in 6-10 days as tiny buttons, which can be harvested in another 4-5 days. Usually, 1-1.5kg of mushroom can be harvested from 10 kg substrate.
**Intervention:** A small scale mushroom activity was introduced in first year. From second phase, it was scaled-up with commercial approach to visualize the economic effect of such model to attract more number of households to this fold. The main interventions are:

- Training on:
  - Primary requirements for mushroom cultivation
  - Mushroom bed installation
  - Risk mitigation during adverse climate
  - Value added products
- Lay out plan of mini mushroom farm
- Assessment of mushroom beds for progress of mycelium growth
- Supply of quality spawn and polythene
- Guidance during production
- Marketing support

Input supply and other services have been provided through Village Level Entrepreneurs (VLEs), who act as master trainers.

**Marketing of the product:** Mushroom cultivation has been proved to be a sustainable business, as Bargarh and Sambalpur people like mushroom a lot and there is a huge market demand. They can, therefore, easily sell their produce in local market.

**Adoption of farmer:**
- Individual cultivation: 200 HHs from 4 GPs have adopted it for individual cultivation
- Commercial cultivation: 10 HHs have adopted it for commercial cultivation

**Economics of cultivation:**

By maintaining a small low cost farm, a farmer can get a net profit of Rs. 1000-1500 per 15 days cycle. The economics of the cultivation has been given below:

<table>
<thead>
<tr>
<th>Name of product-Mushroom Services</th>
<th>Qty</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration fee</td>
<td>30 Bed</td>
<td>1500</td>
</tr>
<tr>
<td>Paddy Straw @ 15 bandle/ bed for 30 beds</td>
<td>450 bundles</td>
<td>600</td>
</tr>
<tr>
<td>pulse powder &amp; bleaching</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td><strong>Total Invest</strong></td>
<td></td>
<td><strong>2300</strong></td>
</tr>
</tbody>
</table>

**Income in 15 days**

1 Bed= 1 Kg

So in 30 Bed =30*1=30 kg @ 120/kg=3600

Return : 1.6 times in less than 1 month  

**Net Profit in 15 Days**  

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Net Profit in 15 Days</strong></td>
<td><strong>1300</strong></td>
</tr>
</tbody>
</table>
## Budget for Mushroom - 100 beds capacity

<table>
<thead>
<tr>
<th>Head</th>
<th>Specification</th>
<th>Cost (Rs.)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kachcha Housing</td>
<td>450 sqft</td>
<td>5,000</td>
<td>4.5 sqft / bed</td>
</tr>
<tr>
<td>Electrification &amp; Water pipe line</td>
<td></td>
<td>7,000</td>
<td></td>
</tr>
<tr>
<td>Total Fixed cost (A)</td>
<td></td>
<td>12,000</td>
<td></td>
</tr>
<tr>
<td>Straw</td>
<td>5 beds/day for 3 months</td>
<td>10,800</td>
<td>12 bundles per bed @ Rs. 2 per bundle</td>
</tr>
<tr>
<td>Electivity charge</td>
<td>3 months</td>
<td>600</td>
<td>Rs.200 per month</td>
</tr>
<tr>
<td>Spawn</td>
<td>450 beds in 3 months</td>
<td>6,075</td>
<td>Rs. 12-15/bottle</td>
</tr>
<tr>
<td>Medicine and other chemicals as disinfectant</td>
<td></td>
<td>300</td>
<td>Rs. 100 / month</td>
</tr>
<tr>
<td>Feed: Chokad / gram flour</td>
<td>450 beds in 3 months</td>
<td>2,250</td>
<td>Rs. 5/bed</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Total Recurring cost for 3 months (B)</td>
<td></td>
<td>20,025</td>
<td></td>
</tr>
<tr>
<td>Total budget</td>
<td></td>
<td>32,025</td>
<td>Fixed cost + recurring cost of 3 batches</td>
</tr>
</tbody>
</table>

### Economics

| Recurring cost                      | 3 months                           | 20,025     |                                              |
| Depreciation cost                   | For 3 months                       | 900        | 20% per annum of Fixed cost with 8 months production |
| Expenses                            | For 3 months                       | 20,925     |                                              |
| Gross return                        | Average yield 0.5 kg per bed for 450 beds | 225        |                                              |
| Gross return                        | Average yield 0.5 kg per bed for 450 beds | 45,000     | Rs.200 per kg                               |
| Net return                          | 3 months                           | 24,075     |                                              |
| Net return per month                | Production cycle                   | 8,025      | During production period                     |
| Net return per month                | Average around the year            | 5,350      | Considering 8 months production period and 4 months lean period |

### Crop diversification:

**Concept and Purpose:** Crop diversification refers to the addition of new crops or cropping systems to agricultural production on a particular farm taking into account the different returns from value-added crops with complementary marketing.
opportunities. Crop diversification in India is generally viewed as a shift from traditionally grown less remunerative crops to more remunerative crops.

Crop diversification can be used as a strategy for addressing food and nutritional security. The diversification of horticultural crops especially fruits and vegetables have been very important in ensuring nutrition security. Crop diversification can also be used as strategy for issues of natural resource management.

**Why Banana:** Bananas are the world’s favorite fruit and the fourth most important food crop after Rice, Wheat and Maize. Banana consumption, per capita in the world, is still increasing and thus creating more demand in day by day. (From 2007 to 2015 U.S. consumption is increasing by 1.7% per year; China’s consumption becomes double over last decade; As per FAO, total world consumption is also increasing in every year).

Though banana has a huge potential for cultivation in Eastern India and high demand in local markets, Kolkata market could supply only 50% of its daily demand. As of now the market in the East is supplied with quality banana from south and western markets. Whole of East, which is highly potential for banana cultivation, is yet to adopt this as a commercial crop. But banana can be an extraordinary commercial fruit. Moreover, farming banana is an easy & simple process.

In addition to this, banana is excellent source of energy and good for health. Bananas are rich in fiber, vitamin B6 & of potassium and therefore, helps in weight loss. It is good for the health of heart, eye and bones. Long time consumption of banana fruit helps in stopping the kidney cancer. They are also good for the patients, who regularly suffer from the Ulcer problem.

