

Participatory technology assessment

for enhancing farming system productivity and developing entrepreneurship for sustainable livelihood

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Location and selection of area

The project was implemented in four villages namely Paninora, Shyam Gaon, Khamjongia and Dangdhora under Titabor sub-division of Jorhat district. This village cluster represents Humid Alluvial Flood Free situation characterized by warm humid climate with an average rainfall of more than 2000 mm. The soils of this agroecological situation are Entisols and Inceptisols with sandy loam, loamy sand or loamy in texture. The farmers of the project site belong primarily to marginal and small categories with very few belonging to semi- medium with the large majority being resource poor farmers. Winter rice sole cropping with mostly traditional varieties dominated the cropping system. Ranjit and a few other high yielding varieties were being cultivated without seed replacement since their adoption. The dairy, poultry and piggery were at subsistence level with local breeds and home waste as feeds, without routine vaccination and healthcare.

OBJECTIVES

- To facilitate participatory assessment of farming systems and innovations and integration of science led innovations and practices into farmers' mixed farming system models for enhancing farm productivity and

profitability.

- To establish economic activity spreading linkage model among the farmers for improving their access to information, technology, input and market.
- To develop skills and build farmers' capacities for adoption of modern agriculture and entrepreneurship development.

INTERVENTIONS

Crop based module

Enhancing cropping intensity with pulse production through relay cropping in rice sole crop area

Objectives

- To promote rice-based cropping system in rice monocrop area towards doubling farmers' income.
- To enhance pulse production in rice monocrop area through low energy, low cost cultivation technology.

Intervention

- Promotion of low energy, zero tillage crop production through relay cropping in rice monocrop area.

Details of modules selected

The participating farmers of the project villages were cultivating winter rice as sole crop under rainfed condition. The approach to mobilize the community to grow a succeeding crop after winter rice needed a low input and energy method of crop production. On the other hand, the participating farmers were apprehensive of growing summer pulse or *rabi* oilseed crops owing to several issues. Accordingly, pulse crop as relay cropping was introduced to enhance cropping intensity, pulse production, land use ratio and ultimately income of the farm units. Seeds of field pea (variety – Aman) were provided and sown one week before harvesting of winter rice. The germination and initial growth of pea was facilitated by utilization of residual soil moisture after winter rice harvest, and the rice stubbles provided the support to the creeping field pea plants.

Rationale of the intervention

The project area is traditionally rice monocropped. The approach to motivate the farmers to grow a second crop must be based



on low input and energy driven technology. Further, utilization of residual soil moisture, which gets rapidly depleted soon after winter rice harvest, was utmost necessary. Accordingly, relay cropping of suitable pulse crop succeeding winter rice was introduced for adoption and success of the intervention.

Outcome

Income gained from adoption of this technology is given in Table 1.

Drawbacks and Lesson learnt

Since a few farmers had adopted the practice, temporary bamboo fencing had to be provided to protect the *rabi* crop from stray cattle.

Training

Trainings imparted for cultivation practices of the rice-relay cropping and soil moisture conservation.

Way forward

- Dissemination through community mobilization.
- Facilitation of storage and marketing of pulse grains through special scheme.
- Intervention on irrigation water management at critical crop growth stages.

Promotion of medium duration variety to facilitate rice-based cropping in winter rice monocrop area

Objective

- To facilitate rice based cropping system in rice monocrop area through promotion of medium duration high yielding variety (130-135 days) replacing traditional and long duration high yielding variety (150-155 days).

Intervention

- Promotion of medium duration (130-135 days) high yielding variety of rice (Shraboni TTB 404) in rice monocrop area.

