Ministry of Tribal Affairs
Government of India

REPORT

ON

"TRIBAL CENTRIC SUSTAINABLE LIVELIHOOD GENERATION AND INNOVATIVE PRACTICES IN INDIA"

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Gandhiji's TalisMan

"I will give you a talisman. Whenever you are in doubt or when the self becomes too much with you, apply the following test:

Recall the face of the poorest and the weakest man whom you may have seen and ask yourself if the step you contemplate is going to be of any use to him.

Will he gain anything by it? Will it restore him to a control over his own life and destiny? In other words, will it lead to Swaraj for the hungry and spiritually starving millions?

Then you will find your doubts and your self melting away"

150 YEARS OF CELEBRATING THE MAHATMA

Mohandas Karamchand Gandhi

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INTRODUCTION

The simple meaning of livelihood is that it is a means of securing the necessities of life. Conceptually "livelihood" connotes the means, activities, entitlements and assets by which people make a living, attempt to meet their various consumption and economic necessities, cope with uncertainties and respond to new opportunities. "Livelihood is never just a matter of finding or making shelter, transacting money, getting food to put on the family table or to exchange on the market place. It is equally a matter of ownership and circulation of information, the management of skills and relationships, and the affirmation of personal identity".

The Scheduled Tribes (ST) in India is generally known as 'Adivasis,' meaning indigenous people or original inhabitants of the country. The tribal communities are geographically isolated, socially neglected and economically exploited and most vulnerable section in the society. Besides tribals have abundant natural resources, they are most marginalized and disadvantaged communities of the Indian society. Around five hundred different tribal communities exist in India. The tribals are categorized under the scheduled list of Indian Constitution under Article 342 (i) and 342 (ii). In accordance with the 2011 census Indian Scheduled Tribes (ST) population are 10.43 crore that is 8.6 % of the total population living in 15% of total land. Tribal communities are particularly prominent in Andhra Pradesh, Chhattisgarh, Gujarat, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, West Bengal, and Northeast India, and the Andaman and Nicobar Islands. Indian tribal people are the worst off in terms of income, health, education, nutrition, infrastructure and governance. The government needs to more focused attention on tribes as they lack the basic conditions like communication, transport and relationship with the city or town.

The livelihoods among tribal communities in India is a complex, dynamic and multidimensional phenomenon, the perception of which varies with geographic location, type of community, age, gender, education, fluctuations in resources, services and infrastructures and social, economic, cultural, ecological and political determinants. Forest and Land are connected to each other because the tribal livelihood history comes from natural and ethnic factors. The predominant livelihood of the tribal communities is based on gathering from the forest materials, agriculture, animal rearing, crafts, daily wages and other works. Even in the modern world, they are struggling for their existence by depending upon the livelihood attain from the forest. Special attention for the tribal community was given in 1950 under Article 48.

The study will focus on these factors to achieve the status of livelihood in all Tribal states and will examine the best ways to overcome with the issues related to livelihood generation methods for Tribals across the states.

This study has been divided into seven themes:

1. Agriculture based innovative Tribal Livelihood and best practices
2. Forest based innovative Tribal Livelihood and best practices

3. Animal husbandry based innovative Tribal Livelihood and best practices
4. Sericulture
5. Pisciculture
6. Art and Craft based innovative Tribal Livelihood and best practices
7. Government Initiatives in Aspirational Districts

1. AGRICULTURE BASED INNOVATIVE TRIBAL LIVELIHOOD AND BEST PRACTICES:

1.1 Micro-irrigation system (Drip-irrigation and Sprinkler Irrigation) for tribal livelihood

1.1.1 Bamboo Drip irrigation system in North-East states:

Dating back 200 years, tribes in northeast India have used bamboo drip irrigation as a means of bringing water to seasonal crops. This timeless and traditional technology uses locally available material while harnessing the forces of gravity. An assortment of holed bamboo shoots zig-zag downhill, diverting the natural flow of streams and springs across terraced cropland. The advantages of using bamboo are two-fold: it prevents leakage, increasing crop yield with less water, and makes use of natural, local, and inexpensive material.[1]

1.https://www.cseindia.org/bamboo-drip-irrigation-2839.

The few materials needed are a small dao (a type of local axe), bamboo strands of various sizes, forked branches, smaller bamboo shoots used for the channel diversions, and two willing labourers. Bamboo Drip Irrigation Systems investigated its use in Meghalaya and says that two workers can construct a system covering one hectare of land in 15 days. About four or five stages of irrigation zig-zag from the water source to the last point of application. Along the way, 18-20 litres of water will eventually disseminate at a rate of 20-80 drops per minute.[2]

The Jaintia, Khasi, and Garo hill tribes have long entrusted the use of bamboo drip irrigation as a means to fulfilling domestic, agricultural, and customary needs. Its function remains unspoiled so as the rains continue to fall and the bamboo continues to grow.[3]

Cost and maintenance

The cost involved in building the system is minimal. Bamboo is available freely in this region. Usually, the farmer himself sets up the system in his plantation with some help from 1 or 2 labourers. The region gets heavy rain, so as a result, each installation lasts for about 2-3 years. After the rainy season the undergrowth is cleared and reinforcements are provided. Old bamboo is left to rot, which over time returns to the soil as humus.[4]

2. Ibid.

3. Ibid.

4. https://permaculturenews.org/2014/02/28/bamboo-drip-irrigation/

1.1.2 Tribes adopted drip irrigation in Orissa

There is no pucca road nor electricity in the tribal village of Tangiriapal in this district but drip irrigation has reached the small and marginal farmers here, helping them to harvest round the year and get better returns. In fact, tribal farmers in 68 villages of Harichandanpur block, who were highly dependent on monsoon and were harvesting hardly one crop a year, are taking advantage of drip irrigation and growing crops for commercial purposes.[5]

Many tribes who were selling their crops in a local heat at lower rates have started marketing their produce at higher prices in a nearby mandi for the first time ever in their lives and becoming 'lakhpati'. In neighbouringNipania village, Sidhu Munda and his wife Parbhati Munda have not only chosen drip irrigation but also set up a plant nursery in a protected greenhouse after an exposure visit to an Indo-Israel unit in Karnal, Haryana.[6]

The National Bank for Agriculture and Rural Development (NABARD) is promoting drip irrigation among tribal farmers. An estimated 32 acres have been covered under the scheme benefiting an equal number of farmers. drip irrigation has been implemented in 32 villages - 17 in Salem district and 15 in Tiruchi district. The areas in Tiruchi district, included those located in Top Sengattupatti, Puthur, Machilipatti and Solamathi while on Salem side, villages including Periyapakkalam, Punavarai, Nallapathi, PeriyaNagore and ChinnaNagore have been covered.[7]

Birjaberna, in Sundargarh district of Odisha, is a tribal-dominated village. ICAR-Indian Institute of Water Management Bhubaneswar planned, designed and executed various water conservation and management strategies since 2013-14 in this village. Through capacity-building programmes, farmers were exposed to various modern agricultural water management practices and were trained about the package of practices of aquaculture activities; care and maintenance of flow irrigation in minor irrigation systems; benefits of drip and sprinkler irrigation systems and different Government schemes.[8]

1.1.3 Micro-irrigation system in tribal areas of Navapur, Maharastra

The water use efficiency is very low under conventional flood method of irrigation due to substantial conveyance and distribution losses. Though the region gets about 1194 mm rain during monsoons, a major part is wasted as runoff and thus scarcity occurs during the dry season. Hence the drip and sprinkler irrigation systems are demonstrated to the tribal farmers.[9]

5. *https://www.dnaindia.com/india/report-odisha-tribal-farmers-becoming-lakhpatis-by-adopting-drip-irrigation-2722575.*
6. Ibid.
7. Ibid.
8. Ibid.
9. Towards Sustainable Livelihood of Tribal Farmers: Achievements under TSP by NIASM, Baramati ICAR-National Institute of Abiotic Stress Management (Indian Council of Agricultural Research), Malegaon, Baramati, Pune, Maharashtra, p.28.

Installation of drip irrigation systems:- The micro-irrigation in general and drip irrigation, in particular, has received considerable attention from policymakers, researchers, economists, etc. for its perceived ability to enhance water use efficiency and thus contribute to enhancing agricultural productivity, economic growth and environmental sustainability. This method results in resources saving, reducing energy (electricity) the requirement, weed problems, soil erosion, cost of cultivation, increased yield of crops and farm profitability. Hence, the drip irrigation system was installed on 51.2 acres of land. A total of 49 tribal farmers were benefitted from this activity.[10]

Introduction of sprinkler irrigation system:- Sprinkler system, another method of micro-irrigation was not being used in tribal areas of Navapur. Therefore the demonstration of overhead sprinkler with a raised bed system in groundnut was conducted to promote the use of sprinkler irrigation system.[11]

1.2 Beekeepingin Nandurbar region, Maharastra

Keeping in view of the vast agro-biodiversity of the flora of Nandurbar region that can sustain a large number of bee colonies by providing nectar and pollen, a major food source for bees, the regions have been adopted by Maharashtra State Khadi and Village Industries Board for promotion of bee-keeping enterprise under the scheme 'Integrated bee-keeping, bee-breeding and honey production'. To further promote the cause, training under TSP on bee-keeping enterprises conducted on February 7, 2012, at KrishiVigyan Kendra (KVK) Nandurbar. Fifteen tribal farmers from selected villages of Nandurbar district attended the training. Additional training was organised for 36 farmers at Directorate of Bee-keeping, Mahabaleshwar, Satara during February 25, 2012 - March 5, 2012.[12]

1.3 Mango production technology in Navapur tehsil, Maharastra

The mango cultivation in Navapur tehsil is characterised by discrete planting of mango trees either in the farms or along with the farm boundaries; however, there are no organised commercial mango orchards. Keeping this in view, training was organized on mango production technology on October 1, 2012, at KVK Nandurbar in which 46 tribal farmers from four villages participated. The talks covered the topics of the economic importance of mango cultivation, agro-climatic requirements, improved varieties/hybrids, grafting methods, planting material, planting season, spacing, training of plants, nutrition, irrigation, intercultural operations, intercropping, regulation of bearing, regulation of fruit drop, plant protection measures, harvesting and yield, post-harvest management like grading, storage, packing, transportation, marketing, etc. Apart from that, they were also briefed about demand and supply patterns, export potential, etc. Besides, on-farm training on integrated nutrient management and demonstration on fertilizer application in mango was organized on July 7-8, 2013 at Bokalzar village. Total of 100 tribal farmers from 5 surrounding

10. Ibid.
11. Ibid.
12. Ibid, p.10.

PICTURE SOURCE: THE HINDUSTAN TIMES

Villages have participated. Demonstrations were conducted on the method of application of organic and inorganic fertilizers to mango plants along with a technique for removal of leaf Webber.[13]

1.4 Sugarcane production technology in Navapur tehsil, Maharashtra

Sugarcane occupies about one-tenth of the cropped area of Navapur tehsil with the productivity of only about 15.4 ton/acre. The low productivity is mainly due to traditional methods of planting and management practices, imbalanced use of fertilizers, inadequate farm mechanization, heavy infestations of weeds, insects and diseases, non-adaptation of the area by sugar factories, etc. Therefore training on sugarcane production technology was organized during October 10-11, 2012 at Central Sugarcane Research Station (CSRS), Padegaon, Satara in which 59 tribal farmers participated. The farmers learnt about growing seasons, improved varieties, land preparation, planting material, planting time, selection of seed sets, set treatment, manuring and fertigation, weed management, intercropping, water management, earthing-up, detracting, propping, removal of water shoots, harvesting management, yield, nutrient deficiency symptoms, pests and disease management, ratoon management, gap filling, etc. The training also included raising nursery using single budded chips, transplanting young seedlings, wide spacing cultivation, organic method of nutrient and plant protection measures, etc.[14]

13. Ibid, pp.10-11

14. Ibid, p.11.

1.5 Paddy cultivation and post-harvest technology in Nandurbar district, Maharastra:-

The Tribal farmers of Nandurbar district use to store non processed paddy produce and process it by traditional methods at household level whenever needed for household consumption. Most of the rice processing methods are of the traditional huller type and are inefficient. The tribal farmers are adopting 'barter system' in rice marketing. Hence, the training programme on rice production and post-harvest technology for tribal farmers of Nandurbar district was organized during November 7-8, 2012 at Zonal Agriculture Research Station (ZARS), Igatpuri (MPKV, Rahuri). Thirty nine tribal farmers from Navapur tehsil had attended the training programme. The guidance involved soil health management, the importance of green manuring crops to improve soil fertility, seed production technology, plant protection, improved varieties, nutrient management, post-harvest technology and value addition in rice, mechanization of rice cultivation and scope of horticulture in rice-growing area. In the end, a field visit of farmers was arranged to seed production plots of ZARS. The training on rice production and post-harvest technology helped to bridge the knowledge gap between commercial farming and present subsistence rice farming adopted by tribal farmers of Navapur tehsil.[15]

1.6 Chilli production and its marketing in Navapurtahsil, Maharashtra

Despite favourable climate for chilli cultivation, it is not commercialized in Navapur tehsil due to lack of awareness on its recommended packages with respect to high yielding varieties, control of diseases and pests, marketing, etc. Hence, training was organized in Bokalzar village on August 10, 2013. It was attended by 90 farmers from 10 villages. The topics covered were climate and soil requirements, varieties and hybrids, seedling raising, sowing time, land preparation, transplanting, spacing, manures and fertilizers, cultural practices, irrigation, weed control, insects and diseases, harvesting and post-harvest operations, curing and storage, seed production, factors influencing prices, etc. The tribal farmers of Navapur have started growing chilli on small scale area; however, the chilli cultivation is not yet commercialized. Hence, a study tour of tribal chilli farmers was organized on March 12, 2014, at Dahanu tehsil of Thane district in Maharashtra state. The 109 tribal farmers participated in this study tour. During study tour, farmers learned about various knowledge on protected cultivation like selection of site, various greenhouse structures, cultural and nursery practices, selection of cultivars, nursery raising, land preparation, fumigation, fertilizer application, mulching and spacing, transplanting, pruning, training, drip irrigation and fertigation, integrated pest and disease management, harvesting and yield, post-harvest management as well as received special tips from progressive farmers to achieve higher and quality yield.[16]

15. Ibid, p.12.
16. Ibid, p.12.

PICTURE SOURCE: FARMING INDIA

1.7 Groundnut farming in Jintur tehsil, Maharastra

A study tour of 37 tribal farmers was organized on December 17, 2014, to Kehal village, Jintur tehsil, Parbhani district of Maharashtra. The groundnut demonstration plots of progressive groundnut growers were visited. During the study tour, farmers learned about soil selection, the climatic requirement, crop rotation, land preparation, fertilizer application, seed selection and treatment, plant spacing and seed rate, weed control, irrigation management, plant protection measures, harvesting, post-harvest handling, drying, etc.[17]

1.8 Integrated fish-makhana-water chestnut farming system in Darbhanga, Bihar

Multiple uses of water attempted through integrating makhana with fish and water chestnut as a concurrent crop. The integration of fish and water chestnut (TrapabispinosaNatans) with makhana (Euryale feroxSalisb) exhibited fish yield of 0.18 to 0.4tonnes/ ha and makhana seed yield of 1.06 to 2.06 tonnes/ha and water chestnut yield of 3.08 to 8.8tonnes/ha. The outcome of the intervention from the 96 beneficiaries tried in an area of 50ha of DarbhangaSadar Block, revealed that makhana as a primary crop gave a net profit of Rs.18,553/- per ha with an employment generation of 223 man days/ha/ year. The fish as a secondary crop integrated in makhana ponds showed an additional net income of Rs.16,146/- per ha with an employment generation of 35 man days/ha/year, whereas water chest nut taken as tertiary crop generated an additional net income of Rs.20,533/- per ha with an employment generation of 83 man days/ha/ year.[18]

17. Ibid, p.17.

18. "National Agricultural Innovation Project (ICAR): Strengthening Agricultural Development and Livelihoods", India Council for Agriculture Research (ICAR),New Delhi, 2014, p.9.