**Why tissue culture plant:** Tissue culture is a process of crop propagation in a test tube under controlled and hygienic conditions. The method improves yield and quality and has revolutionised the horticultural industry. There are several advantages using Tissue culture plants in the Banana farming:

- Seedlings are disease & pest free
- Crop becomes ready for harvesting in very short time period
- Uniform growth of banana plant is observed with higher production
- Plant mature in short time than normal farming
- There is no staggered harvesting of bananas
- True to the type of mother plant under good management
- This method of farming make us able to farming bananas throughout the complete year as easy availability of banana seedling
- With help of this, it is possible to obtain 2 consecutive raccoons in banana cultivation in short time, which directly decrease the cost of cultivation
- More plant productivity, about 95 to 99% plants bears fruit bunches

**Cultivation process:** Tissue culture banana with assured irrigation can be planted throughout the year. During high temperature condition and during very low temperature planting is avoided. Basically banana is planted in two seasons.
• Kharif planting: June to August
• Rabi planting: October to November

Soil having good organic carbon content having good water holding capacity is suitable for banana. There should be good drainage system to remove excess water during heavy rainfall. Trichoderma and Pseudomonas @ 5 gm per pit is very useful to stop soil borne diseases. Phorate is to be avoided in case using of Trichoderma / Psedumonas / any other bio-agents. The fertilizer dose depends on the fertility status of soil. In general, a banana plant requires 200 gm N, 100 gm P₂O₅ and 250 gm K₂O.

**Intervention:** Mono cropping paddy pattern was diversified with banana in the upland and sloppy land making more profit and reducing the dependency on rice so as to reduce the huge pesticide applied in paddy. With crop diversification, there will be reduction in disease pest incidence and so also the reduction in application of pesticide. The actual interventions were as follows:

• Creating awareness on banana as a remunerative cash crop
• Suppling of quality planting materials (tissue culture G9 variety with disease free planting materials)
• Extension services on advance package of practices and crop protection to farmers / Farmer Interest Groups (FIGs) / Farmer Producer Organizations (FPOs).
• Supply of Crop Protection materials
• Output linkage

**Marketing of the product:** Market linkage was provided for output marketing at cluster level. Most of the farmers are selling the product directly in the local market. Some of them are selling it to the vendors.

**Adoption of farmer:** Banana cluster development programme has covered about 250 farmers each having 0.25 acre of land. Thus, under banana cultivation, a total of 60 acres of land have been covered.

**Economics of cultivation:** With introduction a cash crop like banana, the farmers are able to get bulk amount at a time which is around Rs. 1 lakh per annum per acre. (See Annex)

#### 5.3. Integrated crop management through Bio-product Solution:

**Concept and Purpose:** Bargarh district is famous for its commercial rice production known as rice bowl of Odisha. The farmers also grow seasonal vegetables which include cauliflower, cabbage, pointed gourd, brinjal etc. The district is among the top districts of Odisha with respect to consumption of fertilizers and pesticides (Odisha Agriculture Statistics, Directorate of Agriculture and Food Production, Odisha; 2013-14). The application doses of pesticides sometimes are found 3 to 4 times of the recommended doses (primary data). Farmers also apply same formulation pesticides repeatedly. In addition to these, some pesticide companies are selling sub-standard formulations draining out the farmers’ money. Recently Govt. of Odisha
has banned 11 pesticide companies not to sell their products (Hindustan Times, 15th November 2017). All these situations are creating an environment where most of the pathogens and insects are generating resistance against applied pesticides. Farmers are incurring a major part of their cost on pesticides. Sometimes farmers are becoming helpless on controlling disease-pest. At this situation, the present initiative focused on the use the low cost eco-friendly bio-products, which are economically and environmentally suitable for the area.

Bio-products are the products made with some component of biological or renewable materials, including agriculture (e.g., crops and crop residues, dried distillers grains) and/or food processing (byproducts, residues and off-specification materials), forestry, and biologically-derived waste. In agricultural bio-product, their active ingredients can be plants, algae, extracts, microorganisms or active metabolites. Agricultural bio-products are normally used in fertilization, plant growth stimulation or biological control. It has several direct and indirect benefits of agricultural bio-products like, increased economic opportunities for rural communities, development of new industries and product, increased safety for the environment, reduced toxicity and more biodegradability, sustainable production of renewable feed stocks etc.

The products, which are being produced under this initiative, have been given below:

5.3.1. **Non-pesticide Management (NPM):**

*Concept and Purpose:* The Food and Agriculture Organization (FAO) of the United Nations promoted Integrated Pest Management (IPM) as the preferred approach to crop protection and regard it as a “pillar of both sustainable intensification of crop production and pesticide risk reduction”. IPM thus is one indispensable element of Integrated Crop Management, which in turn is one essential part of the holistic Integrated Farming approach towards sustainable agriculture.

Presently more emphasize is being given to Non-Pesticide management (NPM) by using bio-pesticides. These are natural pest control agents obtained from natural substances. They can come from minerals, plants, and bacteria. Using bio-pesticides have advantages over using conventional pesticides, because bio-pesticides are less toxic to the environment and natural life. They play an important role in the protection of agricultural foods and protection against unwanted microbial organisms. NPM can, therefore, be seen as starting point for a holistic approach to agricultural production.

*Intervention:*

- Introducing IPM practices in vegetable/field crop reducing cost of cultivation and pesticide consumption substantially.
Two NPM villages were adopted with maximum coverage of land and farmers.

Massive awareness programme was conducted in the target villages to spread the learning of NPM practices so that maximum farmers adopt the practices.

Off season vegetables were trialed along with the analysis of economics.

Training to the entrepreneurs to produce the same

Demonstration was done on IPM, especially on one botanical pesticide (Bel leaf extract) preparation and application, Pheromone traps usage

**Different types of NPM products produced and adopted by the farmers:**

**National Institute of Plant Health Management (NIPHM),** Hyderabad has provided training to prepare some materials. Some products are prepared influenced by Natural Farming (NF) ingredients by **Global Natural Farming Living School & Research**, South Korea and SAARA, Bangalore. Besides **Regional Centre of Organic Farming (RCOF)**, Bhubaneswar; **Krishi Vigyan Kendra (KVK)**, Bargah and **District Agriculture Department**, Bargah are continuously encouraging to the FPO and entrepreneurs to promote such products.