Details of modules selected

The participating farmers of the project villages were cultivating Ranjit and other improved and traditional varieties of winter rice. The crop was harvested by the end of

Table 1. Income gain from enhancing cropping intensity

Particular	Ms. Jyoti Sonowal		Mr. Jayanta Gogoi	
	Before	After	Before	After
Rice sole crop area (ha)	2.00	1.73	6.67	6.10
Rice sole crop production (kg/ha)	4000	4900	4200	5150
Rice-field pea relay cropping area (ha)	Nil	0.27	Nil	0.57
Field pea production in rice relay cropping (kg/ha)	Nil	734	Nil	850
Rice sole crop net income (₹/ha)	16500	18550	17200	20300
Rice-field pea relay cropping net income (₹/ha)	Nil	31360	Nil	39450
Additional income from rice-field pea relay cropping (₹)	Nil	12013	Nil	43164

November to the first week of December surpassing the normal sowing or planting time of *rabi* crops. Besides, the seeds of the existing varieties had not been replaced for long since their adoption. Medium duration (130-135 days) rice varieties were promoted by providing quality seeds and good management practices that enabled the farmers to harvest their crop 20-25 days earlier. This facilitated sustainable or higher rice yield and growing of second crop utilizing the soil moisture after rice harvest.

Rationale of the intervention

Existing traditional varieties are low yielders, while both the traditional and HYV varieties are of long duration. Thus, a very short window and depleted soil moisture was left for the succeeding crop in *rabi* season. Introduction of medium duration rice variety facilitated cultivation of *rabi* crop in time with optimum soil moisture for seed germination and early vegetative growth.

Table 2. Income gain from adoption of medium duration variety

Particular	Ms. Jyoti Sonowal		Mr. Jayanta Gogoi	
	Before	After	Before	After
Rice crop area under long duration variety (ha)	2.00	1.00	6.67	4.67
Rice production under long duration variety (kg/ha)	4000	4000	4200	4200
Rice crop area under medium duration variety (ha)	Nil	1.00	Nil	2.00
Rice production under medium duration variety (kg/ha)	Nil	4900	Nil	5150
Net income with old variety (₹/ha)	16500	16500	17200	17200
Net income with medium duration variety (₹/ha)	Nil	18550	Nil	20300
Additional income with medium duration variety (₹)	Nil	2050	Nil	3100

Outcome

Income gained from adoption of this technology is given in Table 2.

Drawbacks and Lessons learnt

Since the crop is harvested early, the farmers have to store the seeds for longer period till the normal market is available.

Training

Trainings imparted for cultivation practices and management of the new varieties of rice, and linkage with market and marketing agencies.

Way forward

- Special schemes to promote cultivation of succeeding crop(s).
- Strengthening the storage and marketing of rice grains.

Horticulture based module

Strengthening commercial cultivation of King chilli through good agricultural practices and market linkage

Objective

- To promote good agricultural



practice for cultivation of King chilli and facilitate market linkage.

Intervention

Promotion of improved cultivation practices, viz. good quality seedlings, plastic mulch and sticky trap etc. for cultivation of high value crop King chilli (Bhut jalakia - non-descript local germplasm), and strengthening of the marketing and market link.

Details of modules selected

Bhoot jolokia (King Chilli) is very sensitive to growing conditions and is also susceptible to multiple pests and diseases. The demonstration of IPM practices using both chemical as well cultural and mechanical management practices (e.g. yellow sticky trap) against the vector of viral diseases etc. followed by regular monitoring was implemented under the project. Since the farmers of the project site lacked access to natural water sources for irrigation, they were trained in use of straw and plastic mulching for moisture conservation and weed management.

Rationale of the intervention

In spite of its high market demand and net economic return, many farmers gave up its cultivation, while the existing growers were reluctant to grow the crop in large scale due to severity of bacterial and viral diseases.

The use of disease free, healthy seedlings and adoption of good agricultural practices were the priorities to scale up existing cultivation and to revive areas shifted to other crops of low profitability. Accordingly, interventions on availability of quality seedlings and promotion of good production and management practices were planned and implemented.

Outcome

The additional income gained from commercial cultivation of King chilli is given in Table 3.

Drawback and Lessons learnt

- Capacity building of farmers and development of processing facilities.
- Availability of good planting materials.

Training

Selected members were provided exposure visit to Assam Agricultural University Campus for hands-on training on seedling production, crop care in nursery and main field of King chilli plants with recommended good agricultural practices.

Way forward

- Out scaling in terms of area and production with good agricultural practice.
- Value addition and post-harvest

processed products.

- Secure and stable market.