1.9 The integrated rice-fish-poultry farming system in Villupuram, Cuddalore and Nagapattinam, Tamil Nadu

In this approach fish culture was taken up in trenches running along the border of rice fields. Broiler birds, 1 bird/10m2 of rice area, were housed in coop installed in fields so that the chicken droppings fall into the rice field. This enables poultry waste to serve both as rice manure and fish feed.

This resulted in the addition of poultry manure-11.4 to 19.6 t/ha, suppression of pest-17-27% and increase in net return per household/annum – Rs.6,600 to 10,100/- with enhancement in livelihood by 21 to 32%.[19]

PICTURE SOURCE: KRISHIJAGRAN.COM

1.10 The integrated rice-fish-vegetable system in Assam

Introduced HYV of paddy like Ranjit, Gitesh, Jalashree and Jalkuwari. Aquaculture was added in existing rice crop. Vegetables like French bean, chilli and knolkhol were grown after rice harvest to utilize residual moisture and soil nutrients added by aquaculture activities. Achieved paddy yield of 2.58t (additional 0.9t); fish 40-42 kg and vegetables 3.9t. Net income per HH/year generated was Rs.42,983/- (from 0.28 ha; previous income was Rs.11,144/-).[20]

1.11 Land shaping in salt-affected coastal areas of Sundarbans, West Bengal

Initiated the 'land shaping' (farm pond, ridge & furrow and broad bed furrow, etc.) intervention under Global Environment Facility (GEF) in the salt-affected coastal areas of Sundarbans, Can-

19. Ibid, p.9.

20. Ibid. pp.9-10.

ning Town, West Bengal. Earlier the land was mono-cropped and only traditional rice varieties were grown in Kharif. After the harvest of rice in December the land was fallow till transplanting of next paddy crop in June–July. With the intervention farm-pond technology the farmers are practicing integrated farming system (crop-vegetable-fish). In addition to rice crop, fishes like carps and prawns are reared in the farm pond and in the low-lying rice field. Vegetables are grown throughout the year on the raised land and high ridges created by land shaping and irrigated with rainwater harvested in farm pond.[21]

1.12 Collection and marketing of farm produce in Kerala

Vegetable and Fruit Promotion Council Keralam (VFPCK) started to fruit and vegetable collection points in Wayanad district of Kerala. This is managed by Farmers on a self-help model. 17 farmer-owned procurement and 2 retail centres established with a handling capacity of about 2500 tonnes. They provide transportation facility to distant markets. It has taken GI registration for speciality rice (Jeerakasala, Gandhakasal) of rice.[22]

1.13 Protected Cultivation at Lohaghat, Uttarakhand

Designs of ventilated greenhouse developed. IPM for cucumber and tomato for greenhouse cultivation developed and validated. Production technology of cucumber, tomato and coloured capsicum standardized for zero energy ventilated greenhouse condition.[23]

21. Ibid, p.10.
22. Ibid, p.13.
23. Ibid, p.13.

1.14 Commercially viable products of millets in Dharwad, Karnataka

Collected 1000 landraces of foxtail and little millet, analysed nutrition, nutraceutical, functional and sensory characteristics based on the colour and size of the grains. Increased Little millet production from 1-2 acres to 2-4 acres by 200 farmers. Mille processing units having dehulling, destining, polishing, flaking machines established in 2 districts. Developed five commercially viable ready to eat foxtail and little millet products, viz. diabetic mix, khakara, cookies, flakes and sports food. Ready to cook instant foods viz. millet vermicelli, composite mix for children, noodles, chutney powder, ravaidli mix standardized.[24]

1.15 Collection and marketing of farm produce in Kerala

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1.16 Fish-pig-duck farming system in South Garo Hills, Meghalaya

Fish-pig (Hampshire)-duck (Sonali) based farming system introduced in eleven villages of Sibbari cluster, South Garo Hills. Ten new ponds were constructed and 30 existing small ponds were renovated. Due to this intervention fish productivity increased and individual farmer earned about Rs.10,000/- from a pond (25m x 25m). Ducks produced around 150 eggs/year as compared to 110-120 from local breed and villagers sold eggs for Rs. 6-7/- per egg. The improved Hampshire breeds two furrowing of 7-8 piglets per year. The piglets were sold after 3 months for Rs.1,500/- per piglet.[26]

PICTURE SOURCE: THEHINDUBUSINESSLINE.COM

24. Ibid.p.13.
25. Ibid, pp.13-14.
26. Ibid, p.9.

1.17 Rice-Fish-Poultry Farming System - a success story from Tamil Nadu

Paddy is a major crop of three backward districts of Tamilnadu namely Villupuram, Cuddalore and Nagapattinam. The baseline survey of the wetland clusters of these districts indicated that the gross household income is Rs.31,822/= per ha per year. To enhance the income of these farmers Integrated Rice–Fish-Poultry Farming System has been successfully demonstrated on 430 farm holdings in 12 villages of these districts. Various parameters of the system viz the optimum number of birds, cage size, fish density, trench size were optimized at Annamalai University and demonstrated at field sites. The interventions included transplanted rice in 200 m2 area, 20 poultry birds kept in cages of size 180 cm x 120 cm x 9 0 cm; 100 fingerlings (Rohu, Mrigal, Catla, Common Carp) in the trench of 20m2 area. The trenches are one metre deep and with a top width of 0.75 m and bottom width of 0.5 m occupying 7.5 per cent of rice area. The cages are installed anywhere in the field using four concrete posts of height 240 cm, of which120 cm is buried inside the field and 120 cm is protruding above the ground. The bottom of the cages is made of wire mesh (0.5 sq. inch) so as to leave the broiler waste, straight to the rice field wherein a 10 cm water column is maintained, allowing the poultry waste to get dissolved and enabling it to serve both as rice manure and fish feed. This excludes the need for collecting the poultry waste and applying it to the rice field, the task of which is laborious besides the scope for some wastage.[27]

1.18 Integrated rice-fish – a vegetable system for enhanced livelihood in selected backward districts of Assam

In major parts of Assam rice is taken as a mono-crop. Productivity and income is low. To enhance the livelihood of farmers of the area integration of fish with existing rice crop has been successfully demonstrated is by Assam Agricultural University, Jorhat in three backwards districts of Assam namely Lakhimpur, Kokrajhar and Karbianglong. After the rice crop, vegetables were cultivated to utilize residual moisture and enriched nutrients added by activities of fish. This land was traditionally left uncultivated after rice crop. The technology is suitable for the areas where rice crop is flooded with water for the major duration of the crop. The technology involves digging of the trench of 0.6m X 0.6m (depth and width) on the sides of the rice field. Approximately, 8 to 10 per cent of the area is covered by these trenches. It allows the fishes to be in the trenches during reduced water level in the main plot. Integrated rice-fish – the vegetable system was demonstrated in an area of 168 ha covering 600 farmers (@0.28 ha/hh). HYV Ranjit, were promoted to replace the traditional varieties. Fish (Rohu, Mrigal, Catla, Common carp and Silver carp) were provided with the recommended rate of 400 for 2800 m2 area. After rice crop, vegetables (French bean, chilli and knollkhol) were cultivated. The yield of paddy crop increased from base line value of 2.9 t/ha to 4.7 t/ha. The yield of fish and vegetable from 0.28 ha area was 40-42 kg and 1.7 t (6.1 t/ha respec-

27. "Selected livelihood options for disadvantaged regions of India: National Agricultural Innovation Project", Indian Council of Agricultural Research, New Delhi, p.1.

tively). The net income per household from 0.28 ha increased from previous income of Rs 11144/- to Rs 42983/-.As further modification to the practice, a small pond was provided in the centre of the plot instead of rectangular trench around the rice field.. It minimized the cost required for trench making by 80 % and reduced the area under trench by 80%. As reported, 80% farmers adopted and benefited by this practice. Mr. DigantaGohain was a beneficiary of Rice-fish-vegetable module in Lakhimpur district. He had earned profit of Rs-22,380/- from rice-fish-vegetable module against the traditional farming of only Rs-3,537/-. A total of 40 mandays had been generated during the entire period compared to 14 mandays generated during traditional system.[28]

1.19 Enhanced livelihood through pig-fish-vegetable system Assam

Dhemaji district of Assam is characterized by number of small farm ponds which are poorly managed and results in little or no income. Also, pig and poultry are commonly used commodity in the region. Efforts were made to develop a suitable Integrated Farming system particularly pigfish-horti and poultry-fish-horti to ensure higher income and employment opportunity. In Dhemaji district, Assam for 235. HH altogether 925 improved breeds of pig and 5653 improved poultry birds have been introduced and the first progeny of 900 crossbreed pig has already been achieved. This has led to rapid increase of population of an improved breed of pig in the project villages. In Pig-fish-horti there is an achievement of enhanced income of Rs. 22,473/- per family where the additional income of Rs.13,540/- came from piggery unit, Rs. 3600/- came from a fish pond and Rs. 5333/- came from vegetables.[29]

1.20 Enhanced livelihood through fish-livestock- horti system in Dhalai (Tripura)

Evaluation and validation of indigenous and improved fish based farming system models for enhancing production in agro-ecosystem of disadvantageous areas of district of Tripura for sustainability, profitability and competitiveness was conducted. The results indicated that on an average each household owning an area of 0.42 ha and one pig can earn Rs 29392/= (iean income uptoRs 48630/= from 1 ha area and one pig can be obtained).[30]

1.21 Fish - duck - pig farming system in Dhemaji, Assam

AFPRO introduced fish + duck + pig farming system in Dhemaji district, Assam Fish ponds of 500 m2 were constructed/ renovated. Duck house was built on the pond/embankment to allow manures to fall directly into the pond or it is located on the dike and manure is washed in daily. Fingerlings (size 5–10 cm) of katla, rohu, mrigal, silver carp, grass carp and common carp were released in the pond @ 10000 /ha and the available area in and around of fish pond has been

28. Ibid, pp.2-3.
29. Ibid, p.4.
30. Ibid, p.4.

covered under banana cultivation. Ducks were stocked in the duck house at the stocking density of 15000/ha. Duck dropping act as feed and fertilizer for cultured fish in the pond. Also, left over feed of duck was used as supplementary feed for fish.[31]

1.22 Integrated poultry- fish – vegetable farming system, Assam

A sample survey was conducted in the target districts namely, Lakhimpur, Kokrajhar and Karbi-Anglong covered under the NAIP projects (Component 3) entitled "Livelihood Promotion through Integrated Farming System in Assam" from a group of 750 selected farmers. Among various livestock and fisheries activities, very little expenditure is made on animal rearing and maintenance. The poultry breeds were only indigenous in all the surveyed villages (2684 numbers in all the clusters). Despite having 617 household ponds (617 no's), scientific fish rearing is not done and fisheries contribute little to the family income. Based on the farmers' situations, sub modules were implemented. Poultry house was integrated with a homestead fish pond of 450 m2 water surface area for recycling of animal wastes. Fertilized pond water enriched with blue-green algae was used for irrigating horticultural crops at marginal area measuring 1000 m2 on the bank of the pond. Fish species like catla, rohu, mrigal, grass carp and Silver carp were released in the ponds with proportionate amount. Provisions were made in such a way that poultry excreta can directly go to the pond and this act as feed for fish. Poultry house was constructed for all the beneficiaries under the module. Under poultry-fish-vegetable module, 50 Day Old Chicks (DOC) of Vanaraja/Giriraj breed per beneficiary were distributed among 210 beneficiaries. Okra in Kharif and cabbage in the rabi season were cultivated for additional nutrition and income. An income of Rs 81235/- was obtained under a poultry-fish-vegetable farming system with a benefit-cost ratio of 3.7:1.[32]

1.23 Improvement of livelihood through integration of fish with aquatic commercial crops i.e., makhana (Euryale feroxSalisb.) & water chestnut (TrapabispinosaNatans.) in water bodies in flood prone ecosystem of Darbhanga (Bihar)

Under NAIP sub project "Sustainable Livelihood Improvement through Need Based Integrated Farming System Models in Disadvantaged Districts of Bihar (Lead Centre: ICAR Research Complex for Eastern region, Patna)" efforts were made for integration of fish with aquatic commercial crops i.e., makhana (Euryale feroxSalisb.) & water chestnut (TrapabispinosaNatans.) in order to enhance income, generate employment and in turn improve livelihood. The technology was demonstrated in an area of 50 ha with 96 beneficiaries in DarbhangaSadar Block The outcome of the intervention revealed that makhana as a primary crop gave a total net profit of Rs 7, 90,636/= with an employment generation of 9437 man-days per year. The fish as a secondary crop integrated in makhana ponds showed an additional net income of Rs 4, 65,677/= with an employ-

31. Ibid,p.5.

32. Ibid, p.6.

ment generation of 889 man-days/year, whereas water chestnut taken as tertiary crop generated an additional net income of Rs.25,010/= with an employment generation of 335 man-days/year.[33]

1.24 Utilization of upland follows for the cultivation of maize for increased income, food and nutritional security in Bastar region

The uplands in Bastar region are mostly left fellow or used for cultivation of less remunerative crops like millets, niger or horsegram. The farmers were motivated for cultivation of rainfed maize in upland fallows in project area. Seeds of improved varieties / hybrids (JM 216, Kargil, 30R77) and balanced fertilizer were provided. One women group was also promoted for its cultivation. The crop was sown under the technical supervision of NAIP team along with recommended dose of fertilizer and crop protection measures. In all the clusters 300 farmers were included covering 120 ha area. Due to adoption of this technology farmers achieved maize yield in the range of 45 to 63 q/ha. It is 3 to 4 times higher than the average productivity of 12-15q/ha in Bastar region. Most of the targeted farmers who used to leave left their land uncultivated due to poor economic condition, obtained gross output of Rs 38000 to 53000 /ha and net income of Rs18000 to 33000/ ha. After harvesting of such a bumper crop, they were motivated to hire maize thresher for community threshing of maize. Small farming women were provided hand maize shellers to reduce drudgery.[34]

1.25 Income enhancement through Intercropping, Jhabua district, Madhya Pradesh

Maize is commonly grown as a solo crop in Jhabua district, Madhya Pradesh. To enhance income from maize field, the crop was tested as an intercrop with soybean, black gram, green gram, pigeonpea, and cotton under improved production technology during 2009-10. The results of intercropping viz maize + soybean, maize + pigeon pea and maize + cotton were more encouraging hence these intercropping systems were in the repeated 2010-11 for a higher return. The average income under maize + cotton and maize + pigeon pea intercropping was increased by Rs. 7,635/- per ha. while in case of maize + soybean intercropping an average increase of Rs. 3,580/- per ha. was recorded. However, maize – soybean was adopted most and as estimated the area under maize – soybean increased from 26 ha to 198 ha during 2010-11.[35]