<table>
<thead>
<tr>
<th>Name of the product</th>
<th>About the product</th>
<th>Purpose</th>
<th>Required doses</th>
<th>Application method</th>
</tr>
</thead>
</table>
| Pradayini           | Vesicular ArbuscularMycorrhiza (VAM) based product | • Mobilizes plant nutrients to root zone  
• Supports plant to survive under water stress condition | • Soil application- 1 Kg per acre land | Mix 1 Kg Pradayini with 50 Kg of of FYM/ Compost. The prepared material to be applied in the field during last ploughing stage (morning or evening time) having good moisture condition. In orchad plants, the material to be applied in ring method around the plant. |
| Jadki Dhal          | Tricoderma based product | • Protection against root / soil pathogens especially fungal wilting | • Soil application-500 gm per acre land  
• For seed treatment- 10 gm per Kg of seed  
• For seedling treatment- Mix 10 gm of Jadki Dhal in 1 litre of water. Dip the route | Mix 500 gm. of Jadki Dhal with 50 Kg of FYM/ Compost. Maintain moisture by spraying water at regular interval. Cover with jute bag, & keep under shed condition. After 4-5 days, the prepared material to be applied in the field during last ploughing stage (morning or evening time) having |
PhasalkiDhal  Pseudomonas based product

<table>
<thead>
<tr>
<th>Use</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Against soil pathogens especially against bacterial wilting</td>
<td>Mix 1 litre of PhasalkiDhal with 50 Kg of FYM/Compost. Maintain moisture by spraying water at regular interval. Cover with jute bag, &amp; keep under shed condition. After 4-5 days, the prepared material to be applied in the field during last ploughing stage (morning or evening time) having good moisture condition. In orchard plants, the material to be applied in ring method around the plant.</td>
</tr>
<tr>
<td>Against leaf spot disease by fungus &amp; bacteria</td>
<td>Soil application- 1 Kg per acre land</td>
</tr>
<tr>
<td></td>
<td>For seed treatment- 10 ml per Kg of seed</td>
</tr>
<tr>
<td></td>
<td>For seedling treatment- Mix 10 ml of Phasalki Dhal in 1 litre of water. Dip the route portion of the seedlings for 10-15 minutes &amp; then transplant</td>
</tr>
</tbody>
</table>

**Product Pricing:** Product pricing is calculated based on the production cost, remuneration for entrepreneurs, packaging cost, marketing cost, transport cost, margin for distributor and dealer.

**Adoption of farmer:** The programme in the first year catered 100 farmers introducing integrated pest management (IPM) practices. Second year, Non Pesticide Management (NPM) was adopted in seasonal vegetables and paddy. Different materials were used to disease-pest management like Chill-garlic pest, Five leaves extract, Botanical mixed pesticide, Tobacco extract, Bel leaf extract, Natural amino acid, Vermi wash, Pheromone trap, Yellow drum stick, Bird perches and some commercial bio based products. In the current year, more than 600 farmers of the project area have adopted NPM practices both in paddy and vegetables.
Marketing of the product: The keeping quality of NPM vegetables is longer and taste is better. There is a growing demand in the locality to consume such vegetables. Now weekly twice a market is specially created for NPM products. Farmers are directly selling their products in this market at Bargarh. To sustain the programme, a Farmer Producer Organization (FPO) is promoted having 600 plus members.

Apart from the Bargarh, the product is slowly popularizing in other states also and demand is coming from the farmers. Accordingly one/two vendors have been created in each state and the supply of the bio-product is going on, the detail of the same has been given below (as on 15th Dec, 2017):

<table>
<thead>
<tr>
<th>Name of the product</th>
<th>Quantity supplied (pc / bag)</th>
<th>Farmer reached</th>
<th>Name of the State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jadki dhal</td>
<td>500 pc</td>
<td>500</td>
<td>Odisha (project area)</td>
</tr>
<tr>
<td></td>
<td>200 pc</td>
<td>200</td>
<td>Uttar Pradesh</td>
</tr>
<tr>
<td></td>
<td>50 pc</td>
<td>50</td>
<td>Bihar</td>
</tr>
<tr>
<td></td>
<td>160 pc</td>
<td>160</td>
<td>Punjab</td>
</tr>
<tr>
<td>Phasalki dhal</td>
<td>500 pc</td>
<td>500</td>
<td>Odisha (project area)</td>
</tr>
<tr>
<td></td>
<td>60 pc</td>
<td>60</td>
<td>West Bengal</td>
</tr>
<tr>
<td></td>
<td>200 pc</td>
<td>200</td>
<td>Uttar Pradesh</td>
</tr>
<tr>
<td></td>
<td>65 pc</td>
<td>65</td>
<td>Bihar</td>
</tr>
<tr>
<td></td>
<td>153 pc</td>
<td>150</td>
<td>Punjab</td>
</tr>
</tbody>
</table>

Economics of cultivation: In the first year, Farmers were able to reduce 8-12 number of pesticide applications in paddy and vegetables with a reduce of cost of cultivation of Rs.1200 to Rs.3,000 per acre in different crops. From second year onwards, using NPM products, cost of production is reduced Rs. 2,000 to Rs.5,000 per acre in different crops.

5.3.2. Integrated Nutrient Management (INM):

Concept and Purpose: Biofertilizers are living microorganisms that improve the health and quality of different types of soils and help the plants obtain the necessary nutrients. The soil becomes more nutritious and helps the seeds and roots grow to their full potential. Biofertilizers activate the microorganisms that are found in the soil, thus restoring the soils' natural fertility and protecting it against soil diseases and droughts, which stimulates the growth of plants.
**Intervention:**

- Training and Demonstration on INM, specially on Magic compost preparation and application, vermi-wash preparation and application
- Two Bio-Products production units were established in two clusters involving 10 entrepreneurs.
- FPOs were trained so that they can play a major role on production and marketing of these products.
- Emphasize was given to the branding and packaging so that these products can be marketed by the FPO to other districts and also to other states.