Enhancing farm income through increasing cropping intensity with King chilli cultivation in winter rice-fallow

Objective

- To enhance cropping intensity in suitable rice-fallow medium land.
- To promote cultivation of high value crop towards enhancing farm income.

Intervention

- Promotion of intercropping with king chilli for higher productivity and quality.

Details of the module selected

A few participating farmers, with adequate resources like land, farm machinery, cattle and surplus paddy production, were motivated to grow King chilli after winter rice. The farmers were strengthened with necessary technical advisory assistance and inputs like good quality seedlings, plant management and protection chemicals through FFP project. In a participatory mode, irrigation facility from nearby natural stream was facilitated with technical support from FFP for achieving maximum water use efficiency through drip irrigation at critical crop growth stages.

Rationale of the intervention

The participating farmers of the project villages were cultivating winter rice as sole crop under rainfed condition. Lack of irrigation facility, menace of stray cattle and inadequate access to mechanization etc. were the main reasons for not attempting crop diversification after winter rice in the area. This necessitated motivating and strengthening the farmers

Table 3. Income gain from commercial cultivation of King chilli

Particular	Before intervention	After intervention
Area under King chilli cultivation (ha)	0.39	2.00
Area under small scale tea cultivation (ha)	3.17	1.56
Production of King chilli (kg/ha)	1050	1350
Net income from King chilli cultivation (₹)	45000	250000
Net income from other horticultural and tea crops (₹)	187940	98880
Net income from King chilli and small scale tea cultivation	232940	348880
Market link for King chilli	Local market	Manipur, Nagaland



through promotion of high value crop production having good market demand and facilitating irrigation with high water use efficiency.

Outcome

The additional income gained from adoption of intercropping is given in Table 4.

Drawback and lessons learnt:

- Capacity building of farmers and development of processing facilities.
- Availability of good planting materials.

Training

Selected farmers were provided exposure visit to Assam Agricultural University Campus for hands-on training on seedling production, crop care in nursery and main field of King chilli plants with recommended good agricultural practices.

Way forward

- Out scaling in terms of area and production with good agricultural practice.
- Value addition and post harvest processed products.
- Secure and stable market.

Livelihood promotion and entrepreneurship development through scientific bee keeping

Objective

- To enhance livelihood generation towards doubling farmers' income.
- To promote entrepreneurship in honey bee and bee colony production.

Intervention

- Promotion of scientific bee keeping

for higher productivity and quality.

Outcome

The additional income gain from scientific beekeeping is shown in Table 5.

Drawbacks and Lesson learnt

Since farmers are not adopting rape-mustard and other crops having high potential for honey bee production, the productivity is low.

Training

Trainings imparted for scientific bee keeping, honey bee extraction, packaging and marketing.

Way forward

- Strengthening and out scaling entrepreneurship.
- Packaging and storage facilities.
- Capacity building on processing for honey bee blended products.

Economic empowerment of women groups through edible mushroom cultivation

Objective

- To empower farm women into entrepreneurship and income generation.

Interventions

In order to empower the farm women economically, 100 farm families were identified and facilitated to form 10 nos. of SHGs, each SHG constituting two units of 5 members with a total of 20 units. The members of the groups were provided two days hands on training on mushroom cultivation, packaging, marketing etc. by experts and interaction with successful mushroom entrepreneurs. Each group was provided with necessary utensils and spawn for production of mushroom.

Table 4. Income gain from enhancement of cropping intensity in rice fallow

Particular	Before intervention	After intervention
Area under King chilli cultivation (ha)	Nil	0.40
Area under other crops after winter rice (ha)	Nil	0.40
Production of King chilli (kg/ha)	Nil	1125
Gross income from King chilli cultivation (₹)	Nil	75000
Gross expenditure for King chilli cultivation (₹)	Nil	44095
Net income from King chilli and small scale tea cultivation	Nil	33405
Market link for King chilli	Not applicable	Manipur, Nagaland

Table 5. Income gain from scientific beekeeping

Particular	Village cluster		Mr. Biren Gogoi	
	Before	After	Before	After
Honey bee box (Number)	3	13	3	8
Honey production (kg/box/cycle)	1.25	2.00	1.25	2.20
Number of cycles	1	2	1	3
Income from honey bee (₹/box/year)	1100	1500	1250	1750
Additional income from scientific bee keeping (₹/farm)	Nil	2640	Nil	8350

Regular visit of project staff and regular farm advisory service through mobile communication (both text and video) were provided to farmers about mushroom cultivation.