1.26 SRI and ICM method of paddy cultivation- a great success in Dhalai, Tripura and South Garo Hills, Meghalaya

To improve the productivity and reduce the chemical inputs for generating more income and improving the livelihood of the people SRI method of paddy cultivation was demonstrated in South Garo Hills and Dhalai. A total of 1103 farmers in Marachera and Balaram cluster under Dhalai

33. Ibid,pp.8-9.
34. Ibid, p.9.
35. Ibid. p.10.

district (Tripura), were given seeds of Pusa-44, Samba Mashuri& Naveen @ 1kg/kani (0.16 ha) for SRI cultivation. Similarly, a total of 95 farmers were provided Ranjit variety of paddy in South Garo Hills (Meghalaya). Farmers followed the SRI method of rice cultivation right from raising of nursery. About 90% farmers were satisfied with the SRI method due to the increase in productivity. Average productivity of local variety in South Garo Hills district was 1.5 t/ha and in Dhalai district it was 2.1 t/ha. After introduction of Ranjeet variety through SRI average productivity went up to the 4.8 t/ha in South Garo hills whereas in Dhalai (Tripura) after the introduction of Naveen variety through SRI the productivity went upto 3.7 t/ha . In the two sites (Dhalai& South Garo Hills) the average enhancement in income/ha/yr due to the introduction of HYV rice + SRI technology increased by Rs 6700/ha/yr.[36]

1.27 Redgram transplanting – a success story from Bidar, Karnataka

Redgram or Pigeonpea (Cajanuscajan S.) is popularly known as Tur or Arhar in India. It is one of the major pulse crop of Northern Karnataka. Nearly 5.14 lakh ha is under redgram in the state with a production of 2.42 lakh tons (766 kg / ha). Bidar district is considered as pulse bowl of Karnataka where in pulses like blackgram, greengram, redgram& Bengal gram are major crops cultivated in 206717 ha. Among these pulses the share of redgram is to the extent of 65642 ha. Redgram is also one of the most important commercial crop for dry land farmers. The crop requires less water and also improves soil fertility. It fixes nearly 20 kg N / ha from the atmosphere into the soil. As estimated the potential and present yield of redgram in Bidar district are 2700 kg/ha and 829 kg/ha respectively. To bridge this yield gap (1871 kg/ha.) KVK, Bidar organized farmers scientists interface meet, wherein progressive farmers and KVK scientists discussed various aspects to boost the yield levels in redgram. The idea of transplanting / dibbling technology finally emerged during these meetings.[37]

1.28 Rice cultivation through a community approach in a remote tribal village of Dhule, Maharashtra

Under National Agricultural Innovation Project, Laghadwal– Navagaon villages of Sakritaluka in Dhule district of Maharashtra were selected for project activities from April, 2009. Tribal farmers of the area are beset with low productivity rainfed agriculture, high socially and economically backward population, low agriculture wages, and lack of infrastructure and marketing facilities. This cluster comes under moderately high rainfall zone with rice as a important kharif crop. In Sakritaluka, area under rice is about 7000 ha. Processing units of rice are very meager and located at very long distances. Current practice of seeding in July or waiting till adequate onset of monsoon has its own uncertainties and often results in delayed transplanting and low yield. Establishment of paddy nursery in June was the major intervention introduced to utilize rainwater optimally. Community nursery was raised in each village to overcome challenges thrown by late onset of

36. Ibid, p.11.

37. Ibid, pp.11-12.

monsoon. Shortage of water was offset by a community action wherein all the villagers joined together to utilize the only available water resource, is alone tube well in each of the three villages. The traditional practice of transplanting 10 or more plants per hill was strongly discouraged and only 2-3 seedlings were planted per hill. Thus the seed rate was cut by 60-80 %. (Rs. 540/=). Recommended doses of chemicals & fertilizers (NPK:100:50:50) were applied. Row to row and plant to plant distance was kept same at 25X25 cm. It is estimated that in seed cost alone, the community saved Rs. 246780/- during 2010 from 457 acre area.[38]

PICTURE SOURCE: TIMESOFINDIA.COM

1.29 Multi-tier horticulture under homestead based production situations, Malda, Murshidabad and South Dinajpur districts of West Bengal

The technology is to enhance household nutritional security of the participating community partners, having a poor land base, by way of providing enhanced availability of seasonal vegetables for daily family diet round the year and through effective utilization of cultural space under backyard/ courtyard/pond dyke situations. It was demonstrated in Malda, Murshidabad and South Dinajpur districts of West Bengal. The technology has two core components: i. A low-cost three-tier scaffold for better utilization of vertical space. ii. Cultivation of seasonal vegetables. At the base of tier (i.e. on the ground), crops like chilli/hybrid tomato/veg. coriander/ green fenugreek/ red amaranthus etc. were placed. At the tier-1 (i.e. over 4' wide scaffold) broad-leaved cucurbitaceous crops like bottle gourd/cucumber/ash gourd/ridge gourd/snake gourd/ pointed gourd etc. were

38. Ibid,p.14.

grown. At the tier-2 (i.e. over 2' wide roof of the scaffold), short leaved vine crops like bitter gourd/ basella etc. were placed as per seasonal fitment. The technology was demonstrated in northern districts of West Bengal. For standardization of the scaffold structure, prototype development and its due refinement was done by the project scientists by way of taking inputs from the selected village level resource persons so as to ensure availability of adequate and uninterrupted sunshine at all the tiers. The technology in reference is basically triggered at ensuring the household nutritional security through greater incorporation of home produced vegetables in the family diet. While the base line statistics concerning average per caput rate of vegetable consumption in daily diet at the identified clusters was estimated to be a meager 131gm., it shot up to 256.76gm./ caput/day to suggest a commendable 96% increase in that respect.[39]

1.30 Utilization of drying beds of water tanks for growing watermelon in summer, Gondia district

The innovation involved utilization of residual moisture in tank beds for successfully growing the watermelon. A group of 36 farmers from Asalpani (Tanda) Village in Goregaon cluster of Gondia district, belonging to the tribal community were selected for the cultivation of watermelon (Var. Black Sugar). The gravity irrigation system was developed for irrigation as the drip irrigation system was too costly for the farmers to purchase. Hence, a simple system with 1000 lit tank was installed on elevation and the laterals were gravity fed. The water tank was filled up by the farmers manually by rotation of labour. One tank irrigated 0.22 acre area. The innovative method of nursery preparation was used. Instead of broadcasting the seeds on nursery beds, single seed was sown in a plastic bags reducing seed requirement and hence the cost of seed. Transplanting was done 15 days after sowing. During 2009-10, with an yield of 50 tonnes an additional income of Rs 2.0 lakhs was obtained with 33 farmers participating in it.[40]

1.31 Zero tillage in wheat cultivation: a success story from DakshinDinajpur

Farmers of selected villages of Tapan Block practised the cultivation of wheat with the help of conventional method. But after a successful demonstration of wheat cultivation in a small plot by using the new technology of zero tillage by U.B.K.V. Coochbehar through NAIP project in 2008-09, beneficiaries of this cluster understood that it is possible to get more yield and thereby return of an average Rs. 18000 ha-1 in zero tillage method as a sowing of seeds can be done timely without land preparation i.e. immediately after the harvesting of the preceding crop (paddy) that helps in efficient utilization of residual moisture which reduces a significant cost of wheat cultivation. As a consequence of the positive effect of the trial, more than 50 farmers showed interest in wheat production through zero tillage technology in the following year. This method has shown promise for horizontal expansion.[41]

39. Ibid, pp.16-17.

40. Ibid, p.17.

41. Ibid,p.18.

1.32 Mushroom cultivation at Balaram Village, Dhalai

Edible mushrooms are generally considered good source of protein, vitamins and minerals in addition to their flavour and condiment value. About 3.5-4% protein with 71-90% digestibility of fresh mushrooms is nearly twice as that in most of the vegetables. Vitamins, especially those of B complex group like thiamine (B1), riboflavin (B2), niacin and biotin and minerals like potassium, phosphorus, sodium, magnesium and calcium are present in adequate quantities. Apart from this they have certain important medicinal values, such as, the effects of antitumor, hypolipidemic, hypocholesterolemic, antibacterial, antifungal and antiviral. The successful introduction of mushroom cultivation has been made in Balaram Village of Dhalai district in Tripura. They are selling fresh mushroom in local markets @ Rs. 80/ per kg. Two farmers of Balaram, namely, Mr. BimalDebnath and Mrs. RebikaSangma, have started large scale production of mushroom, preparing separate mushroom house, substrate soaking tank and disinfecting unit, racks, etc. Many more farmers are now interested and coming forward to produce mushroom in large scale for generating more income. In the month of May, 2008 mushroom cultivation was first introduced there giving in situ training and demonstration at the farmers' houses. In all six SHGs (Abachanga, Khabaksha, Sharda, Pohor, BokriBodol and Loknath) and fifty beneficiaries were imparted training programme. Later on several training and demonstration were conducted on mushroom cultivation with use of different agricultural wastes in different methods. The farmers successfully learned the techniques. Later on mushroom cultivation has been fully adopted by several farmers of Balaram village. In all 139 farmers cultivated mushroom during the period starting from June, 2008 to January, 2009. They used 750 mushroom spawns (each 150g) and produced 362kg of fresh oyster mushroom. There expenditure was calculated as Rs. 9000/- @ Rs. 12 for a polybag filling. The farmers sold their produce @ Rs. 80/- per kg fresh mushroom to the local markets and earned Rs. 28952/-, which resulted in Rs. 19952/- as net profit.[42]

1.33 Mushroom Production for livelihood A case study from Samastipur

Malpur is a tola of Morsand village under Pusa block of Samastipur. Major population in Malpur is SC landless labours. They have insufficient employment opportunities, poor skills and out-migration of rural youth are among major issues to be addressed in this tola. Scientits of R.A.U., Sameshpur visit this village several times to form FIG for Mushroom production/ apiculture/vermicompost as they were landless labours. During their visit in day time either forenoon or afternoon between 8 pm to 4 pm they could meet only women members of this village. On enquiry it was informed that being landless labours all the men had gone to work outside villages. Then they convinced women of the village to form women group of 20 for mushroom production. They given training initially for oyster mushroom production at their door step. Mrs. Anita Devi was elected group leader of the FIG. When the first flash of oyster was produced they were exposed for its cooking preparation of pakaura. Gradually they started selling it within and nearby villages

42. Ibid, pp.19-20.

at the rate of Rs.70/kg. In second step Anita Devi along with her group is giving consultancy for mushroom production. Now, the women FIG of mushroom production is producing button mushroom. Today Mrs. Anita Devi's name is known in village, block and KVK due to her consultancy on mushroom production.[43]

1.34 Production of paddy straw mushroom and oyster mushroom – success from Orissa

Rice is the staple food of people in Orissa. Enough straw is available for mushroom production. The climate is also congenial for growing paddy straw mushroom during kharif (8 months) and Oyster (Dhingri) mushroom during rabi(4 months). Across all the 6 clusters of Dhenkanal, Kandhmal and Kalahandi, the technology can be scaled up. Within a short period, farmers get return with high benefit cost ratio. Under NAIP-3, 18 mushroom sheds have been constructed. Each shed has 60 beds. A farm family can get gross return of Rs.1,04,580/-, net return of Rs.62,580 and benefits : cost ratio of 1.49 : 1 with investment of Rs.42,000/- per annum. So 104 no of small and marginal farm families have been involved in the mushroom production activity. The mushroom spent straw can be utilized for preparing vermi-compost.[44]

1.35 Mushroom production in village Mudiyani of District Champawat

Nirmal Kumar Vishwakarma is a 31 year old progressive farmer of Mudiyani village of District Champawat. He owns 50 nali (1ha) land under rainfed condition and supports livelihood of other three elder and four younger members of his family. He grew potato, rice, soybean, wheat and

43. Ibid,pp-20-21.

44. Ibid,p.21.

chilli on his farm and earned an income of Rs. 20,000 approximately. He was always curious to raise his agricultural income and used to keep himself in touch with T.V., radio, newspapers etc. He got an opportunity in the year 2007, when his village was selected under NAIP. He was among four mushroom grower of his village. Now, he is famous as mushroom man in his locality. He was the first person who came forward to attend a three day training programme on mushroom production at VPKAS, Almora. Experimental Farm, Hawalbagh. After that, he was provided with five quintal synthetic compost with spawn of button mushroom in the month of December. He started it in a room of 3mX4mX2m adjacent to his house. He was provided technical assistance by the concerned specialist. He did not encounter any disease problem. By the end of April month he was able to harvest 94 kg of button mushroom. He earned an income of rupees of seven thousand (approximately) by selling the produce @ Rs. 75/kg. He spent his earning on purchase of stationary, books, paying of school fee of his children and medical treatment of his family members. He visited nearby district headquarter town, Champawat eight km away from his village for selling the mushroom to vegetable retailers. Initially, he faced the problem of marketing because of less demand of mushroom in the town, and also being a new vegetable crop. People were unfamiliar with the taste. He decided to visit door to door for selling of his produce. In this way he established direct linkage with more than 20 consumers of Champawat town. These consumers directly placed their orders over cell phone to him. He observed that it was a low risk crop (not dependent on outside weather of open field) and needed less water in comparison of green vegetables like tomato, cauliflower etc. It could not be damaged by wild animals like other vegetables grown in open field. He was so much motivated that he had decided to expand the production level in the next year. In the year 2008, he has put ten quintal compost of button mushroom. He has also learned the techniques of pickles making from mushroom to deal with the problems of marketing. He has decided to go for pickle making, if fresh mushroom is left with him. In this way, he has set up a new example in his village that a person can raise his agricultural income by diversifying the farm activity by lowering the risk and generating the self-employment.[45]

1.36 Introduction of HYV and adoption of improved production technology of potato- a success story from Tamenglong, Manipur

Tamenglong district, is the most backward district of the Manipur. The district is not only historically important but also possesses high potential for horticultural development. The project site is restricted to three villages viz. Joujangtek, LuwanglonKhullel, and Dolang situated along the stretch of Old Cacchar Road. Hilly topography with a plain area as low as 395 m MSL (Leimatak bridge) and upland as high as 1156 m MSL truly indicate inaccessibility of the area and hence resulted in poor transport and communication system. Due to rugged topography, transport and communication system are very poor and hence the district remained backward in spite of its high potential for exploration of commercial horticulture industry. Transportation of goods become very difficult due to poor road condition and communication system, therefore the area

45. Ibid,pp.22-23.

appear to be inaccessible and remain untouched by most of the developmental programme. Most of the land remains uncultivated due to lack of infrastructures and financial problems. Potato var. KufriJyoti was first introduced at Joujangtek village, Tamenglong District under NAIP during 2009 and later it was introduced at Dolang and LuwanglonKhullel during 2011. The variety is a medium maturing with yielding potential of 20MT/ha and a high degree of field resistance to late blight and wart disease. The disease free seed had been collected from Regional Research Farm, Mao (2030 m MSL) Manipur which is under Department of Horticulture, Manipur. Twenty MT of potato seed of KufriJyoti was distributed to 24 farm families and an area of 7 hectare was carried during February 2009. The potato had been harvested during 2009. Total yield was about 200 tonnes from 7 hectares during 2009. In 2011 potato var. KufriJyoti was introduced at Dolang and LuwanglonKhullel, under NAIP programme. Around 50 MT potato was produced from 2.5 hectare. The knowledge of grading, curing and cottage storage methods were imparted to the farmers. Out of total production during 2011 about 8 MT of "B" Grade tuber of 30 gm average wt. have been stored for next year plantation. The graded tubers were cured by spreading thinly over a well prepared floor made of wood with free air circulation from ventilation. However exposure to direct sunlight should be avoided. The potatoes were stored on racks (3m height 0.6m width, 0.4m rack to rack). Large and small tubers had been sold at market @ of Rs.12/kg, earned about Rs. 20 Lakhs & Rs.15/kg earned about Rs. 5.5 lakhs during 2009&2011 respectively, as stated by village chiefs, Dolang, LuwanglonKhullel, and Joujangtek villages of Tamenglong. These have been a very encouraging sign for the farmers of these villages and were excited on the potato cultivation.[46]