**Different types of INM products produced and adopted by the farmers:**

<table>
<thead>
<tr>
<th>Name of the product</th>
<th>About the product</th>
<th>Purpose</th>
<th>Required doses</th>
<th>Application method</th>
</tr>
</thead>
</table>
| Soil Charger        | Mixture of beneficial microbes (Azotobactor, Azospirillum, PSB, EM microbes, Indigenous microbes) | • Building soil health & good ecosystem.  
• Good uptake of nutrients  
• Nitrogen fixation  
• Solubilizing Phosphorus  
• Developing protection against disease-pest | Soil application- 5 Kg per acre land | Mix 5 Kg of soil charger with 50 Kg of FYM/Compost. The prepared material to be applied in the field during last ploughing stage (morning or evening time) having good moisture condition. In orchad plants, the material to be applied in ring method around the plant. |
| Sabujima            | Vermi wash based product | • Plant growth booster  
• Makes healthy plant  
• Increases crop resistance power against disease-pest | 1<sup>st</sup> time- 70 ml per litre of water  
2<sup>nd</sup> time- 35 ml per litre of water | 1<sup>st</sup> time use- 1 litre of Sabujima in 14 litres of water and spray over crop  
2<sup>nd</sup> time use- 35 ml Sabujima per litre of water and spray over crop |
| Puspika             | Natural Amino Acid derived from | • Increases flowering  
• Helps in fruit | 3 ml per litre of water | Add 3 ml Puspika in 1 litre of water, add little detergent powder and |
Product Pricing:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Product</th>
<th>Purpose</th>
<th>Dose</th>
<th>Pack size</th>
<th>Distributor price (Rs.)</th>
<th>Dealer price (Rs.) 20% on Distributor price</th>
<th>Suggested Farmer Price (Rs.) 20% margin</th>
<th>MRP (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Puspika</td>
<td>Natural Amino Acid: Energizer, enhances flowering &amp; fruit setting</td>
<td>2-3 ml per litre of water</td>
<td>100 ml</td>
<td>85</td>
<td>102</td>
<td>122</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>250 ml</td>
<td>208</td>
<td>250</td>
<td>301</td>
<td>370</td>
</tr>
<tr>
<td>3</td>
<td>Sabujima</td>
<td>Bio stimulant: Healthy plant with good immunity system</td>
<td>A. 30-35 ml per litre of water</td>
<td>1 litre</td>
<td>95</td>
<td>114</td>
<td>137</td>
<td>150</td>
</tr>
<tr>
<td>4</td>
<td>Jad Ki Dhal</td>
<td>Bio agents: Protection against soil pathogens and root care</td>
<td>A. Soil Application: 1 litre mixing with 50 kg compost per acre.</td>
<td>1 litre</td>
<td>79</td>
<td>95</td>
<td>114</td>
<td>125</td>
</tr>
<tr>
<td>5</td>
<td>Phasalki Dhal</td>
<td>Bio agents: Protection against diseases like leaf spot and crop care</td>
<td>15-20 ml per litre over crop and soil.</td>
<td>1 litre</td>
<td>79</td>
<td>95</td>
<td>114</td>
<td>125</td>
</tr>
<tr>
<td>6</td>
<td>Soil Charger</td>
<td>Mixture of microbes: Building soil health, nutrients &amp; good ecosystem.</td>
<td>5 kg of Soil Charger mixing with 50 kg compost per acre near plant root zone.</td>
<td>5 kg</td>
<td>237</td>
<td>284</td>
<td>341</td>
<td>350</td>
</tr>
</tbody>
</table>
Pradayini

Microbes:
Mobilizes
nutrients &
supports during
water stress
condition

1 kg of Pradayini
mixing with 50 kg
compost per acre
near plant root
zone.

Marketing of the product:

<table>
<thead>
<tr>
<th>Name of the product</th>
<th>Quantity supplied (pc / bag)</th>
<th>Farmer reached</th>
<th>Name of the State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil charger</td>
<td>500 bag</td>
<td>500</td>
<td>Odisha (project area)</td>
</tr>
<tr>
<td></td>
<td>398 bag</td>
<td>390</td>
<td>Uttar Pradesh</td>
</tr>
<tr>
<td></td>
<td>100 bag</td>
<td>50</td>
<td>Bihar</td>
</tr>
<tr>
<td>Sabujima</td>
<td>940 pc</td>
<td>188</td>
<td>Odisha (project area)</td>
</tr>
<tr>
<td></td>
<td>150 pc</td>
<td>150</td>
<td>West Bengal</td>
</tr>
<tr>
<td></td>
<td>59 pc</td>
<td>59</td>
<td>Punjab</td>
</tr>
<tr>
<td>Pushpika</td>
<td>1,205 pc</td>
<td>241</td>
<td>Odisha (project area)</td>
</tr>
<tr>
<td></td>
<td>189 pc</td>
<td>189</td>
<td>West Bengal</td>
</tr>
<tr>
<td></td>
<td>400 pc</td>
<td>400</td>
<td>Uttar Pradesh</td>
</tr>
<tr>
<td></td>
<td>101 pc</td>
<td>100</td>
<td>Bihar</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>100</td>
<td>Punjab</td>
</tr>
</tbody>
</table>

Impact of the product in agriculture: More than 500 HHs in the area are involved in seasonal vegetable cultivation. The increase cost of pesticides and fertilizers are minimizing the profit of farmers. During the starting of the interaction, it was found that some farmers decided not to take vegetables like cauliflower and chilli. But after the use of it, they have again started to cultivate cauliflower and chilli.

The farmers who adopted these products reported that:

- The plants are growing healthily
- The crop yields are increased by 20% to 30%
- Color of flowers/ fruits and even of leaves is more bright
- Taste of the fruit is better
- After harvesting, the vegetables/fruits remain fresh for longer time without any freezer.

6. Channels of service delivery:

The products and services are designed to serve a diverse set of farmers, ranging from small and marginal to high-end progressive farmers, engaged in agriculture and allied activities and finally agri-input / agro-processing companies.
In order to effectively reach each of the target customers the company has devised different channels of service delivery, namely; Producer Groups (PGs) for small and marginal farmers and direct Farm Management Services for high-end progressive farmers (HPF). For promotional agencies and agri-business companies the channel is, essentially, collaborations.

6.1. Farmers Producer Organization (FPO)

This channel focuses on serving marginal and small farmers, either individually or in groups. The customers are grouped into Farmer Interest Groups (FIGs) for aggregation of produce and for better bargaining power. Finally 25 FIGs are federated one into Farmer Producer Organization (FPO) at cluster level to support farmers.

The services are provided in an economically affordable way at the customer’s door step. The average land holding size of the target customers is in the range of 2-5 acres.