Rationale of intervention

In the project villages, several SHGs were formed and registered with Block development Office. One time grant from Government of Assam through Department of Agriculture as non refundable revolving fund was provided to the groups, but most of the SHGs were either defunct or inactive. One SHG in the project villages started mushroom cultivation before implementation of the project activities. In view of prevailing demand and market for fresh mushroom in the locality and nearby areas, the experiences and functioning of that SHG was reviewed and analyzed. Lack of knowledge about scientific cultivation, non-availability of spawn in regular basis and lack of awareness about potential of fresh mushroom as income generating avenue were the major issues in empowering farm women into small scale entrepreneurship in the project villages.

Outcome

Income earned by the SHGs is given in Table 6.

Drawbacks and Lesson learnt

- Uncertainty in availability and quality of mushroom spawn.
- Short production cycle due to high humidity and temperature during summer.
- Lack of entrepreneurship attitude among the farm women.

Training

Trainings imparted for cultivation, packaging and marketing of edible fresh mushroom.

Way forward

- Entrepreneurship development and promotion in mushroom spawn production.
- Facilitation of year round mushroom cultivation through temperature and humidity controlled structure.

Table 6. Income earned by women SHGs

Particular	SHG-1 (Nizara)	SHG-2 (Suravi)	SHG-3 (Kanaklata)	SHG-4 (Sewali)	Total (10 SHGs)
Total production (kg)	170	168	101	84	1307
Average production (kg/unit)	85	84	50	42	65
Total expenditure (₹/unit)	8000	7200	4320	3600	5780
Total income (₹/unit)	17000	16800	10080	8400	13070
Net income (₹/unit)	9000	9600	5760	4800	7290
Net income (₹/SHG)	18000	19200	11520	9600	14580

LIVESTOCK BASED MODULE

Enhancing income of farm women through scientific poultry rearing

Objective

- To strengthen farm women into profitable, small in-house farming.
- To enhance farm income and family nutrition through scientific backyard poultry rearing.

Intervention

- Promotion of scientific rearing of poultry through introduction of improved breed, feed and disease management.

Details of module selected

Traditionally, poultry rearing has been a significant contributor to the farm income in rural households. The poultry birds are usually reared for eggs and meat. However, most of these birds are of local/ indigenous in breed and hence exhibit poor production performances. Keeping this in mind, scientific backyard poultry rearing was promoted among the farm women with introduction of improved breeds, feed and disease management practices.

Rationale of the intervention

The farm women of the project area traditionally reared local breeds of poultry. The approach to motivate the farm women to practice scientific backyard poultry rearing integration

with their existing farming system was done to boost the egg and meat production while enhancing their farm income. Accordingly, improved breed of poultry like Vanraja, Kalinga Brown and Rainbow rooster along with scientific feed and disease management practices was introduced for adoption and success of the intervention.

Outcome

Income gained from scientific poultry rearing is given in Table 7.



Table 7. Income gained from rearing of poultry

Particular	Before intervention	After intervention
Egg production (Number/bird/laying period)	21	66
Meat production (kg/bird)	1.00	1.75
Total egg production from a unit of 10 birds (Number/year)	285	950
Total meat production from a unit of 10 birds (kg/year)	9.0	18.5
Sale price of egg (₹/egg)	10	10
Sale price of meat	300	300
Net income from a unit of 10 birds (₹/year)	5350	13150

Drawbacks and Lesson learnt

- High mortality due to late diagnosis of disease and irregular vaccination.
- Decrease in egg count and meat production due to imbalanced feed.

Training

Trainings imparted on improved breed, feed and nutrition, vaccination and first, profitable backyard rearing of poultry birds with techniques for identification of common diseases.

Way forward

- Promotion of entrepreneurship on mini hatchery and chick production.
- Developing suitable technology for in farm feed formulation and production.