1.37 Tuber crops: A boon to Nuagaon (Dhekanal, Orissa) with barren lands

Nuagaon is one of the villages in Sadar cluster in Dhenkanal district adopted by NAIP project. This village has large area of uncultivated uplands. Due to low yield of rice and increased cost of cultivation, farmers abandoned cultivation in these lands for many years. Tuber crops can be grown in poor and marginal soils. A group of farmers comprising SridharaBhuian, Purushotama Swain, Dinabandhu Pradhan, Kamakshya Pradhan and KamakshyaBhuian agreed to grow sweet potato and yam bean together in such lands. Accordingly, sweet potato and yam bean were cultivated in 1200m2 and 300m2 area, respectively, during kharif, 2010. They realised sweet potato yield of 1569 kg and yam bean yield 590 kg respectively and got gross return of Rs 11, 995/- and net return of Rs 6,955/-. The farmers shared the benefit among themselves.[47]

1.38 Livelihood generation for marginal and small farmers through integrated interventions of vegetable at Tera village of Raebareli

Tera village located in the Harichanderpur block of Raebareli district of Uttar Pradesh is one of the poorest villages in the state and was reported by the Times of India issue on 5.9.2009 as on

46. Ibid,pp.23-24.

47. Ibid,p.24.

the verge of famine. Till date, none of the development programmes of the state and centre has reached the village except the present NAIP-III project. The village was constrained with regular floods and drought in lowlands and poor productivity in the uplands. The average income of the marginal farmer in the village was Rs.21000/-. Most of the farmers were resistant to change from the rice-wheat system and expressed that already they were at the verge of poverty and hence they don't want to take any risk. However, a handful of them came to adopt the innovative low cost income generating interventions of off season vegetable cultivation. Sh.RamBahadur is a typical representative of such farmer who earned their livelihood through cultivation of rice-wheat-mustard in 0.35 - 0.6 ha and one or two bovines. An annual income of Rs.23,700/- was being obtained from agriculture which comprised of Rs.15,400 from rice-wheat, Rs.3600/- from vegetables (potato, tomato and cucumber) and Rs.4700/- from milk. His land was partitioned as 0.15 ha for wheat with varietal change and the other 0.15 ha was used for winter hybrid vegetable (tomato and cabbage) cultivation supplemented with vermicomposting and Trichoderma and Psuedomonads based liquid and farm manures. He earned about Rs.13,000 from vegetables in winter and Rs.5600 from wheat. From this technological backup he also went for summer vegetable cultivation with cucumber, muskmelon and bhindi with elite varieties, mulching and compost supplementation in 0.25 ha. Banana with moong gram as intercrop in about 0.075 ha was taken up with the income generated from initial winter vegetables. An income of Rs.13,450 was generated with the summer vegetables and moong gram. Apart from this the milk yielding potential of the cow was increased from 2 liters/ day to 4 liters/day with mineral mixture supplementation, deworming and fodder which earned him Rs.9000/-. His total income from winter and summer season was Rs.41, 050/-. The standing banana crops which have started to throw bunch will be ready to harvest by December or January which will fetch him another 56,000 rupees as income @ of Rs.7.00/kg. Hence his total income will certainly be around Rs.97,050/-. His investment apart from planting materials was Rs.15,500/- under variable cost. Only family labour was utilized for cultivation. About 200 mandays were used for the above purpose. He is happy that he will be able to get his daughter married this year. Like him many farmers namely Sh.Sant Ram, Sh.RamKilavan, Sh.Sambhu, Sh.Basharat, Sh.Ayodyhya Prasad and others earned an average income of Rs.25000/- from vegetable cultivation in their half acre land and went for banana cultivation in the current season. Shrisambhu harvested Rs. 36000/- from off season cauliflower and Rs. 26500/- from tomato. Now, as per their version, due to ICAR/NAIP guidance and support they are out of poverty cycle and will guide farmers of nearby villages for coming out of poverty trap. These small modules of integration would be a stepping stone in the lives of poor farmers who are poorer than the marginal farmer criteria of less than a ha.[48]

1.39 INM and IPDM in the Onion crop- a success in Chitradurga district

In the project area of Chitradurgadisgtrict , the farmers are not in the habit of growing latest improved varieties of crops as well as applying micronutrients and onion is no exception. Under the project, 62 households were selected for INM demo (1 acre) in Onion The farmers were accord-

48. Ibid,pp.24-25.

ingly provided improved seeds of ArkaKalyan variety of onion and based on soil test, they were recommended to apply micronutrients such as Sulphur (Gypsum @ 500 kg/ha), Zn (ZnSO4 @ 12.5 kg/ha) and Boron @ 2.5 kg/ha. Upon analyzing the overall impact of ArkaKalyan variety and micro nutrient application, the results indicated that productivity of onion increased by 15 %.Towards this the expenditure of Rs.1100/acre was incurred and the net returns generated were Rs. 28110/acre. Thus, the new variety ArkaKalyan and micro nutrient application technologies are not only technically feasible but also economically viable. It also generated an additional employment of 15 man days/ha.[49]

1.40 Dahod Tribal farmers becomes seed producers-A success story

National Agricultural Innovation Project (NAIP) is operational in Jadakheriya cluster of Dahod District in Eastern Gujarat since 2008-09. In Jadakheriya cluster, Jadakheriya, Kamboi and Polisimal villages were identified for undertaking the various developmental activities through the project. The population of these villages is predominantly of tribal nature. The topography of the Jadakheriya cluster is undulated and 90 per cent of the area is covered under hilly terrain. Agriculture is the main occupation of the tribal community in this cluster. Before the initiation of the project, farmers were cultivating the old varieties of the different crops with improper use of existing natural resources. Due to this reason, farmers were getting poor output from their land. It directly impacts the food security of the farmers coupled with low socio economic status. After the inception of the NAIP in this cluster, GVT initiated various crop based activities viz., dissemination of high yielding crops varieties, crop diversification, and seed production. The awareness amongst farmers was created about the importance of improved seed of different crops. GVT always believes in participatory approaches in field activities. The tribal farmers of Jadakheriya cluster were motivated by organizing various seed production related training programmes at village as well as office level. Farmers gained the knowledge on techniques like selection of field for seed production, production technology, seed plot registration, fee requirements by the seed certification agency, isolation distance, rouging, processing, bagging, tagging, transportation, marketing and interaction with seed enterprises especially the KRIBHCO Seed Unit (KSU) at Himmatnagar, District Banaskantha, Gujarat. The farmers were also exposed to the breeder/foundation seed production farm of Anand Agriculture University at Main Maize Research Station, AAU, Godhra in Panchmahal district.[50]

1.41 'm-Krishi' Fisheries Advisory Service (Potential Fishing Zone (PFZ)) — a tool for enhanced fish catch with reduced time and fuel

This intervention m-Krishi has been successfully implemented in 11 villages of Raigad district. As a case study a saving of 70,000 litres of diesel per month has been estimated from one village (Ekdara) of Raigad, Maharashtra. Thus, a huge savings of diesel, enhanced income besides

49. Ibid,p.26.

50. Ibid,p.27.

reduced pollution could be achieved by this technology. In climatically challenged districts where marine fishers are loosing livelihoods due to distribution shift of pelagic fishes, submergence of their low lying fish drying platforms, unseasonal and extreme rains where dried fish on bamboo platforms are spoiled some technological interventions are necessary to prepare them to look for alternative, eco-friendly and remunerative technology. Potential Fishing Zone (PFZ) forecasting is one such technology that has been validated by CMFRI, NRSA, SAC, FSI and other organizations in past As shown in figure sub-sea surface temperature & ocean colour are detected in the form of electromagnetic energy which are redirected to earth station to give composite picture of those areas where there is more likelihood of marine pelagic fishes. Data generated by NOAA-AVHRR and OCM is integrated in PFZ advisories. INCOIS (MoES) now generate regular advisories of the PFZ areas during cloud free months for stake holders. However, during the preliminary survey in Raigad district it was found that many fisher-men are not aware of this service and those having awareness are unable to utilize benefits of the service because during frequent electricity shut downs digital boards / FAX machines etc. are not in a position to receive advisories. An innovative service called m-Krishi-Fisheries have been developed by NAIP subproject title “Strategies to enhance adaptive capacity to climate change in vulnerable regions” (Lead Centre: IARI, New Delhi) in collaboration with TCS innovation lab and is being demonstrated. This is likely to fill critical gaps in dissemination of this technology as provided in power point presentation. The technology is being patented and is capable of providing immediate, shot term and long term solutions to the beneficiaries in identified clusters at selected villages through Self Help Groups.[51]

1.42 Improved productivity of shifting/jhum cultivation lands – Godda district

Shifting or Jhum cultivation, a primitive type of cultivation technique, is a transition from food gathering to food production. Under this, part of forest area is cleared for agriculture, and then agriculture is done for about 3 to 4 years. After that farmers shift to some other area due to low productivity in due course of time. After a cycle of about 20 years, farmer will come again to the same area when the area is regenerated and improved its fertility. Shifting cultivation is popularly known as ‘jhuming’ in north east and ‘khallu’ in Jharkhand. In Godda district, it is practiced in Sunderpahari range on the top of the hills where lands are flat and rich in forests. The soils contain very high percentage of nutrients and are acidic in nature because organic matter content is more than 0.75%. In two villages namely Telodhoni and Palamdumar, where this type of cultivation is common, but the yield of crops grown was low. Through NAIP project high yielding varieties of crop like maize, barbatti (lobia) and pigeon pea have been introduced for up-scaling their livelihood. The improved variety (Dutta) of maize (Zea Maize) in the area has recorded average yield of 89.20 qtls/ha compared to 44.84 qtls/ha of the traditional variety. The B:C ratio is recorded as 2.19 against 1.68 of the traditional. Also the improved variety is insect, pest and disease resistant. Similarly, pigeon pea (Cajanuscajan) improved variety from U.P. (NDA-1) was introduced in the area and 19.76 qtls/ha against 13.03 qtls/ha of the traditional variety. The B:C ratio is recorded as 2.41 against 1.68 of the traditional. Also it is more resistant to wilt, sterility mosaic disease and

51. Ibid,p.38.

phytopthora blight. Likewise, improved variety of cow pea, locally known as Barsatii, was also introduced in the area that has recorded yield of 9.79 qtls/ha against 6.38 qtls/ha of the traditional variety. The B:C ratio is recorded 2.44 against 1.59 of the traditional. With this introduction of improved seeds people dwelling in Jhum cultivation area get good returns of the produce and are getting prosperity. This way total 26 HHs have been benefited so far covering about 4.50 ha.[52]

PICTURE SOURCE: WWW.THEHINDU.COM

1.43 Enhanced income through Vermicomposting – a success story of Ashok Mondal, Vill. Pulintola from District Malda (WB)

Due to backward geographical position and highly flood-prone nature of the selected villages under NAIP programme, most of the households maintain their livelihood with a very marginal income and also the villagers are unemployed, landless labour and marginal farmers. Prior to the launching of the project NAIP, a majority of villagers destroyed the waste or residuals of the crops, vegetables and manure (cow dung) in a heap form. But after the introduction of NAIP – 3 project sufficient training were provided by the scientists of UBKV, Coochbehar and BCKV, Kalyani on the methods of production of vermicompost and its beneficial effects in increasing the fertility of land and thereby productivity of crop and also reduce the harmful effect of using Traditional method of composting Improved method of composting has been implemented with successful field trials at two household named Ashok Mondol and SitaramMondol in a group approach of five members per unit of vermi-pit of this cluster. More than 50 rural youths took the idea that vermicomposting by the using of crop and farmyard residues could be a source of supplementary income to them and they started the production of vermicompost with the input supply from the project in 2009-10. By encouraging with this intervention of item of earning additional or supple-

52. Ibid,p.35.

mentary sources of income another 95 beneficiaries of this cluster took up this promising activity and is earning a additional average income of Rs 581.91/ beneficiary/month. Furthermore, rural poor from surrounding villages of this cluster has shown interest in training of vermicomposting to start this activity with their own investment.[53]

1.44 Tasar Sericulture: A sustainable option for livelihood, Gadchiroli district, Maharastra

Gadchiroli is one of the backward districts of Maharashtra under intervention in BAIF led NAIP subproject "Sustainable Rural Livelihood Security in Backward Districts of Maharashtra". The programme is being implemented in Etapalli block of Gadchiroli, a remote place. The residents of the area mainly belong to scheduled tribes; Madiya and Gond. It is difficult for landless and marginal landholders to work on wages locally as agriculture activity is very limited. With more than 75% land having forests rich in Terminalliatomentosa, forest based intervention of tasar was planned here with the consent of forest department. This programme on tasar was initiated as there is growing market demand of organic or wild silk namely tropical tasarAntheraeamylitta. This programme has shown the path for 131 families to generate additional income through Tasar egg production, silkworm rearing and post cocoon processing activities. Eight youths could take up grainage work to ensure timely supply of basic input materials of eggs, 65 persons participated in silkworm rearers and 25 are reelers cum spinners converting cocoon into value added product of yarn silk. This is further linked with weaver group (11) for weaving thereby creating marketing chain in symbiotic way. The ultimate fabric is sold through project supported exhibitions and BAIF supported outlet. Success of this composite activity in the area has inspired other people and more than 80 families are willing to undertake it. During the year (2009-10) total cocoons produced were 406060 worth Rs 396060/- as compared to Rs 60,000 cocoons produced in first year (2008-09). Fifteen groups having 65 participants took up silkworm rearing during September to October, 2009. The groups have earned average Rs 7000/person as compared to previous year of Rs1500/person. Village Jivangatta of Etapalli has become Tasar village as nearly 40 families of this village have taken up grainage, rearing and reeling. One of the group of 4 members in Jivangatta have produced 152832 cocoons worth Rs 116490; average income earned per participant is Rs 29125/- in 45 days of silkworm rearing. Eight youth involved in grainage showed their capacities to use microscopes to segregate diseased eggs; thus ensuring production of good cocoons for other participants. At present each family involved has potential to earn Rs 4000 to 25000 per year depending on the activity they involve. The programme has protected the trees on 250 ha of land. With this success, Directorate of Sericulture and Central Silk Board has agreed to provide funds to cover 50% cost of infrastructure development and support for machinery. This intervention has enabled local people to have their livelihood by conserving forest. At present, landless, marginal landholder, educated youth and women all are finding an alternative vocation in this activity.[54]