The service package for this segment of customers is standardized and has set deliverables, which are communicated to the customers at the time they are registered. To deliver services in a sustainable, scalable and effective manner the services are fee-based which is charged at the time of registration.

6.2. Farm Management Services for High-end Progressive Farmers

This channel is focused on providing technical support services to big and high end farmers engaged, primarily, in Horticulture activities. These farmers have substantial land holding size but lack access to timely and door-step technical advisory services.

BASIX has developed in-house competencies to customize the services as per the requirement of individual farmers. It also takes assistance from Subject Matter Specialists (SMS) to provide specific and need based recommendations.

6.3. Village Level Entrepreneurs (VLE)

Village Level Entrepreneurs (VLE), another channel for providing services. VLEs were identified based on certain criteria (Minimum 10th standard, Smart, interested to work) and ultimately selected through proper interview process. They were then trained and supported to become
service providers for the local farmers. Gradually they have been attached to the FPO to become service providers of the FPO. They are supporting in the registration of customer, FIG meeting etc. They provide the services on revenue model. They also sell the agri-inputs on behalf of FPO to the confined farmers. The FPO monitors these VLEs to implement viable business model in the target area.

There are presently a total of 13 entrepreneurs at the project area. They are working on a part-time basis and earning on an average of Rs. 1,500/- per month on a revenue basis, and TA/DA from the project.

6.4. **Bio-product entrepreneur:**

The major challenge on NPM is preparation of lot of ingredients by farmers. Many farmers don’t get sufficient time to prepare such materials. Besides packaged bio-products available in the market are having quality issue. To address these issues, local entrepreneurs including ladies are promoted to produce NPM ingredients.

Currently, there are 10 such entrepreneurs in two model villages- Borgaon (under Borgaon GP) and Khedapali (under Bardoli GP). They are identifying IPM/INM customers, monitoring the progresses, solving the issues at field level etc.

4S provided class-room training and capacity building supports to them. 4S is also supplying the inputs to them and buy back the products from them once these are ready. All these products are then packaged to supply NPM farmers on commercial basis. This has opened an opportunity for Entrepreneurs to earn Rs. 5,000-7,000/- per month on production of these materials.

The FPO is now taking a lead role to market these NPM/ INM products as a revenue source. The NPM/ INM products are also tested in other states like West Bengal, Chhattisgarh, Uttar Pradesh, Bihar and Punjab with encouraging results creating a scope for large scale NPM practices across nation.
6.5. **Dealers:**

In order to test the product in other states and get the feedback of the farmers, few dealers/distributors were created in different states. The dealers/distributors have been selected based on the criteria that, they are having a shop/outlet in the rural/peri-urban area, having a hold to motivate the customers (farmers) to test at least for one time and have interested to work on these products. Till date, a total of five such vendors have been promoted, the detail of which is given below:

- Bihar- 8 Dealers
- Uttar Pradesh- 3 FPOs as dealers
- Punjab- 1 Distributor
- West Bengal- 1 FPO (to act as a dealer)

7. **Case Study:**

7.1. **Case Study1-Success Story on IPM Service:**

There is no end to possibilities if our will-power is strong enough to take us forward and opportunities are just a handful of candies when we want to cross the walls of success. 4S since its inception is constantly working for the empowerment of farmers and those who are backward. ACC cement comes forward, through its CSR, to enhance the lives of those who are ready to fight; but lack the arms and ammunitions in the District of Bargarh.

The story narrated here is of **Rohit Pradhan** from village Khedapalli of Bardol GP. He is a matriculate and lives in a joint family. His father was a farmer so inherently he bears some agricultural knowledge. His current age is 35 years; he is married and is staying with his wife and three children.

Mr. Rohit Pradhan is not from a very rich family. He is having only 1 acre of land in which he is cultivating vegetables like Parbal, brinjal, tomato, Ladies finger and Cabbages from time to time in particular season. He has also made a dip well too in his field due to govt. Subsidy.

According to Mr. Rohit Pradhan though he was doing Parbal farming every year but was not getting more profit due to late production and pest
attack. This time he set up his mind to get more profit from this Parbal farming as our SMS Mr. Gangadhar Sahoo told him the tricks and services those he can avail from 4S through LEISA project. The details of his registration and services offered to him, for 25 decimil areas, under IPM services @500 is as follows;

Date of Registration: - 9/4/2016
Service Start Date: - 10/4/2016
Services Offered: - Technical Assistance and handmade pesticides which includes tobacco extracts, botanical pesticides, fish amino acid, chili garlic paste, Hariyali, wander, nibarana and Bhushakti

Frequency Monitoring Visit by LSP: - once in every week

The expenses made by him within four months in traditional method and IPM service is as in the below table

<table>
<thead>
<tr>
<th>Chemical Method</th>
<th>Cost (In Rs.)</th>
<th>IPM Method (In Rs.)</th>
<th>Cost (In Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compost: - 1 Tractor@1000</td>
<td>1,000.00</td>
<td>Compost: One</td>
<td>1,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tractor@1000=Rs.1000</td>
<td></td>
</tr>
<tr>
<td>Fertilizer:- 25Kg in 25 dec.</td>
<td>625.00</td>
<td>10kg. Fertilizer(DAP) in 25 dec+Bhushakti-5Kg.+Tricoderma-0.25Kg</td>
<td>585.00</td>
</tr>
<tr>
<td>Pesticide:- Monthly Cost.</td>
<td>960.00</td>
<td>Chilli garlic paste Botanical pesticide, Wander &amp;Nibarana</td>
<td>465.00</td>
</tr>
<tr>
<td>Three times in a week 15 liter(Dhol) @Rs. 80 per 15 liter(Dhol)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banjhi (Supporter):- 1100 piece @Rs.2</td>
<td>2,200.00</td>
<td>Banjhi (Supporter):- 1100 piece @2=Rs.2,200</td>
<td>2,200.00</td>
</tr>
<tr>
<td>Top Dressing:- Twice in a month during fruiting Stage 20Kg.in each time</td>
<td>1,040.00</td>
<td>Twice in a month during fruiting Stage 10Kg.in each time</td>
<td>520.00</td>
</tr>
<tr>
<td>Yield:- 1Qntl @Rs 26/per Kg</td>
<td>5,825.00</td>
<td>Yield:- 1.3Qntl @Rs 26/per Kg</td>
<td>4,770.00</td>
</tr>
</tbody>
</table>

Mr. Rohit Pradhan totally spent a sum of Rs. 5,270 (4,770+500) including IPM service Fee for 25 decimilparbal cultivation. In return, he got the first yield 15 days earlier than traditional method of practice and now is producing an average of 130kg of parbal in every week and also without any difficulties he is selling these in the local market @ Rs.26/ Kg. ; The interesting story behind the selling of his products in the market is; he is saying that he has produced these without using any chemical pesticides.