NRM based module

Enhancing efficiency of farm waste recycling through vermicompost production

Objectives

- To replace traditional practice with improved composting method for higher quality and recovery.
- To promote entrepreneurship in vermicompost production.

Intervention

- Promotion of improved method of compost production in participatory mode.

Details of module selected

The recommended method for vermicompost production using concrete tank and covered with suitable shade was introduced among 20 farm units of different villages under the project. The construction of tank and shade was facilitated in participatory mode with the farmers and the project. The prospective growers were provided hands on training and critical input of recommended species of earthworm culture for the module.

Rational of the intervention

The farmers of the project villages produce composts under open air following traditional practice. With introduction of various modules under the project and anticipated



increase in cropping intensity through crop diversification including horticultural crops, each farm is expected to produce additional compost of good quality. The recommended waste recycling method for vermicompost production, developed by Assam Agricultural University, had been successfully promoted in many villages of the state under different projects. Apart from availability of good quality compost in a shorter period, the venture had benefited many enthusiastic farmers into successful entrepreneurs. Accordingly, the component was introduced under crop-based module for promotion in the project villages.

Outcome

Additional income earned from adoption of the technology is given

in Table 8.

Drawbacks and Lesson learnt

- Discontinuity in production cycle.
- Long production cycle during winter due to low humidity and temperature.
- Lack of entrepreneurship attitude among the farmers.

Training

Trainings imparted on improved method of composting with hands on training on vermicompost production, earthworm culture preservation and maintenance, and storage, packaging of harvested manure.

Way forward

- Entrepreneurship development in vermicompost and earthworm production.

Table 8. Income earned from improved method of compost production

Particular	Mr Uma Sonowal	Mr Krishno Kachari	Mr Md Sharif Ahmed	Mr Gubin Gogoi	Mr Prabhat Kachari	Total (20 units)
Vermicompost production (kg/cycle)	450	350	400	400	375	371.50
Earthworm production (g/cycle)	450	450	500	650	400	448.75
Sale price of vermicompost (₹/kg)	12	15	10	12	15	10.90
Number of cycles (Number/year)	3	3	4	4	3	2.95
Total expenditure (₹/unit/year)	7700	9000	9250	9075	8750	8341
Total income (₹/unit/year)	18900	18450	20000	24400	19275	14839
Net income (₹/unit/year)	11200	9450	10750	15325	10525	6498

- Compost enrichment and blending with poultry manure, farmyard manure.

Farmers' innovative method for soil moisture conservation and management

Objective

- Mitigating moisture stress condition during *rabi* season.

Intervention

- Soil moisture conservation and management technique among the farmers of Titabor, Jorhat, Assam.

Details of module selected

The farmers of Paninora, Khamjongia and Shyam Gaon, Jorhat district of Assam traditionally cultivate cucurbit in rice field. These villages are situated in the foothills of Naga Hills and the water table recedes rapidly during the dry months (Post-monsoon and winter season). The only perennial water sources in the area are the small rivulets, which also dry up during the winter months with low water availability for *rabi* crop cultivation. To overcome the water stress condition, few farmers have started growing cucurbits in trenches in an innovative manner. The designed trench is a single long trench dug without disturbing the nearby soil thus keeping soil moisture intact. The seeds are sown in these trenches maintaining proper spacing and then the trenches are filled up using dug up soil. Once seeds germinate, straw mulching is practiced for conservation of moisture. Once the creeper of the cucurbits is formed, the nodes of the creepers are covered with soil-dried cow dung mixture which helps the formation of new roots in the nodes, so that the plant can draw water and nutrients from a wider area. The farmers also use rice stubbles in the field to be kept undisturbed as this would be more efficient in keeping the soil moisture intact.

Impact

Adopting the 'Trench cultivation' has been innovative to solve the water stress issues. The method also has provided farmers to cultivate hybrid vegetables with better yield by conserving moisture during winter.

Outcome

The impact of adoption of trench cultivation is given in Table 9.

Drawbacks and Lesson learnt

The practice performs reasonably well under normal climatic conditions. However, strengthening and development are required in terms of back up irrigation under prolonged rain free period, higher productivity vis-à-vis profit.

Training

Trainings imparted for good agricultural practices for cultivation of pumpkin and other potential vegetable, grain crops adaptable to the existing practice.