53. Ibid,p.36.

54. Ibid,pp.39-40.

1.45 Pickle making of Jackfruit and other underutilized NTFPs- a source of livelihood in Godda district, Jharkhand

The jackfruit (Artocarpusheterophyllus or A. heterophylla) is nutritious, rich in vitamins A, B and C, potassium, calcium, iron, proteins and high in carbohydrates. In Sunderpahari and Godda ranges several Jackfruit trees are found in abundance in and around the forest areas of the villages selected under NAIP in Godda district. Each year a tree of jackfruit yields about 70 to 90 kgs. of fruits and people either consume it or sell it in the market at throw away prices. Under the NAIP sub project in Godda, the areas with high concentration of jackfruit were identified and their value addition was introduced by making pickle for commercialization of this product. This way the product, which was underutilized in the area, has been commercialized and added livelihood of the rural poor. Under NAIP total 117 members of 9 SHGs were linked with pickle making of jackfruit and other fruits available in the forest areas. The SHG members were first provided with training on processing and preservation of the jackfruit and other NTFPs for pickle making. Thereafter, the groups actually prepared the product and did packaging for sale in the market. Marketing tie-ups were explored. The promoted brand for sale of the product is 'Yogini'[55]

1.46 Dungaria Agro Producer Company Limited, Mewada: Facilitating Innovative Livelihood Solutions to Cotton Seed Producers through an Integrated Farming Mechanism

The Dungaria Agro Producer Company Limited (DAPCL) came to existence under National Agriculture Innovation Project (NAIP) program entitled Livelihood and Nutritional Security of Tribal Dominated Areas through Integrated Farming System and Technology Models. With the guidance and support of organizations including MaharanaPratap University of Agriculture and Technology (MPUAT), KrishiVigyan Kendra (KVK), and ACCESS Development Services (ADS), DAPCL has taken great strides towards becoming a selfsustaining organization capable of empowering small and marginal farmers. The use of selfhelp principles to create 25 Farmer Business Groups (FBGs), comprised of 328 members, has helped facilitate savings, enhance. The aggregation of farmer surpluses to generate more marketing power, and allowed for training and capacity building sessions throughout 10 villages of the Dungarpur District.[56]

1.47 JhambukhandKisan Agro Producer Company Limited (JKAPCL) - a way forward through contract farming

JhambukhandKisan Agro Producer Co. Ltd., Banswara is a social enterprise promoted under National Agricultural Innovation Project (NAIP) for Livelihood and Nutritional Security of Tribal Dominated Areas through Integrated Farming System and Technology Models. Since its inception, JKAPCL has strived at its best under the guidance of MaharanaPratap University of Agricul-

55. Ibid,pp.44-45.

56. Ibid,p.46.

ture & Technology, Udaipur (MPUAT), KrishiVigyan Kendra, Banswara (KVK) and ACCESS Development Services, Udaipur. Major activities of JKAPCL include agriculture based input supply of quality hybrid seeds, fertilizers and pesticides recommended by MPUAT, Udaipur. The other business include output marketing of its member's produce from grains such as maize, wheat and vegetables. Grading is one area where JKAPCL is focusing on to brand itself as a quality grain supplier in the local area. However, to sustain in the long run, the Producer Company is trying to intervene in seed production and take up seed production at a larger scale. Wheat seed production at JKAPCL: In an effort to increase the agri based livelihood, JhambukhandKisan Agro Producer Co. Ltd. tiedup with Rajasthan State Seeds Corporation Ltd (RSSC), Banswara for seed production. ***(1) Wheat seed production at JKAPCL:*** In an effort to increase the agri based livelihood, JhambukhandKisan Agro Producer Co. Ltd. tiedup with Rajasthan State Seeds Corporation Ltd (RSSC), Banswara for seed production. RSSC came forward to associate with JKAPCL on a buyback agreement for wheat seed production. JKAPCL selected 23 farmers from its project area and took over 75 acres of irrigated fertile land in lease from its share holders. At every step, JKAPCL team put its best to aware farmers regarding seed production technology among the identified 23 selected farmers. At regular interval, the certification agency has sent its inspection team to the field for supervision. RSSC Ltd. conducted a stakeholder's meet and training activity on seed production. JKAPCL also organized a farmer interaction for wheat production, a fully sponsored event with RSSC Ltd, Banswara. Representatives from MPUAT, Department of Agriculture, Banswara also participated in the event.[57]

1.48 Vegetable and Fruit Council, Keralam (VFPCK) Model- a success in Wayanad, Kerala

To maximize income to the participating farmers of Wayanad district Vegetable and Fruit Council, Keralam (VFPCK) Model was adopted under the NAIP subproject. The model is characterized by farmer owned markets. In all 13 collection points and one retail outlet for the collection and marketing of farm produce were established. Fourteen persons were working at these collection points and the retail outlet. Transportation facilities for diversion of excess agricultural produce were provided. Through these units 1612 tons of vegetables and fruits with value of Rs. 2.995 crores were traded upto September 2011.[58]

1.49 Promotion of tribal livelihoods through land and water management under Odisha Tribal Empowerment and Livelihood programme

This component will cover all activities on mechanical structures and agronomic practices for conservation of soil and water resources would be creation of small irrigation structures like check-dam, Farm pond, WHS etc, development of the agricultural lands (contour bonding, ter-

57. Ibid,pp.47-48.

58. Ibid,p-49.

racing etc.), treatment of the nalas, soil conservation measures (gully control, contour trench, staggered trench, contour plantation etc.), contour plantation, conservation tillage, DCP, promotion of improved agronomic practices of horticulture and agriculture in highly degraded lands to restore top soil and soil moisture.

1.50 Transforming the livelihood of Tribal farmers of Nandurbar in Maharashtra through Onion and garlic cultivation

Onion and garlic are important commercial crops which can improve livelihood of farmers. They also play a crucial role in food and nutritional security of tribal. The tribal belt of Nandurbar in Maharashtra has congenial climatic conditions for production of onion and garlic at commercial level. But cultivation of these crops was limited to the kitchen garden before the initiation of Tribal Sub-Plan (TSP) in this area by ICAR- Directorate of Onion and Garlic Research, Rajgurunagar(I-CAR-DOGR). Under TSP, systematic effort was undertaken to improve the area and production of onion and garlic by careful application of improved technologies. Thus, focus was given in conduct of field demonstrations of improved technologies at farmer's fields through improved seed/ bulb distribution, knowledge dissemination, capacity building and entrepreneurship building. About 550 tribal farmers were selected in the form of 55 groups under this scheme. Each group comprised 10 selected farmers with one acre of land for conduct of field demonstrations, training and input distribution. Thirty-two tribal villages have been selected from three Talukas viz.; Navapur, Akalkua and Dhadgoan of Nandurbar for implementation of TSP on onion and garlic. In total, 124 demonstrations on newly improved varieties of onion and garlic and improved production technologies were undertaken. All the selected 32 tribal villages are benefited by commercial cultivation of onion and garlic. More than 2000 tribal farmers have been trained by organizing 22 field day/ trainings by ICAR-DOGR. Most of the farmers from selected areas are now cultivating onion and garlic on commercial scale. Onion and garlic are giving more profit than traditionally grown crops in these areas and even got the highest price of onion produced in Indore market.

1.51 The Wadi project

The National Bank for Agriculture and Rural Development (NABARD) has been supporting various welfare projects for Scheduled Tribes in the country under its Tribal Development Fund. The Wadi project is one such integrated tribal development initiative of NABARD. Wadi in Gujarati means an orchard. Under the project a Wadi plot usually covers one acre per beneficiary who must be a marginal farmer not having more than 5 acres of land. Two or more crops are strategically selected for intercropping in the Wadi model to Minimise climatic, biological and marketing risks. In each acre fruit trees like cashews, mangoes, litchis etc are planted with the agricultural crops. The main features of a Wadi model are economic upliftment of the farmers through sustainable agriculture, social empowerment, improvement in quality of life including health and women empowerment in tribal dominated areas of the country. The broad interventions are in the areas of land use planning, soil and water harvesting measures and improved farming based agro-forestry practices. Therefore, Wadi not only strengthens the agrarian livelihoods of the tribal households, but also increases food and nutritional security. Considering the extreme poverty, land and climatic conditions, NABARD sanctioned a Wadi project in 37 villages covering 1116 tribal families of Dasmantpur block and Agragamee became the Principal Implementing Agency of the project in the targeted region. Exposure visit for the tribal farmers was organised as the first step of the project and they gained hand on experience at Gujarat where Wadi plantations started during the 1980s. **The Wadi model:** The main measures taken in a Wadi model were also implemented under the NABARD project in Dasmantpur block in Koraput district of Odisha:

1. ***Water and Soil conservation:*** Although Dasmantpur receives moderate to high rainfall, due to its steep slopes and rocky terrain, water retention is poor resulting in severe soil erosion and nutrient loss. To protect the fertile top surface runoff during the monsoon, and to increase moisture retention in the Wadi plots, earth and stone bunding, platforms, trenches and ring basis were introduced. Protective irrigation systems such as ring wells, check dams and diesel pump sets were used. The gully treatment and bunds slowed down the flow of water and stemmed erosion; the groundwater levels improved. This significantly increased the cropping intensity.

2. ***Fencing:*** After land preparation and pit digging by the farmers, fruit trees were planted, and fencing like “H” type staking was given to each sapling immediately to protect them from cattle. As farmer DukhuMuduli of Parajabarikanta village says, “Fencing of a Wadi plot is one of the most crucial tasks failing which our entire effort will become futile.’’

3. ***Intercropping:*** To optimize land use and cater to short-term needs, intercropping is used to cultivate a range of crops like grams, millets and vegetables. Tomato, brinjal, beans, chilly, pumpkin and various pulses like arhar, chickpea, pigeon pea, black gram are grown by the farmers which provide rich nutritional food to their family while the sale of the surplus crops supplements their income.

4. ***Organic Farming:*** The Wadis were supplied with organic manure for growth and soil revival. Sixty-five vermi compost pits were constructed under the project where cow dung and goat droppings were used for composting. The rich compost improves soil fertility and reduces dependence on chemical fertilizers, thus facilitating production of organically grown produce in the region. Measures were taken to prevent termite, bacterial and fungicide attack by using neem cake and cow urine. All these efforts increased the natural fertility of the soil and boosted production.*The Wadi project helped me realize the significance of settled agriculture and now farmers are no more practicing shifting cultivation which is more labour intensive and incurs less returns.''*

1.52 Livelihood Generation through promotion of Lemongrass

Villagers in Hapamuni would like to call themselves green entrepreneurs. This is because it is only village in the Gumla and also in the state Jharkhand where lemongrass is produced and from where oil extracted from the plant goes to the global markets. The 500 litres of lemon grass is produced every month. Lemon grass is grown over 100 acres of land which were once barren. Mostly women workers are employed and local hardly go to the brick- kilns outside the village. The initiative helped to generate the opportunities of employment within the village.

1.53 Livelihoods enhancement through improved technology interventions in Horticulture

Maharashtra is the second largest producer of Banana after Tamil Nadu in the country and contributes to about 14.4% of the total production of banana in the country. The state produces about

4.3 m. MT of banana from an area of 0.08 m ha with a productivity of 52.5 t/ha. Main varieties grown in the state are Dwarf Cavendish, Basrai, Robusta, LalVelchi, SafedVelchi. The cultivation is concentrated in the Jalgaon, Ahmednagar, Dhule, Nanded, Parbhani regions of the state. There is lack of post-harvest infrastructure for banana. Substantial quality of the produce is being marketed outside the state. 0.34 lakh MT of banana have been traded in organized markets with average price of Rs. 5-6/kg. DBT and ICAR-NRCB certified virus-free tissue culture banana plants var. Grand Nain were procured and distributed to identified farmers at Chitwi and Vadsatra villages. During meetings held with the farmers, detailed information related to the pit preparation, application of FYM, Neem cake, application of water soluble fertilisers with drip irrigation and methods for preventing insects were disseminated to the farmers. The use of drip irrigation led to adoption of water and nutrient use efficient cultivation technologies in banana.

1.54 Kitchen gardening of dragon fruit

Activities related to implementation of improved technology interventions in horticulture crops has been expanded. Dragon fruit cuttings/saplings were procured from ICAR-NIASM and distributed to tribal farmers of Navapurtaluka and Nandurbar District for kitchen gardening / backyard farming.

1.55 Promotion of kitchen garden for 300 families (Rs. 100 for seeds per family) in Chhattisgarh

To ensure round the year food security which is the most important objective of this project, farmers are made aware of kitchen garden concept and encouraged to prepare kitchen garden in their houses. In this context, 8 varieties of vegetable seed had been distributed to 300 families in 20 villages of the project area in the month of August. The detail of different varieties and quantity distributed are as under Brinjal 10gram, Green Chilly 10 Gram, Tomato 10 Gram, Ladies Finger 15 Gram, Gourd 16 Gram, Raddish 20 Gram, Methi 30 Gram, Corriander 30 Gram. Following distribution of seeds, the farmers actively stated the sowing the seeds and developing the kitchen garden in their respective backyards of their homes. Throughout the period, the cadres and the supervisors monitored the progress of the kitchen garden and assisted the farmers on related aspects. The vegetable plants have shown a good growth especially at places where there are reliable source of water for irrigation. At some plots, the production also has started coming and it helped to generate the additional source of income.

1.56 Rainwater harvesting and recycling in Dang, Gujarat

Rainwater harvesting and collecting through construction and renovation of (i) small farm ponds, (ii) temporary check dams and (iii) gully plugging are most essential components for maximum utilization. This is practiced in hilly and moderately to highly sloppy terrain that receives high rainfall in monsoon but experiences severe water scarcity during post-rainy season. Owing to these interventions groundwater level increased to the extent of about 1.09 m in Sarvar and Chikhalda

clusters of Dang district, Gujarat. Increased soil moisture content and availability of water for irrigation, further increased area under crop cultivation by 10-16% and consequently crop yield.

1.57 Seed Societies in districts Jhabua and Dhar, Madhya Pradesh

NAIP implemented the concept of seed societies in order to accelerate the availability of quality seed in tribal district Jhabua, Madhya Pradesh. Seed societies namely, Laxami Beej Utpadak-ShakariSansthaMaryadit, Golabadi and Sharda Beej UtpadakShakariSansthaMaryadit, Narsingrunda, Rotla having 22 and 21 farmers members, respectively were established. Further, two seed societies namely, AshapuribeejUtpadakShakariSansthaMaryadit, Jhyada and Balram Beej UtpadakShakariSansthaMaryadit, Vaglawat were also created with a total of 21 members in each society. With success of these societies, farmers in neighbouring villages and districts are also inspired. Presently, 21 seed societies in Dhar district are offering services to tribal farmers.

2. FOREST BASED INNOVATIVE TRIBAL LIVELIHOOD AND BEST PRACTICES

2.1 Lac Cultivation in Betul district, Madhya Pradesh

There are number of backward districts covered under component 3 with a large area under forests and where forest trees are available in plenty. Lac cultivation was considered a viable option for livelihood improvement in such areas. Two success stories from Betul (MP) and Jamtara are presented herewith. Betul district is one of the disadvantaged district of Madhya Pradesh where forest trees are available in plenty. Lac cultivation was considered a viable option for livelihood improvement in the area. The activity was initiated with 92 tribal farmers on palas, ber and kusum trees. Proper trainings were provided to these farmers. Initially, 4490 trees were inoculated. With successful inoculation, 13470 kg of brood lac was produced during November and December 2010.This lac was sold for Rs. 6.73,500/- (@ Rs. 50/-kg) to neighboring market and others farmers. Thus, an additional average income of Rs 7320 per farmer was obtained from lac cultivation. Initial annual average income of these farmers from agriculture was 15,000/- and after adoption of lac cultivation practice the total annual average income went to Rs 22,320 per farmer. After looking at the progress of NAIP farmers in the village, other farmers are also aware about lac cultivation now. They are looking to these progressive farmers as their role model.