The farmers of nearby areas are also showing their interest to produce parbal in next Kharif after observing the yield and income of Mr. Rohit. And even 15 more IPM service has been
rendered to the nearest farmers in last two months. The local farmers are also not forgetting to appreciate the effort of our LSP for regular monitoring their crop in terms of yield compared to their traditional practice.

7.2. **Case Study 2- Non Pesticide Management (NPM): Say NO to Poison farming**

**Shyam Ghan Pradhan**, a 28 years old young energetic youth, lives in the village Bargaon of Bargaon Gram Panchayat under Bargarh district of Odisha. He is a part of his joint family consisting of his father, mother, two elder brothers and their two children. Mr. Shyamghan is a graduate but has never tried for any kind of private or Govt. jobs. He says that no jobs would have given him as much as he is getting now without losing his independence from his 20 Acres of land. When Mr. Shyamghan was at school, from that time onward he is involved in agriculture. He says that for him, his father is his first Resource person and next to his father is 4S. In 20 Acres of land Mr. Shyamghan produces various kinds of products across the year. He cultivates rice twice in a year then he cultivates vegetables like carrot, beans, long beans, pumpkin, ladies finger, cabbage, cauliflower and many more. Water facility is available at any time in his field from bore well which has been made from the own money of his family.

Last year Mr. Shyamghan came to know about 4S and its services offered through the project Swabalamban by coming to a village meeting which was going on at Bargaon village. He was quite impressed and enthusiastic to get idea about vegetable production without applying chemical pesticides (Non Pesticide Management). He wanted to practice the kind of services in his field too. He made his registration by paying Rs. 500 under IPM (Integrated Pest Management) for cauliflower cultivation and acquired all relevant information for the cultivation of this crop. Then he prepared the seed bed under the supervision of our LSP(Livelihood Service Provider) and SMS(Subject matter Specialist) in September 2015. For a pilot basis, Mr. Shyamghan did cauliflower cultivation in 15 decimal area. He began with the
main land preparation, first of all he did dip ploughing of the land and applied organic fertilizer(gobarkhad) and irrigation of his land. 2,000 plants were transplanted in the main field in last September 2015. Weeding was carried regularly in a week interval. Package of practice was maintained throughout the crop duration. Each and every members from his family were engaged in the cultivation.

He started harvesting the crop from 2nd week of November 2015. Initially the Produce was sold in the local market due to huge demand and later when supply was more and demand was less Mr. Shyamghan sold his produce through the middle man, who were coming to him and taking the products by paying him a very less profit margin compared to the market price. Total harvest was around 1.4tons (14,00Kg), which was sold at an average of Rs. 26.00 per Kg. Around Rs. 36,400 was earned from cauliflower cultivation by Mr. Shyamghan against his conventional practice. The big difference noticed by Mr. Shyamghan is he could store the product for 6-7 days without any kind of damage with very rich in taste compared to earlier product (Product from conventional method of practice). “Cash earned was much more as compared to the production and expenses in conventional method of practice” says Mr. Shyamghan.

Expenses detail with Pesticides and without pesticides for 15 decimal Area is as follows:

<table>
<thead>
<tr>
<th>With pesticides</th>
<th>Cost (in Rs.)</th>
<th>Without pesticides</th>
<th>Cost (in Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed 20Gram</td>
<td>380</td>
<td>Seed 20Gram</td>
<td>380</td>
</tr>
<tr>
<td>Compost 1 cart</td>
<td>200</td>
<td>Compost 1 cart</td>
<td>200</td>
</tr>
<tr>
<td>Fertilizer (3times) 45kg</td>
<td>1575</td>
<td>Fertilizer (2times) 20kg</td>
<td>700</td>
</tr>
<tr>
<td><strong>Pesticide</strong></td>
<td></td>
<td><strong>NPM</strong></td>
<td></td>
</tr>
<tr>
<td>Classic 2 times</td>
<td>40</td>
<td>Nayak Powder 500gram</td>
<td></td>
</tr>
<tr>
<td>Towson (2times) 2 times</td>
<td>150</td>
<td>Botanical Pesticide (3times) 3 times</td>
<td>140</td>
</tr>
<tr>
<td>Gum 80 ml</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin (Chamak) 3 times</td>
<td>120</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Expenses</strong></td>
<td><strong>2545</strong></td>
<td><strong>Total Expenses</strong></td>
<td><strong>1420</strong></td>
</tr>
<tr>
<td><strong>Total Production 1 tonne</strong></td>
<td></td>
<td><strong>Total Production 1.4 tons</strong></td>
<td></td>
</tr>
</tbody>
</table>

Now Mr. Shyamghan is one of the cheerful farmers in the region. He is enjoying vegetable cultivation with his family. He is also preparing Botanical pesticides, Fish amino acid and tobacco extracts at his home in huge quantity. This year he is planning for 50,000 cauliflower plants to be cultivated in his field.
7.3. **Case Study 3- VermiWash – A potential product to reduce chemical fertilizer requirement:**

Low prices being offered for farm produces and the rising costs of chemical inputs had made the living condition of Mr. LalitKhamari very miserable. He was in sought of new ways to increase his farm incomes in order to lead a better life. Finally his continuous hard work and devotion has made him a successful farmer in his area. This is the real story of Mr. LalitKhamari Residence of village Bargaon of Bargaon Gram Panchayat under Bargarh District of Odisha who is a middle aged farmer living with his family comprising his 4 children, three daughters and one son, and his wife. He is cultivating a total land of 3.5Acre of which 0.5Acre is his own land and rest he is doing on tenant.