Way forward

- Crop diversification and intercropping.
- Storage facility for marketing during high demand.
- Promotion of suitable local varieties for secured, in time seed availability and pest-disease resistance.

Low cost protected structure for in-site production of quality planting materials and off season crops cultivation

Objective

- To facilitate in-site production of good quality planting materials in low cost protected cultivation structure

Intervention

- Demonstration on precision planting for seedling raising in low cost shade net house and off season vegetable cultivation.

Details of module selected

The low cost shade net house (floor area 100 m²) was developed in participatory mode using bamboo structure. Portable drip irrigation facility was created and the judicious

use of water was demonstrated. Cocopit and vermicompost as part of the growing medium was utilized for soil moisture conservation and production of healthy seedlings of vegetable crops. The *rabi* vegetable seeds of farmers' choice and good quality were provided for production of seedlings. During other period, the use of facility for production of off season leafy and other vegetables, leaf spices etc were demonstrated.

Rationale of the intervention

The heavy rainfall during the months of August and September poses a major challenge to the farmers for raising of seedlings of *rabi* season vegetables in time and they had to purchase the seedlings at higher prices from the market. This leaves the farmers with no choice for varieties and quality of *rabi* vegetable seedlings. The low cost shade net house, constructed in a participatory mode, was used to demonstrate growing of hybrid vegetable seedlings using pro trays on bamboo shelves utilizing the vertical space.

Outcome

The income earned from the off-season crop cultivation is given in Table 10.

Drawback and lessons learnt

This technology demonstrated the concept of precision farming to the farmers and also the possibility of utilization of vertical space. However a shade net house with cladding of UV stabilized polyethylene film would ensure better utilization of the facility in Assam conditions.

Training

Trainings were organized in the project villages on production of vegetable seedlings and off season vegetable crops and spice herbs. Besides, capacity building on precision farming, especially

Table 9. Impact of trench cultivation of pumpkin in rice-fallow

Particular	Innovative method	Conventional tillage
Average fruit yield (Number/plant)	23.8	18.0
Average fruit yield (t/ha)	82.7	62.7
Pumpkin cultivated area (ha)	0.13	0.13
Pumpkin production (t)	11.0	8.4
Net income from pumpkin cultivation (Rs.)	67679	52415



Table 10. Income from off-season vegetable cultivation and seedling production

Particular	Before intervention	After intervention
Production of <i>rabi</i> vegetable seedlings (number/year)	Nil	5,700
Production of off season vegetables (kg/year)	Nil	245
Production of leafy vegetables, spice herbs (kg/year)	Nil	65
Production of vegetables (kg/year)	480	Nil
Net income from the shade net house (₹/year)	4,960	14,925

enhanced water use efficiency and micro climate maintenance was facilitated.

Way forward

- Fertilization for higher nutrient use efficiency during critical stages of crop growth.
- Up scaling the utilization of vertical space.
- Facilitating year round production of shade loving medicinal and aromatic plants.

Impact of Farmer FIRST Project

- Area under HYV of Sali rice like Gitesh, TTB-404, Ranjit sub-increased.
- Average income of participating farmers of FFP villages enhanced.
- Area and productivity of some crops like Kking chilli, sali rice, relay cropping and pumpkin increased.
- Farmers were motivated for scientific rearing of pig, poultry and fish farming.

- Revamping of SHGs in the project village with income generating activities like mushroom cultivation.
- The liaison of farmers with line departments and linkage with FCI, marketing agents strengthened.
- Accessibility of farmers of project villages to institutional finance enhanced and strengthened
- Few farmers of the project villages recognized as resource persons
- High school and college students visits to farmers' field initiated
- Few farmers of the FFP recognized with awards at national, state and district level.

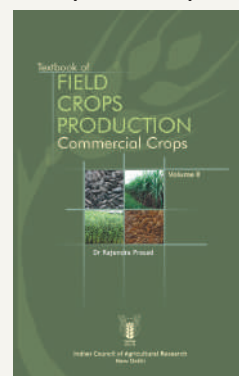
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Textbook of Field Crops Production – Commercial Crops

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(Volume II)



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