2.2 Preventing deforestation through lac cultivation – a case study in Jamtara district of Jharkhand

Jamtara is one of the disadvantage district of Jharkhand state in India. The district is also blessed with forest of Butea monosperma, commonly called the ‘flame of forest’. Normally palas trees

were being utilized for fuel wood and other basic requirements of village. Many farmers cut these trees as these are of no economic value. An intervention under NAIP programme was envisaged on creating awareness to tap livelihood from available natural resources. The villagers of Baramajhadih village of Narayanpur block; Dahartola, Charedih, Rupaidih, Sarumundu and Sinjotola of Jamtara block have successfully produce and marketed broodlac from their palas tree within one year of its introduction as a part of intervention by NAIP, ICAR. Ten farmers of village Baramajhladih (block Narayanpur) who were earlier not even aware of lac produced 399 kg broodlac from their palas tree and earned Rs. 20,000 for the first time. Shri BaladeoMarandi and Shri NirmalMarandi earned Rs. 7000 each from summer season lac crop, raised during October 2008 and harvested in July 2009. Now these ten farmers formed a FIG named "LahUtpadanSamooh, Baramjhladih". Besides, these group members also preserved broodlac (lac seed) for their own requirement to produce next crop. Twelve farmers of village Dahartola, Charedih, Rupaidih, Saurumundu and Sinjotola have also successfully produced 354 kg broodlac and earned Rs. 17,700 in the same way. Shri SubodhHembrom of village Charedih and Shri BodiNath of Saurimundu are the farmers who earned Rs 3600 and 3500 respectively. These groups of farmers now formed FIG named "Khusiali lakh UtpadanSamooh, Rupaidih". First time intervention of NAIP in these villages resulted in enhanced income from palas trees by introducing lac production. Now farmers are able to produce their own broodlac for further propagating this venture, utilizing their own trees, set example for other farmers to follow it and utilize other unexploited trees. The farmers of this village stopped cutting of naturally available palas, rather preserving these, for better environment and exploiting it rationally for income enhancement without any adverse effect on trees for lac production. The villagers pledged for preservation of all their palas trees as it also generate employment and income.[59]

2.3 Lac Cultivation in Dhanbad, Jharkhand

Lac, known for its use in making bangles, is soon going to help 250 families sustain in the tribal areas of Dhanbad. The divisional forest department here is undertaking the cultivation of lac on palaash (Budeamonosperma) trees in a three-year project involving Rs 29 lakh. It would involve support, cultivation and marketing of the product.[60]

Divisional forest officer (DFO) Sanjeev Kumar said that palaash is a very common tree in this part of Jharkhand, which grows mostly in the degraded soil. At least 10 percent of the forest cover here comprises palaash. "We planned using the trees to generate income for the poor villagers in the tribal areas. Lac cultivation is easy and reaps profits in a short time," the DFO said. Under Lac VikasYojana, the government has at present sanctioned Rs 83,000, out of which Rs 25,000 is being used for the training and the rest for purchasing agricultural equipment.The 12 villages, where lac would be cultivated are Amkura in Nirsa, Paharpur and Banpur

59. "Selected livelihood options for disadvantaged regions of India: National Agricultural Innovation Project", Indian Council of Agricultural Research, New Delhi, pp.42-44.

60. Mukharjee, Reshma (2008), "Lac farming boost to tribal families"; https://www.telegraphindia.com/states/jharkhand/lac-farming-boost-to-tribal-families/cid/594619.

in Govindpur, Jerma in Dhanbad, Delmi and Domanpur in Topchanchi, Gopalpur in Baghmara, Lahbera, Lachhuraidi, Maharjgunj, Lodhariya and Jamdiha in Tundi. The 250 families in these villages comprising men and women would be given a target of cultivating lac in 25,000 trees with a support of Rs 10,000 each in the first phase.[61]

2.4 Lac Cultivation in Gumla District, Jharkhand

Lac cultivation for livelihood is being carried out in the Gumla district of Jharkhand. It focuses on working with 8000 tribal women, helping them to earn a sustainable income from lac farming. Within India, the state of Jharkhand has the largest number of host trees and ranks first in the country for production. However, in the Gumla district of Jharkhand, not even 20% of lac host trees are in use. Many of these trees are on land owned by tribal groups. With annual incomes for lac producers being over 29,000 rupees, there is a huge opportunity for tribal groups to benet from this livelihood.[62]

2.5 Training on the best practices of Lac farming in Chhattisgarh

Nursery raising and distribution of semilata saplings for lac cultivation to 100 farmers. Lac is one of the important forest produces that fetch a good market price and add to the income of the tribal. Lac is both collected as well as cultivated by the tribal. Along with the indigenous Babool and Kusum trees, in recent times, Semialata has also emerged as a fast growing and reliable plant in which Lac can be cultivated. To make the tribal aware about and also promote the Lac cultivation in Semilallata plants, a semilata nursery was raised in each sector having 3000 saplings. The training on best practices of Lac farming was held on 15th and 16th December 2014 at Kasabaya and Paragaon villages respectively. The trainer/resource person Mr. Milan Viswakarma imparted training to the traditional as well as the newly interested farmers .Total 143 farmers including women participated in the training program. The major topics being covered in the training program were selection of trees for lac farming, varieties of lac, and major activities in lac cultivation, type of pest and its management and harvesting.

2.6 Promotion of Lac cultivation in tribal areas of Gujarat

Gujarat presents diverse climatic conditions with a major part exhibiting low rainfall (<700 mm per annum), while districts down to Tapti river show rainfall of more than 2,000 mm. Salinity poses challenge in the coastal regions. Lac cultivation could be an attractive means of income, especially in challenged areas. In the past, lac production was an important activity of the tribes inhabiting in districts Vadodara, Dahod, Godhra, Banaskanta and Sabarkanta. Even with the availability of vast lac host bio-resource in the aforesaid districts, the total output of lac in Gujarat is limited to only 15-20 tonnes per year.[63]

61. Ibid.

62. www.pacsindia.org/projects/inclusive-livelihood-models/lac-production

63. "Promotion of lac cultivation in tribal areas of Gujarat"; https://icar.org.in/node/8061.

A demonstration of winter lac production was also given in the farmers' field (Tajpur, Banaskantha) on 1,000 big trees of ber (Gola). The 2 000 kg kusmibroodlac brought from Ranchi, Jharkhand and Bankhedi, Madhya Pradesh was inoculated at 2 kg/tree in July 2008. A total 220 q broodlac was harvested. Since, there is no market of broodlac, 70 q of sticklac worth Rs 4.9 lakh was prepared from the harvested crop. Two small scale processing units (100 kg/day) were installed at Forest Research Centres at Basan and Piplej for demonstration of conversion of sticklac to seedlac. Based on the success of this project, a new project has been sanctioned by the Gujarat Forest Research Institute with a budget allocation of about Rs 1.742 million for establishment of two kusmibroodlac farms with farmer-participatory approach for promotion of lac cultivation in traditional and non-traditional areas of Gujarat.[64]

2.7 Livelihood improvement through collection, primary processing and marketing of tamarind, Bastar district, Chhattisgarh

Tamarind is an important forest produce in Bastar with an annual turnover of about Rs. 200 Crores. Tribal people collect raw pods & sell it to middlemen who earn major share of profit by primary processing and marketing. In order to handle the entire processes of collection, processing and marketing and to exclude the middleman, six groups (60 families) were organized and trained for procurement, dehulling, deseeding, packaging and marketing in Cluster Pedawada, District Bastar. Groups involved 92 more families for processing.[65]

2.8 Aranya: building a tamarind economy in tribal Chhattisgarh

Sukma is the southernmost district of Chhattisgarh. In 2016, the District Collector came up with Aranya, a social enterprise that is now changing the lives of tribals living here. The organisation produces Imli Chaska, a sauce made from tamarind, which grows in abundance in the region. Grown organically, the sauce contains 85 percent fruit pulp as compared to the industry standards of 27 percent.

2.9 Tamarind production and processing in Odissa

In a bid to increase the tribal forest dwellers' income, the district the administration has decided to launch a Non-Timber Forest Produce (NTFP) - based value chain project under Central sponsored MahilaKisanShashaktikaranPariyojana (MKSP) scheme. A detailed proposal will soon be submitted by the Odisha Rural Development and Marketing Society (ORMAS) to the Central Government for approval. Under the project, ORMAS has identified four NTFPs like sal seeds and leaf, tamarind and char seeds for marketing as per the specification of Panchayats (Extension to Scheduled Areas) Act. These value chain development initiatives would contribute significantly to the forest dwellers' income from the NTFP related activities, the officials said. A survey is being conducted in forest areas under Bamra, Kuchinda, Jamankira, Jujomura, Naktideul and Rairak-

64. Ibid.

65. Ibid,p.45.

hol blocks to identify the sources and volume of NTFPs.Assistant Director of ORMAS Srimanta-Hota said nearly 4000 tribal households will be covered under the project. Training on making of sal leaf plates, de-seeding of tamarinds, and de-coating of sal and char seeds would be provided to them.[66]

2.10 Economic Impact of Mahua on Tribal livelihood and its marketing in Chhattisgarh

Mahua also known as Mowra Butter tree (MadhucaSpp) is found in mixed deciduous forests of Central India, Maharashtra, Andhra Pradesh, Madhya Pradesh and Chhattisgarh. It is also planted in the plains of northern India and Deccan Peninsula. It is one of the most valued trees among tribal communities of central India and its every part is used for various purposes. The succulent cream-coloured corollas when fall on the ground during March and April are collected and dried. These are a rich source of sugars and contain appreciable amounts of vitamins and calcium. The importance of this Non Timber Forest Products (NTFPs) contributing to rural livelihoods and alleviating rural poverty is well known in Chhattisgarh. Therefore, this study was undertaken in Chhattisgarh with the objective of finding out the economic impact of Mahua and its marketing pattern on forest dwelling tribes. Mahua average collection, consumption, selling, income and employment of selected households in Chhattisgarh. It can be seen that on an average 320.75 Kg Mahua flower and 94.55 kg. Mahua seed were collected by the selected tribal households. It also revealed that out of the total 31.19 kg. mahua flower and 3.19 kg. mahua seed were consumed by households. And rest of the quantity i.e. 289.56 kg. Mahua flower and 91.35 kg. mahua seed were sold in the market at the rate of Rs 17.34 and Rs. 21.19 per kg. respectively. And the income generated by selling were Rs. 4973.95 for Mahua flower and Rs. 1937.26 for mahua seed. The study shows that farmers are not cultivating the Mahua but making profit out of it by collecting them and selling into the market either directly to the consumers or through the mediators at different levels. The state Government also plays a key role in enhancing their profit by procuring most of the NTFPs either through commission agents or through primary minor forest produce society at village level. Results of such studies will further strengthen the case for or against NTFPs collection as a mechanism for alleviating poverty and supporting wildlife conservation. The present research and enquiry would be greater significant to the policy makers. Further, economists may develop new policies on the marketing of non-timber forest products (NTFPs) so that the profitability share (producers share in consumer rupee) should be increased.

2.11 Promotion of tribal livelihood through Joint Forest Managemen

This component will be implemented in the micro watersheds having adjoining forest patches and the inhabitants of the MWS having dependencies on those patches. Each MWS will be allocated at least 200 hectares of forest area for protection in a Participatory Forest Management approach. The forest dwellers will be organized into the VanaSangrakhanaSamities (VSS) and the

66. https://www.newindianexpress.com/states/odisha/2019/aug/10/non-timber-forest-produce-based-value-chain-initiative-to-boost-tribal-livelihood-20168…

VSS will implement the activities to develop the allocated forest patch as per the JFM guideline of Forest & Environment Department. Out of the total 200 ha of allocated forest area, about 80 ha will be effectively treated @ Rs.7000/- per ha as per the existing cost norm followed by the Forest & Environment Department for rehabilitation of Degraded Forests (RDF) and balance 120 ha will be protected by the communities for natural regeneration. The contribution of communities is also to be ensured under this component of activity. The organization of VSS and identification of forest area to be developed will start from the second year of the programme cycle and investment will start from the third year of the programme cycle.

2.12 MedhnaLekha India's First Bamboo village

The Forest Rights Act of 2006 gave forest inhabitants the right to manage, conserve, protect and regenerate the forests and its resources. The act gives ownership of minor forest produce, except timber, to dwellers living in the village territory. This produce includes bamboo, honey, lac, herbs, leaves, berries, fruits, among other things. It, however, took 6 years and a long legal battle before MendhaLekha, a tribal village situated in Gadchiroli district, Maharashtra, could become the first village to be granted community forest rights. Today the village has a successful bamboo economy. The entire village, comprising 450 people belonging mainly to the Gond tribe, works together in cultivating bamboo as raw material for the paper industry. The villagers make profits in crores, and are using the money for several development and social welfare activities in the area.

2.13 Areca nut cultivation in Meghalaya for tribal livelihhod

Kahikuchi is the most important variety of Areca nut grown in Meghalaya and DawkiKwai is extensively grown in East Khasi hills and Jaintia hills. Planting material is prepared through a two stage nursery. Seeds are first sprouted in the primary nursery and then transplanted into a secondary nursery for further growth. Farmers do not access any machinery for taking up any pre cultivation or inter-cultivation activities. Also, farmers do not use any pesticides or insecticides at any stage of the crop and hence are not dependent on any agricultural input providers. Areca nut plants are affected with yellow leaf disease and bud rot disease causing great damage to the crop. Farmers in the state are losing 20% of the plants every year owing to senility, wind and diseases. Areca nuts are completely rain fed and no protective irrigation is provided in summer months. Even harvesting is taken up manually and hence except sickles and crow bars, no other instruments/ machinery is used. Farmers do not take any crop loans from banks.[67]

The benefit cost ratio for farmers in Khasi and Jaintia hills is 58%, whereas that for farmers in Garo hills 1.3%. The benefit cost ratio of owners of soaking pits is 3.2%, where as that of arecanut grading and sorting unit and supari manufacturing unit is 1.2 and 1.4 respectively.[68]

67. "Areca nut Subsector in Meghalaya: A Review", Institute of Livelihood Research and Training (ILRT), Meghalaya Basin Development Authority (MBDA), Mehalaya.

68. "Areca nut Subsector in Meghalaya: A Review", Institute of Livelihood Research and Training (ILRT), Meghalaya Basin Development Authority (MBDA), Mehalaya.