Earlier he was doing paddy cultivation in 2.5 acres and in 1 acre he was cultivating vegetables like brinjal, cauliflower, parbal, ladies finger and long beans by traditional methods and indiscriminate use of chemical fertilizers in 3.5 acre of land and his earning was Rs. 2.5 lakhs annually. However, the cost of cultivation was Rs. 16,000/acre. Last year he came to know about the services offered by us, LEISA Project, and started vermimash collection through vermi pits. Mr. LalitKhamari started applying vermimash in the Paddy cultivation as well as in vegetable cultivation directly from vermimash container.

To prepare vermin wash, a 50 liter of plastic drum is used with a hole at the base of the container where a tap was fixed at the bottom of the drum. A base layer of small pieces of stones are placed upto height of 10-15 cm. A coarse sand layer of 5 cm above which 40-45 cm pre-decomposed organic wastes is placed. Water is used to moisten the different layers with help of a drum with a hole at the bottom of it which is placed at the top of the plastic drum. 100 earthworms are released on the container. After 10 days, vermi-wash started forming in the container. He used it in his paddy field by diluting one liter of vermi-wash with 10 liter of water. He had applied this 2times in his paddy field within a month with a 15days interval in flowering stage.
According to Mr. LalitKhamari, the application of vermi-wash kept the crop green so he never felt the Nitrogen deficiency in the crop and did not apply urea second time. In traditional method he was using 50Kg urea and by applying vermiwash he reduced urea quantity to 25Kg. In this way he has managed to reduce the fertilizer cost.

Surprisingly Mr. LalitKhamari noticed that the fertilizer cost had been reduced in 2.5 Acres of land but his yield was almost same to previous year yield. He is expecting better yield by applying vermi wash next time. He found that as the preparation of vermiwash was not in proper time so he could not apply it in his field on time. “This time I’ll apply this vermi wash on proper time along with SRI cultivation technique in my field” says Mr. LalitKhamari.

7.4. **Case Study 4- Commercial Mushroom cultivation**

Mr. Ananda Barik is a progressive farmer of village Tentala experimenting with cloning of plants, new varieties of rice, trying out organic fertilizers and innovative pest management techniques. He is very familiar with various agricultural practices, as he is in this activity from the age of 16. When he was in 10th standard his father passed away, and being the eldest son of the family, the burden came on his shoulder. His study stopped, and he tried hard to feed his family from agricultural practices. Mr. Barik had an ancestral property of 10 acres of land. Earlier the undivided family was engaged in cultivation of paddy, groundnut, different gourds (Snake gourd, Bitter gourd, Bottle gourd etc.) and brinjal in 12.5 Acre land (10 Acre owned and 2.5 Acre leased). Presently, the land has been divided among the brothers. He is now staying with his wife, two children, mother and one un-married brother, and cultivating 3.5 acres of land which he got from his ancestral property.

Ananda had learnt about the prospects and opportunities in mushroom cultivation from various sources like TV, Newspaper and other krishi magazines. But due to lack of technical knowledge he was unable to do this activity. From a village awareness meeting, he came to know about the Project SWABALAMBAN and various services being offered by ACC in partnership with 4S (. He showed his willingness to become a VLE (of his village and got a chance to attend the training program on mushroom cultivation at OUAT (Orissa University of Agriculture and Technology), Bhubaneswar. After the training he did registration for mushroom cultivation by paying Rs 750/- for 30 beds. By utilizing the skill and knowledge he got a profit of Rs. 2,000/- within a short span of time. With this, he aimed to enlarge this activity with a permanent structure. Through project LEISA (Low External Input for Sustainable Agriculture), he built a
commercial mushroom unit with very low investment from his side. From the month of July 2016, he started installing beds inside the commercial farm. Every day he was installing 10 beds and within 48 days he got a good return from 500 beds. The details is as below-

<table>
<thead>
<tr>
<th>Expenses</th>
<th>Quantity/Number</th>
<th>Amount (In Rs.)</th>
<th>Total Production</th>
<th>Average Rate of Sale ((In Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration Fee</td>
<td>One Time</td>
<td>10808</td>
<td>382Kg 750 gm</td>
<td></td>
</tr>
<tr>
<td>Paddy Straw</td>
<td>5000 Bundles</td>
<td>10000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spawn</td>
<td>100 Bottle</td>
<td>2400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dal Powder</td>
<td>50 Kg</td>
<td>2500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lime</td>
<td>5kg</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Total Expenses = Rs. 25808
- PROFIT = (382.750*140)-25808 = Rs. 27777

Services offered to Mr. AnandaBarik through LEISA project of 4S:
- Spawn for 300 beds
- Polythene for 300 beds
- Technical Assistance from time to time

When we asked Mr. AnandaBarik to say something about his success, he said, “At first I am thankful to my family members especially to my brother and my wife who made this success happen, and then to ACC and 4S for their continuous support”. He has a target of earning a minimum of Rs. 200,000/- in next year by enlarging the farm structure, as he has created an assured market for his produces. Also he is planning to establish one vermin compost unit by utilizing the wastage from mushroom farm.

Many farmers of his village have seen him practicing this activity and earning a good return. They have also become interested to do this activity in coming years. For this, now after harvesting paddy they are keeping the paddy straw in safety places instead of burning them.

8. View of the Stakeholders:

8.1. Feedback of bio-product entrepreneurs:

All 10 bio-product entrepreneurs, promoted under this study, are quite happy with this activity. They are in view that, by producing this product they are earning quite a reasonable amount on a regular basis, and simultaneously they are doing a noble work as these products are good for health. Moreover, they have got a business orientation through this project, which they are expecting to help them in future also. Once housewives have now become economically independence. All of them want to expand their business in future by producing more in volume.
8.2. **Feedback of Customer of organic vegetables:**

A feedback survey in Bargarh market revealed that the demand of organic vegetable is increasing day by day. The customers are ready to spend more money for organic vegetable, as this is not harmful for the health. Customers also informed that even they do not use freeze, these vegetables remain fresh for 3/4 days in normal temperature. They are also claiming that the taste of organic vegetable is much better that the vegetables, where chemical fertilizers/pesticides are used.

8.3. **Feedback of Agriculture department:**

The Deputy Director of Agriculture, District Agriculture Officer and Assistant Agriculture Officer of the area visited our production centre and have interacted with Entrepreneurs about how they are producing bio-products, their monthly income and also interacted with farmers who are using these products. They are quite happy with this initiative. They have assured to provide all possible supports to take this programme forward to entire district and also adjacent districts.