Areca nut has been traditionally cultivated by the tribes of Meghalaya since time immemorial. Areca nut is grown in East Khasi hills, Jaintia hills, West Garo hills and East Garo hills of Meghalaya. Areca nut is planted on the hill slopes in Meghalaya and the climate of the state is congenial for the growth of areca nuts which requires 14 degrees to 36 degrees temperature and well distributed. In the year 2012-2013, areca nut in Meghalaya(Source: National horticulture nuts were produced in 14600 board) hectares of area with a production of 19800 Metric tons.[69]

2.14 Livelihood Option through Arecanut Cultivation in Tripura: A Case Study of Noagang and its Neighbouring Villages

The indigenous peoples of Tripura have traditionally been "jhum" cultivators. In course of time, the system of cultivation got declined owing to the scarcity of land and at the same time with the falls of jhum cycle. This in turn induces the scheduled tribes of Tripura to find another alternative way of living. Owing to higher employment potentiality, income returns and better marketing; areca nut cultivation among the respondents became another best vocation alternative to jhuming for earning livelihood.[70]

Varieties of Arecanut (Supari): Areca nut cultivation was practiced as homestead cultivation by the farmers in the selected areas; only some farmers carried cultivation in the form of garden. The cultivation is done in hilly areas and traditional method of cultivation was practiced. There were two varieties of areca nut cultivated in the study areas identified by the growers through their shape and period of production. They called them as "Desi" type and "Assami" type. Desi type was round in shape and was smaller than Assami type. They started to bear fruits on September and at the end of February. On the other hand, Assami type was bigger in size than Desi type and was oval in shaped while bearing fruits on January and at the end of June. It was revealed from the study that almost all the growers grew both types of Desi and Assami respectively. But it should be noted that the proportion of Desi type production was much higher than the Assami type in the study areas.[71]

The areca nut is an important source of livelihood for the rural peoples whose lands are not suitable for other food crops cultivation. Thus, areca nut becomes important source of livelihood and acts as the dominant source of income to the cultivators. The employment potentiality either cannot be neglected due to its high labour intensity. In addition to areca nut cultivation, in the study areas, other allied agriculture activities were also cultivated which in turns adds their income. Their socio-economic conditions would have been improved provided they were more literate. As the current study was located in the hilly areas, labour cost is the major cost

69. "Areca nut Subsector in Meghalaya: A Review", Institute of Livelihood Research and Training (ILRT), Meghalaya Basin Development Authority (MBDA), Mehalaya.

70. Kuki, Vanlalrema and David LalramnghakaHalam (2016), "Livelihood Option through Arecanut Cultivation in Tripura: A Case Study of Noagang and its Neighbouring Villages", International Research Journal of Social Sciences, 5(1): 47-54.

71. Kuki, Vanlalrema and David LalramnghakaHalam (2016), "Livelihood Option through Arecanut Cultivation in Tripura: A Case Study of Noagang and its Neighbouring Villages", International Research Journal of Social Sciences, 5(1): 47-54.

incurred by the growers owing to impossibility of using capital intensive technique. Hence, areca nut is cultivated using simple and traditional method without consuming modern inputs like fertilizer, pesticide, hybrid seed, irrigation etc. therefore, there is a chance of increasing areca nut production in the study areas cultivated by the growers if they would have adopted modern's agriculture inputs. Needless to say, rainfall is the only irrigation source for the growers, to carry agriculture activities in the local areas. In terms of income, per unit seller is more profitable than whole garden seller. Owing to the intervention of brokers, so the farmers cannot fully reap the advantages of current market price prevailed. Thus, areca nut cultivation was providing 41% of the total income of the respondents while 34% of farmers were getting more than 50% of income from areca nut. Therefore, the important of areca nut as a source of livelihood cannot be neglected in the study areas.[72]

2.15 Fermented Areca nut (Goimoza, mozatamul)

Raw areca nut and betel leaves locally called tamul pan or goiphatai is an important symbolic element in all the sections of people in Assam where it is considered as an offering of devotion, respect, and friendship. It is used as a sign of welcome or thanks giving and is served on a special utensil called sorai or batha. It is also used in ritual purposes like pujas and in marriages as a symbol of togetherness. The fermentation of areca nut is done to preserve it for a long time, give a specific taste, and remove the systemic effects of raw areca nuts. The raw materials include areca nut, leaflet of areca nut, jute bag, and cow dung. The fermentation of areca nut is done in two ways. In one method, a pit of 2.5 feet is dug and leaflets of areca nut are placed surrounding the side and bottom of the pit. Some amount of cow dung is spread over it where the nuts are

72. Kuki, Vanlalrema and David LalramnghakaHalam (2016), "Livelihood Option through Arecanut Cultivation in Tripura: A Case Study of Noagang and its Neighbouring Villages", International Research Journal of Social Sciences, 5(1): 47-54.

put, covered with jute bags along with some soil, and left for 3e4 months to ferment. After the due fermentation time, the areca nuts are taken out from the pit. If the method is done properly, areca nuts can be preserved for about 2 years or more. In another method of fermentation, the rawareca nuts are collected and then put in a jute bag. The mouth of the bag is made air tight and then this bag is soaked in water. Aspecific smell indicates the completion of fermentation by which areca nuts can be preserved for 3-4 months.[73]

2.16 Women of Odisha: when 'pattals' trended in Europe

A group of over 3,500 women from 127 tribal hamlets in Kandhamal, Sambalpur, Angul and Deogarh entered into a formal agreement with Leaf Democracy, a German company, to supply one lakh siali leaf plates every month. The plates, commonly known as pattals, are in high demand in European countries, and act as a biodegradable alternate to plastic and styrofoam. These women, who earlier sold minor forest products such as siali leaves, sal seed, mohua flowers and tamarind locally, are today working as a women's self-help group and inspiring many other women to follow suit.

3. ANIMAL HUSBANDRY BASED INNOVATIVE TRIBAL LIVELIHOOD AND BEST PRACTICES

3.1 Pig rearing as a source of livelihood- A study from Dumka and Jamtara, Jharkhand

Pig rearing with proper management practices as a source of enhanced income has been successfully introduced by Birsa Agricultural University, Ranchi. T&D breed of pig were provided to 35 farmers of Narayanpur, Jamtara, Jama&Dumka block of Jamtara and Dumka districts, Jharkhand. The farmers were trained on pig rearing. These pigs can be fed the waste collected from the nearby hotels or agricultural by-products available in the villages. The pigs grew to about 75-80 kg in 8 months as compared to desi breed which grows only 40 kg. About 18 piglets are received from one female in a year. As observed, the farmer has additional income of Rs. 35,000 /annum through pig farming.[74]

3.2 Research group helps pig business become bigger business in Northeastern India

Small-scale pig production is the basis of livelihoods of many poor tribal people living in India's remote northeast corner. Pigs could provide a pathway out of poverty for many people

73. YutikaNarzary. Jahnovi Brahma, Chandan Brahma and Sandeep Das (2016), "A study on indigenous fermented foods and beverages of Kokrajhar, Assam", Journal of Ethnic Foods, 3, 284-29.

74. "Selected livelihood options for disadvantaged regions of India: National Agricultural Innovation Project", Indian Council of Agricultural Research, New Delhi, p.29.

if they were able to transform their subsistence production into market-oriented systems. Very few people in Nagaland are vegetarian and pork is the most preferred meat (50% of all pork consumed in India is consumed in the northeast). Although only about a quarter of all a pigs in India are in the northeastern states, some 80% of tribal families keep at least 2 to 3 pigs. Pig meat is so in demand that these states import pigs from northern Indian states and Myanmar. Nagaland alone imports about 10, 000 pigs per month.

The international Livestock Research Institute (ILRI) undertook the first comprehensive assessment of the whole pig value chain in northeast India in 2006-2007. Reports were published for the state of Assam as well as Nagaland and set out the role of pig production in people's livelihoods and the current state of pig production here, identifying some of the sector's technical, economic, social and institutional constraints and opportunities. As part of a National Agricultural Innovation Project (NAIP) funded by the World Bank,the Government of India and the International Funded for Agricultural Research (IFAD), ILRIis implementing a project with other local partners in Mon District of Nagaland to improve livelihoods through development of the pig sector. With few good roads or other infrastructure, most people here are very poor, and their pig farming remains very traditional. The small, local pig breeds raised here are fed forages harvested from the jungle and kitchen waste Pig production in these villages remains very traditional and largely unprofitable. While most of the farmers produce one mature pig, of 70-80 kg, in a span of 3-4 years, the same sized pig can be produced within 8-10 months through adoption of a few relatively simple improved practices. In the pilot project in Mon, ILRI and members of the community together identified a package of integrated, locally appropriate interventions: (a) improvement of the local pig genotype through distribution of higher-producing pig breeds, (b) development of community based veterinary first aid services, (c) cultivation of dual-purpose crops that can feed pigs as well as people, (d) better pig housing, sanitation and quarantine measures (e) closer links among stakeholders in the value chain, from input suppliers to pork sellers, (f) creation of business development services and (g) building the capacity of target groups using local resource persons and influential groups. ILRI's initiatives raised the level of interest of community members in pig keeping, especially for breeding.

The ILRI project promoted the adoption of clean and hygienic practices in the pig sty and encouraged the cultivation of food-feed crops. Two trained paravets in each village became sufficiently confident to provide veterinary first aid and business development services. Household income from pigs increased from by 133-457 percent. With funding from the NavajbaiRatan Tata Trust under their North East Initiative and in collaboration with several local non-government organizations, this successful model will be extended to other parts of Nagaland and into Arunachal Pradesh and Mizoram. Several government and non-government organizations in northeast India are interested in replicating this model and have sought not only ILRI's technical support but also its help in framing a people-centric policy for development of the pig sub-sector initiated by the government's North East Council.[75]

75. Ibid, pp.29-30.

3.3 Sustainable livelihood through Kadaknath production in Jhabua, Madhya Pradesh

An Indian high value poultry breed, Kadaknath is native of Jhabua, famous for its black and tasty meat. The bird is known for its meat quality, texture, flavour and special medicinal value. It is reared mainly by the tribal community of Bhil and Bhilala in the districts Jhabua and Dhar in Madhya Pradesh. Due to its high market demand, the population of this bird is declining rapidly and it is under threat of extinction and genetic erosion. An attempt was therefore made for conservation and promotion of this high value Indian poultry race Kadaknath under National Agriculture Innovation Project Component- 3 sub project entitled, "Integrate farming system for sustainable rural lively in undulating and rainfed areas of Jhabua and Dhar districts of Madhya Pradesh". During interaction with farmers of Jhayda cluster, Jhabua, it was observed that slow growth on natural feeding (186 days sexual maturity) and more than 50 % mortality before maturity are major factors which affect the survival, growth and productivity of this breed. Accordingly, the intervention made under the project were construction of low cost poultry sheds, trainings on advanced technologies of poultry production, optimum feed and balance diet, vaccination for protection from diseases and exploring the marketing avenues. Ten tribal farmers were selected for this programme and one hundred poultry chicks of ten days old were made available to each beneficiary. The farmers were advocated on technologies for scientific poultry production, balance feeding, health management and marketing. Now the beneficiaries have been trained in managing the production of Kadaknath in proper way. This new Kadaknath production technology has reduced the mortality rate from higher than 50% to 10-12% and thus enhanced the survival percentage. The bird is gaining the body weight in faster way and is attaining saleable weight of 1.10 kg in 105-120 days. The producers are selling this body weight poultry @ Rs 300 to 350/kg body weight. In this way, an individual beneficiary is getting the net income of Rs 90 to 105 thousands /beneficiary/ year. There are also developing sustainability fund. The tribal farmers are very happy with the technology and now numbers of tribal are constructing the low cost poultry sheds from their own resources and adopting the technology for rearing of poultry birds. It is also helpful in reducing the job oriented migration as many of the farmers are engaged in poultry farming. This sustainable livelihood through Kadaknath rearing has been well recognized by the district administration of Jhabua. The KadaknathMurgiPalanSamooh, Jhayda has been awarded by a certificate of appreciation with a cash prize of Rs 20,000/- on the occasion of Independence Day i.e. August 15, 2010 by district administration, Jhabua for excellent work on Kadaknathrearing. The excitement and devotion of successful poultry growers may create a revolution in Kadaknath poultry rearing in Jhabua and Dhar district of Madhya Pradesh.[76]

3.4 Goat Development – 'Goat Bank' Approach in Maharastra

BAIF, Pune introduced a concept of Goat Bank in selected disadvathged districts of Maharashtra. Breedimrpvement of base population of goat is major objective of this intervention. Osmanabadi

76. Ibid,pp.30-31.

goats were given to selective participants with an understanding that they will give one female kid born to each goat they received to the other non recipient family and these new recipients will continue the same practice so that over a period of time large number of participants in the project area will own purebred goats. Families having goat herds get befiit of breeding services of the bucks. Total 1683 kids were born and 2400 families benefitted through adoption of breed improvement technologies and improved feeding practices. Induction of standard management practices like vaccination, de-worming, improvement in feeding standards, weight monitoring and record keeping benefitted the goat rearing families. The approach which resulted into weight gain of 15-18 kg at 12-15 month as against 10-12 kg of local breed at same age and also selling price increased from Rs. 90 to 100/kg live weight.[77]

3.5 EAGL: using goats to fight poverty in tribal Maharashtra

DrNilratanShende extended his PhD research on poverty elimination and built a social enterprise out of it. The enterprise he started, EAGL, is empowering farmers and tribal groups in Maharashtra's Melghat region using livestock. Nestled in the dense forests along River Tapti, Melghat is home to many tribal villages, belonging mainly to the Korku community. EAGL supports these families with livestock, mainly goats, and has helped over 200 families break the shackles of poverty.

77. Ibid,pp.31-32.

3.6 Goat Framing

Improved technology interventions in goatery has also been undertaken for livelihood improvement of tribal farmers. Four training programmes of three days duration each were conducted in collaboration with Krantisinh Nana Patil Veterinary College, Shirval for 177 tribal farmers from Navapur, Dhadgaon and Nandurbar District between 6th to 25th March 2017. Tribal Farmers were imparted with skill and knowledge of goat rearing techniques, management, feeding, breeding and disease management, insurance, bank loans etc. during training. Besides on hand training, field visits were also arranged for the farmers. All the trained farmers have expressed determination to take up goat farming in scientific way and on commercial scale. Out of these, 44 trained farmers have been supplied with goat units of four does and one buck of Osmanabadi breed. The goats were procured from PunyashlokAhilyadeviHolkar sheep and goat development board, Dahiwadi Farm (Govt. of Maharashtra).

3.7 Sirohi bucks for breed improvement, Rajasthan

The bucks and goat of Sirohi breed were provided to small and marginal farmers. Farmers are getting higher returns from sale of male progenies and also getting higher milk production. At village Phalasia, a farmer was able to earn about rs.15,000/- on sale of two one and half year old two male sirohiprogenie.

3.8 Livelihood security for tribal livelihood through Backyard Poultry

Backyard poultry is kept with minimal input of resources and is considered by most smallholders as supplementary to the main livelihood activities. The birds scavenge to find feed and are rarely provided more than kitchen leftovers, although supplementation with cheap grains or leftovers from the keepers' own grain production does occur. The backyard poultry farming is more beneficial to marginal, land less labourers, tribal and backward class people. Backyard poultry generate petty cash for house hold requirement in addition provide balanced food with minimum inputs available in the rural areas. Feeding of the backyard poultry is made easy by using household wastes, farm products and green vegetation, besides free scavenging for waste grains and insects. The backyard rearing certainly improves the economic status of a majority of tribal families from lower socioeconomic groups in the tribal areas. The present study was purposively conducted in Bastar district of Chhattisgarh. The Bastar district comprises seven blocks out of which two blocks (Bakawand and Jagdalpur) were chosen randomly. From each block five villages were selected randomly and from each village 12 poultry rearers were selected randomly making a total 120 poultry rearers for the study. The data were collected using well-structured and pre tested interview schedule by covering all the dimensions of nutritional and livelihood security i.e. flock size, production performance, selling price, annual income of family and income from poultry. All the backyard poultry respondents reported that they rear desi type coloured birds. Desi birds seem to be the promising native chicken for low input free range system of rearing for meat and egg production in tribal areas. The primary occupation of both the blocks was agricul-

ture whereas backyard poultry farming was found to be a secondary and subsidiary occupation for majority of the respondents. It could provide gainful employment to the family members and utilize the baron and fallow land available with the rearers. Similar finding was also reported by Meena et al. (2012) in the study area of Rajasthan.

3.9 Poultry Framing in Navapur and Chitavi area

Technology interventions in poultry farming Technology intervention in backyard poultry farming has successfully been demonstrated in the Navapur and Chitavi area. The cages for backyard poultry units to house 20 birds each were designed, fabricated and supplied to 300 tribal farmers. 3000 Vanraja birds (Dual Purpose) were supplied to these farmers after training and imparting skill for backyard poultry farming. The farmers were also provided with feeders, waterers and feed for initial month. Training programme and the group meetings with tribal farmers on “Back-yard Poultry Farming” were organized on the 18th December 2015 and the 10th February 2016, where more than 300 tribal farmers participated and were benefitted.

PICTURE SOURCE:THEHINDU.COM

3.10 Accelerated poverty alleviation of tribal households - cage fish farming by displaced fishers in reservoirs of Jharkhand

Jharkhand, a new Indian state created in 2001 presents a unique culture, demography and geo-graphical characteristics. Around 28% of the state 33 million people (2011 census) are tribal, forming a group in the state. Agriculture is the predominant livelihood for rural communities and subsistence level farming dominates the food production system, with limited opportunities for on-farm employment to landless people for the greater part of the year. There is limited scope

for labor movement in search of employment, particularly in tribal and hill areas where road and communication networks are limited. However, fisheries and aquaculture are regarded as an integral part of food production system and livelihood for over 135,000 people who are dependent on fishing and related activities, with major participation of tribal fishers. With the team effort of Department of Fisheries (DoF) the state has the distinction of achieving high growth in fisheries and aquaculture during the last decade of around 49% per annum over the base year (2001) and 9.4% over previous year. Fish production has increased to 116,000 tonnes worth around Rs. 1 billion (US$150 million) from the initial 14,000 tonnes. The concerted efforts of DoF have resulted in continually improved production and sector growth in spite of several predicaments, transforming fisheries and aquaculture activities in the state from subsistence level to extensive, semi intensive and near commercial scale in some segments.

3.11 Livelihood Enhancement through Improved technology in Fisheries in Maharashtra

The Indian major Carp (IMC) culture is to rear a healthy population of fish that are free of stress and diseases, and are feeding, growing and surviving at the optimum rate. The health of the fish and diseases are directly linked to environmental quality. Avoiding stress by maintain environmental quality through proper management is essential to maintain a healthy, diseases free population. Enhancing productivity by means of increasing the stocking density, feed, chemical and other inputs in semi intensive and intensive farming systems has resulted in increasing stressed on IMC. In aquaculture systems, all the environmental components such as biological, chemical and physical may vary abnormally with the intensity of culture operation. Six villages of NavapurTaluka namely Karanji, Bhomdipada, Borepada, Jamtalav, Chowky and Chitvi were selected for IMC aquaculture. Indian major carp (IMC) fingerlings (size 5-6 g) were stocked in farm/fisheries ponds (stocking density@ 10,000/ha). At villages namely Karanji, Bhomdipada, Borepada, Chowky and Chitvi, water quality parameters such pH, DO and ammonia were measured. Research on fish ponds led to the optimal water quality and plankton primary productivity. At Jamtalav pond, ammonia was found to be higher. In order to control ammonia level, zeolite (stilbite) trapped with silver nano particles was applied in the pond. This has helped in alleviation of multiple abiotic and biotic stresses in the pond with the result of higher fish production. Water analysis kit was also used for measurement of these parameters on the field. Chowky and Chitvi were selected for IMC aquaculture. Indian major carp (IMC) fingerlings (size 5-6 g) were stocked in farm/fisheries ponds (stocking density@ 10,000/ha). At villages namely Karanji, Bhomdipada, Borepada, Chowky and Chitvi, water quality parameters such pH, DO and ammonia were measured. Research on fish ponds led to the optimal water quality and plankton primary productivity. At Jamtalav pond, ammonia was found to be higher. In order to control ammonia level, zeolite (stilbite) trapped with silver nanoparticles was applied in the pond. This has helped in alleviation of multiple abiotic and biotic stresses in the pond with the result of higher fish production. Water analysis kit was also used for measurement of these parameters on the field.

3.12 Sustainability of Diary based livelihoods of the tribes in Ranchi and Dhanbad district in Jharkhand

The present study assesses the extent of contribution of Dairy based production system towards the sustainable livelihood of the tribes in Jharkhand. Out of 24 districts of Jharkhand, Govindpur and Ormanjhi blocks of Dhanbad and Ranchi districts respectively were randomly selected for the study. From these two blocks, four villages were selected randomly and from each village 30 tribal farmers were again selected randomly, constituting a total number of 120 respondents. The data were collected through Participatory Rural Appraisal (PRA) and personal interviews during the year 2013-14. The results indicated that the livelihoods of tribal communities in the area have traditionally been dominated by Dairy Production System (DPS) - C+B+G (C=Cattle, B=Buffalo, G=Goat). Among the sustainable livelihood components human capital was minimum compared to others and use of traditional knowledge (5.98), farm energy (5.95), ICT Tools (5.71), livestock density (5.97) and access to natural resources (5.85) had highest influence on sustainable livelihood of the respondents. The DPS prevalent in the area substantially contributed for the sustainable livelihood of the respondents and was the integral part of day-to-day livelihood activities, nutritional security and traditional life style of tribal people in the area.Dairy animals' manure helps in maintaining soil fertility; and they fulfill a wide range of socio-cultural roles of tribes. Even the poorest of the poor tribes often have dairy animal that can save them along a pathway out of poverty. Small farmers have dairy animals with low milk productivity, low milk price and shortage of quality breed animals as major constraints (Rani et al, 2013). Properly managed dairy production system can play an important role in mitigating hunger and counteracting environmental degradation. Sustainable Livelihoods Approach, are genuinely transdisciplinary as they are produced, disseminated and are applied in the borderland between research, policy, and practice (Knuttson, 2006). Moreover, as an important diversified activity, the DPS of the tribes are more crucial for economic development of the state in specific and country in general. Hence, a systematic study was designed to investigate contribution of Dairy Production System towards the sustainable livelihood of the tribes of Jharkhand.

4. ART AND CRAFT BASED INNOVATIVE TRIBAL LIVELIHOOD AND BEST PRACTICES

4.1 Livelihood generation through Tribal crafts:

Tribal has been producing different handicrafts both utilitarian and decorative over centuries. Tribal economy in the earlier days was a barter system through mutual help. Lending, if any, between different members of the community is also governed by customs and interest has not been applied. Thus self sufficient economy of the tribal does not have substantial surpluses to warrant establishment of regular markets nor knew their potentialities for their handicrafts. Slowly

PICTURE SOURCE: TRIPADVISOR.COM

market economies began to appear around religious festivals and demands for new items started increasing. This lead to weekly markets, Traders or middle men came on the scene and slowly these tribal artisans who display their skill, acquired through tradition, used to sell their products to these traders or middleman, unfortunately these artisans are being exploited and are paid paltry amounts. Even these systems are getting eroded due to poor marketing facilities and are unable to with stand competition from manufacturing industries. Studies have shown that there is continuous depletion of their numbers over time and, many of them have become a large body of landless agriculture labor. Their pride place in traditional craftsmanship which provided an outlet to the innate artistic talents by manifesting itself in full range of variegated shapes size and designs is at present in the state of total disarray.

They gradually are moving towards extinction and the official help to market them is tardy. In order to overcome the problems of unemployment and poverty and a higher incidence of migration of active population, the diversification of economy from subsistence to commercialized production of farm and non-farm products has been recognized among the most important alternative options and a necessary policy.

4.2 Living in flood-prone areas of Assam with no alternate sustenance options, women of Missing tribal community have upgraded their traditional handloom weaving skills, and have adapted to market needs for a lucrative livelihood

Missing villages are on the banks of the Brahmaputra River and its mighty tributaries. Every year the area faces devastating floods. The recurrent floods reduce the scope of alternate livelihood. Villages like Sisitangoni of Dhemaji district and Matmora of Lakhimpur district are affected by riverbank erosion or sand deposition, reducing any possibility of agrarian or land-based liveli-

hoods. However, dovetailing modern technology with the traditional skill of the weavers, handloom can provide a lucrative livelihood opportunity for the families of the area. With the objective of bridging the demand and supply gap, and making handloom weaving a sustainable livelihood, Missing Autonomous Council (MAC) and the Center for Microfinance and Livelihood (CML) with the Tata Trusts planned an intervention to be executed over three years. The team decided to introduce technology to overcome the low production efficiency. As a first step, a warping drum was introduced for getting a defect-free warp. Unlike the traditional method, warping drum helped reduce the area required to make a warp. Replacing the throw shuttle loom with advanced fly shuttle loom brought down the cost of production. A complete set of fly shuttle loom costs about Rs 30,000. But the cost was reduced to Rs 5,000 through a local innovation of replacing the steel frame of the loom with bamboo frame. Bamboo is not only locally available, it is also cheaper, durable and easily repairable. In batches of 25, the weavers underwent a 60-day skill training, overcoming resistance from the men at home, giving up their contribution to the livelihood and running of the family. During the training, they learnt to take the warp in a warping drum, practice in the fly shuttle loom, develop designs, diversify products and also maintain records. In 18 months, 375 members have completed their training. On completion of training, each weaver received a fly shuttle loom. With the prospects appearing good, the weavers provided bamboo and labor for construction of a 100 sq. ft weaving shed in their homes where floods would not damage them. “Earlier I couldn’t take warp during rains as it required a large open ground but today with the warping drum I can take warp in a single room,” RunaDoley of Matmora village told VillageSquare.in. The training and practice in the new loom has increased the production efficiency up to a maximum of 250%. “Now I produce four mekhela chador in a month, when earlier I could make only one or two,” Anima Taye of Sisitangoni village told VillageSquare.in. The introduction of technology has not only improved production speed but also reduced the drudgery for the weavers. “Earlier I had to bend after every weft to throw the shuttle and I couldn’t sleep at night because of the back pain. But now I weave at triple the usual speed without bending and without pain,” Purnima Kaman told VillageSquare.in.

5. SERICULTURE

Chhattisgarh govt. to empower tribal women in the state with the help of silk. Though, women constitute nearly 50 percent of the country’s population, they are often oppressed and their rights are violated in India. Tribal women, in particular, are doubly oppressed because of their status as a woman and a tribal. According to *India Today*, tribal women in India have the lowest literacy rates.

PICTURE SOURCE: HTTP://WWW.AVENTURE.AC.IN/

In this context, to change the status quo and to make tribal women in the state self-reliant, the Chhattisgarh government has come up with an initiative to train them on production of Tusar silk and teach them the process involved in removal of threads from the silkworm. Women belonging to self-help groups in Jashpur district have been given 45 days training on this. After the completion of the course, they are entrusted with the responsibility and this process has proven to be a good source of income to the tribal women, which in turn will empower them.

6. SOME GOVERNMENT INITIATIVES

Government has made various initiatives and **Aspirational District Programme** was one of them, with the main vision of inclusive and holistic growth with Livelihood Sustainable practices.

6.1 Agriculture Entrepreneur Scheme:

The model is proving to be an inspiration for the local community as more and more farmers are keen on adopting the best practices of such as mixed cropping of fruits, vegetables, drip irrigation etc. The Agri-Entrepreneur model apart from enabling the young generation in identifying the viability and economic success of farming practices in the district has also proven to induce a behavioural change in the farmers by reversing the trend of rural-urban migration.

6.2 Clean Gopala Green Gopala:

In order to protect and improve the environment, District Administration Goalpara along with Department of Social Forestry, Civil Society and citizens together and planted more than 12.6 lakh saplings in mission mode with a period of 20 days, surpassing the target of 12 lakh (one person, one sapling) sapling population. Saplings have been planted across the district along highways, schools, health centers, forest lands and villages.




PICTURE SOURCE: WWW.AISANAGE.COM

6.3 Enhancing Agricultural Productivity through High Density Farming:

In a bid to improve agricultural productivity and maximizeutilization of resources, best practices in farming are being promoted and developed in Kupwara District. Awareness drives to educate farmers about benefits of high-density farming and the proactive involvement of district administration has helped in accelerating development in agricultural sector.

6.4 Potable Water to Households in hilly region and tribal regions through gravity system:

Under this project, water from springs is collected through gravity flow system taking advantage of the undulating terrain. Perennial steam water is harnessed in an elevated zone and utilizing gravity water, water is brought to the lower-level through PVC pipe along with contours, intermittent outlets and controlling devices.

6.5 Horticulture Price Agreement Initiative

To make farming a profitable venture, the Horticulture Price Agreement Initiative was launched by Aspirational District of Chhatarpur. The initiative has forward and backward linkages and guarantees procurement at maximum price and partnership in local micro processing units for farmers, while generating employment in local youth.

6.6 Scientific Sericulture-Enhancing Livelihood:

Mamit is Mizoram is weaving the path towards development through Scientific Sericulture practices. The district is working towards creating employment opportunities for the locals and increasing silk-production capacity. Sericulture in India is a fairly organised activity and is largely rural-based and labour-intensive.

PICTURE SOURCE: FIBERFESHION.COM

6.7 ASHA- EkUmeedki Kiran:

The Aspirational District of Kondalgaon established 'Asha Centre'in February 2018 is a special initiative to empower local women by providing employment. The Centre is operated in collaboration with District Project Livelihood College and the District Skill Development Authority. The Centre provides Skill Development Training under Pradhan MantriKaushalVikasYojana and Mukhya-MantriKaushalVikasYojana total free of cost.

6.8 Setting Up An Industrial Sewing- Machine Facility:

One of the major goals in Left-Wing Extremism affected districts is to create sustainable livelihood opportunities for the people of the district. In Palamu, people after getting trained by the State and Central Government under various training programmes, usually migrate out of the district in search of employment opportunities.

6.9 Solar Mama's:

In remote districts like Gumla, few hamlets have not yet been electrified due to scattered settlements, difficult topography and challenges of inaccessibility. To mitigate this challenge, the District Administration along with an International NGO, Barefoot College, organised local women in Self-Help Groups and trained them with these skills needed for the fabrication of solar panels, lights and photovoltaic circuits.

PICTURE SOURCE: THENEWSMINUTE.COM

PICTURE SOURCE: WWW.VILLAGESQUARE.IN

6.10 Solar Power Driven Khawa:

In order to keep themselves afloat during severe draughts, farmers in Osmanbad District within a Khawa cluster have come together, as an alternative to selling only milk. Khoya or Khawa as a product has more demand and shelf life than milk and every farmer makes a profit for every litre.

6.11 Construction of Subsurface Dams:

Kadapa is a drought prone district in Andra Pradesh due to scanty rainfall and complex geology. To address the issue of water shortage , the district has constructed subsurface dams using Z sheet piling technology at six locations on Rive Papagni that is spread across 34 kms.


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