8.4. **Feedback of Bargarh Municipality:**

Current emphasize of Bargarh Municipality is to make “Clean Bargarh, Green Bargarh”. Municipality officials are quite hopeful with current initiative, as these products are being produced by vegetable wastes (Soil Charger) and fish wastes (Puspika) and therefore helping in waste management of the city. The Executive Officer was quite excited with this and thinking of future collaboration with 4S for betterment of the society by recycling the wastes of the city into a healthy product.

9. **Way Forward:**

- In future, the team has a plan of expanding the initiative in other states also, like Bihar, Jharkhand, West Bengal, UP and Punjab. For that, the team is coordinating with the government department of these states, as without support of government departments this initiative cannot be successful in wide range.

- Developing a quick system to decompose farm waste is the target of the team in near future.
Annexure: Award on Integrated Farming to our farmer by: President of our FPO being Nominated by KVK, Bargarh and awarded by VC, Odisha University of Agriculture and Technology, Bhubaneswar
From,
Sri Naba Kishore Das, B.Sc. (Ag.)
Deputy Director of Agriculture
Department of Agriculture & Food Production
Government of Odisha
Bargarh District
Odisha

To Whom It May Concern

Certified that "Sarva Seva Samity Sanstha" and "BASIX Krishi Samruddhi Ltd" have developed a number of bio–products mobilizing local community in Bargarh district in Odisha. They have trained, guided & developed entrepreneurs including women entrepreneurs to produce bio–products. The farmers are encouraged at village level to form Farmer Interest Groups (FIGs). FIGs are federated to form Farmers Producer Organisation (FPO) named as Rajib Lochan Producer Company Ltd. FIGs & FPO are actively participated in promoting such bio–products namely Sabujima, Puspika, Jad ki Dhal, Phasal ki Dhal, Soil Charger & Pradayani.

We wish such products should be adopted by many farmers for eco friendly environment & cost effective agricultural production.

Dy. Director of Agriculture
Bargarh
Annexure: Appreciation letter by CDVO, Department of Animal Husbandry & Veterinary Services

Appreciation Letter

Sava Seva Sanstha (BASIX) is working to promote Back Yard Poultry in the district of Bargarh, Odisha. BASIX is providing Day old Chicks with proper training on brooding to farmers along with vaccination and need based medication through Project Swabhiman under CSR activity of ACC, Bargarh Cement Works, Bargarh, Odisha.

We recognize BASIX for its contribution on developing Back Yard Poultry at rural house hold level.

Chief District Veterinary Officer

Department of Animal Husbandry & Veterinary Services

Government of Odisha

District Bargarh, Odisha
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Inputs / Operation</th>
<th>Unit</th>
<th>Volume</th>
<th>Rate (Rs.)</th>
<th>Year-I (Rs.)</th>
<th>Year-II (Rs.)</th>
<th>Year-III (Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Land preparation (Deep ploughing &amp; harrowing)</td>
<td>hour</td>
<td>13.5</td>
<td>300</td>
<td>4,050</td>
<td>2,025</td>
<td>2,025</td>
</tr>
<tr>
<td>2</td>
<td>Digging of pits</td>
<td>No.</td>
<td>1200</td>
<td>10</td>
<td>12,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Compost</td>
<td>bag of 60 kg</td>
<td>400</td>
<td>15</td>
<td>6,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Fertilizer - DAP</td>
<td>kg</td>
<td>330</td>
<td>25</td>
<td>8,250</td>
<td>8,250</td>
<td>8,250</td>
</tr>
<tr>
<td>5</td>
<td>Fertilizer - Muriate of Potash</td>
<td>Kg</td>
<td>480</td>
<td>16</td>
<td>7,680</td>
<td>7,680</td>
<td>7,680</td>
</tr>
<tr>
<td>6</td>
<td>Fertilizer - Urea 8 times</td>
<td>kg</td>
<td>420</td>
<td>8</td>
<td>3,360</td>
<td>3,360</td>
<td>3,360</td>
</tr>
<tr>
<td>7</td>
<td>Plant</td>
<td>No.</td>
<td>1200</td>
<td>22</td>
<td>26,400</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Labourer (Total)</td>
<td>person</td>
<td>75</td>
<td>200</td>
<td>15,000</td>
<td>12,000</td>
<td>12,000</td>
</tr>
<tr>
<td>9</td>
<td>Irrigation. Tubewell 24 times</td>
<td>acre</td>
<td>24</td>
<td>300</td>
<td>7,200</td>
<td>7,200</td>
<td>7,200</td>
</tr>
<tr>
<td>10</td>
<td>Pesticide : Fungicide 6 times</td>
<td>kg</td>
<td>4.5</td>
<td>300</td>
<td>1,350</td>
<td>1,350</td>
<td>1,350</td>
</tr>
<tr>
<td>11</td>
<td>Pesticide : Insecticide</td>
<td></td>
<td></td>
<td></td>
<td>1,000</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>12</td>
<td>Growth Promoter : Parovita</td>
<td>kg</td>
<td>9</td>
<td>40</td>
<td>360</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td>13</td>
<td>Micro nutrients</td>
<td>250 gm</td>
<td>2</td>
<td>800</td>
<td>1,600</td>
<td>1,600</td>
<td>1,600</td>
</tr>
<tr>
<td>14</td>
<td>Staking</td>
<td></td>
<td></td>
<td></td>
<td>6,000</td>
<td>6,000</td>
<td>6,000</td>
</tr>
<tr>
<td>Cost of Cultivation</td>
<td>Total</td>
<td>100,250</td>
<td>50,825</td>
<td>50,825</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>--------</td>
<td>---------</td>
<td>--------</td>
<td>--------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Yield per plant in kg</td>
<td>22</td>
<td>20</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of plants/acre (considering mortality &amp; other damage)</td>
<td>1,100</td>
<td>1,100</td>
<td>1,100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Yield per acre in kg</td>
<td>24,200</td>
<td>22,000</td>
<td>19,800</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Selling price Rs. per kg</td>
<td>8.00</td>
<td>8.00</td>
<td>8.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gross Income per acre (Rs.)</td>
<td>193,600</td>
<td>176,000</td>
<td>158,400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Income per acre (Rs.)</td>
<td>93,350</td>
<td>125,175</td>
<td>107,575</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average net income in 3 years (Rs./ acre)</td>
<td>108,700</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>