Revival of large cardamom cultivation

...through rhizomes and local traditional knowledge has been introduced in villages around Barsey Rhododendron Sanctuary, Sikkim. Rhizomes of cardamom are first planted in a nursery. The cardamom saplings are grown in the nursery to a certain height and then they are transplanted and sown in the fields. This has reduced disease infestation of the saplings which was happening when the saplings were directly planted in the fields. The new method had led to decrease in seedling rot in large cardamom. This programme set up two nurseries which has helped to raise 30,000 saplings each worth a total of Rs 1.5 lakhs in two villages.

System of Rice and Wheat Intensification (SRI/SWI)

...is a cultivation technique in which rice and wheat are planted while maintaining a constant distance leading to better productivity. A distance of 8 cm is maintained between plant to plant and a 20 cm distance is maintained between the lines. This kind of sowing allows for sufficient aeration, moisture, sunlight and nutrient availability which leads to a proper root system development from an early stage. This technique was introduced in areas with low water availability. The average increase in income per household from planting rice in 20 decimal of land was found to be Rs 1850 per season. While the average increase in income per household from planting wheat in 12 decimal of land was Rs 1946 per season.

Low Cost Polyhouse

Two types of polyhouse have been demonstrated for vegetable cultivation. One is the “A frame polyhouse” which was established in an area of 30ft by 10ft while the other is a “hoop shaped polyhouse” which has been established in an area of 20ft by 10ft. Off season vegetables like broccoli, lettuce, cucurbits have been grown in the polyhouses under controlled environment in hilly regions with extremely cold climate. Compost is also added to increase the productivity of the vegetable.

Integrated Farming

...was introduced to diversify agriculture in areas where agriculture was totally rainfed and irrigation facilities were poor. Inter crops of redgram, black gram and vegetables was done with the main crop of cotton. Demo plots of cotton along with redgram (inter crop), cowpea, ladies finger (trap crop), sunhemp and castor as border crops have been established. Mixed cropping demo plots with green gram and black gram along with marigold, lady finger and sunhemp as border crop have been established. The farmers have used green manuring methods and vermi composting for improving soil fertility. Non Pesticide Management practices for pest management have also been used to save input costs as well as agriculture productivity enhancement. An additional 72 acres of fallow and culturable wasteland was also brought under integrated farming as well as horticulture in 3 villages. The average increase of income per household by growing cotton and redgram in one acre was found to be Rs 14500 per season. The average yield of cotton was 415 kgs per acre and red gram was 215 kgs per acre per season. Green gram and black gram cultivation has also augmented income per household by Rs 12350. The average yield of green gram is 380 kgs per acre and black gram is 420 kgs per acre in a season.

System of Crop Intensification

...seeks to increase the food grain production by reducing the use of chemical fertilizers. The fields are ploughed three times manually after which the seeds are sown. Organic manure is used in the fields instead of the chemical fertilizers. Manual weeding is also done. The crops grown were wheat, corn, rice and finger millets. There was, however, no significant yield due to white grub infestation and poor winter rains. This practice needs to be refined further to see visible results on the field.

This document is a summary of the detailed submission on project activities provided by the project partners.

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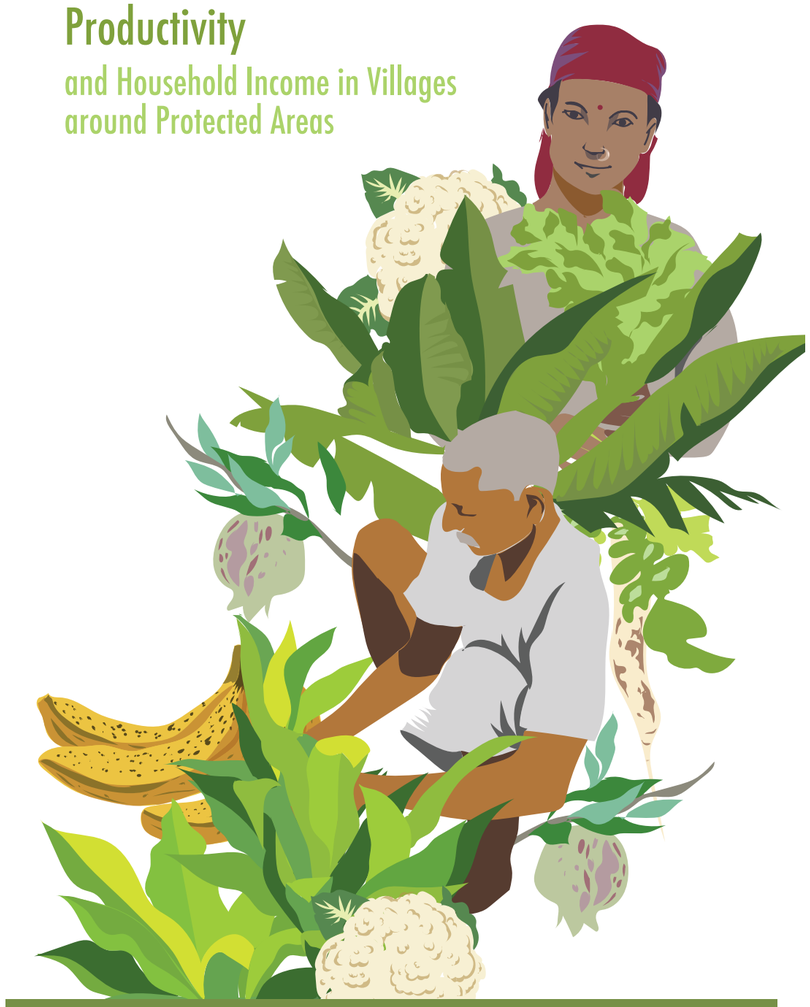
Technological Interventions for Augmenting Farm Productivity

and Household Income in Villages around Protected Areas



The Science for Equity Empowerment and Development Division, Department of Science and Technology, Government of India and WWF India supported network programme “Conservation and Sustainable Livelihoods in Partnership with Local Communities around the Protected Areas: Phase 2” has demonstrated low cost simple technologies on farmers fields to diversify farming options. These demonstrations and subsequent adoption has helped households to augment their yield and income.

The sixteen Protected Areas which are part of Phase 2 are located in diverse agro-ecological regions. Efforts were made to identify the appropriate technologies and crops as per

1. Willingness of farmers
2. Suitability to the region
3. Suggestion of Krishi Vigyan Kendras/agricultural institutes

Partner Name	*Protected Area*	*Agro Ecological Regions*	*Activities*	*# of HHs*
Centre for People Forestry	Kawal Wildlife Sanctuary, Telangana	Deccan (Telangana) Plateau and Eastern Ghats	Horticulture Plantation, Integrated Farming Vegetable Cultivation	103
Gorakhpur Environmental Action Group	Valmiki Wildlife Sanctuary, Bihar	Eastern Plain	LESIA Farming, Kitchen Gardening, Zero Tillage Farming, Inter-Cropping	327
Himal Prakriti	Askot Wildlife Sanctuary, Uttarakhand	Western Himalaya	Low Cost Polyhouse, Crop Intensification	29
Jagran Jan Vikas Samiti	Jaisamand Wildlife Sanctuary, Rajasthan	Western Plain, Kachchh, and part of Kathiwara Peninsula	Tuber Cultivation, Fruit Plantation, Vegetable Cultivation	250
Jan Sewa Parishad	Hazaribagh National Park, Jharkhand	Eastern Plateau and Eastern Ghats	SRI, SWI, Vegetable Cultivation	94
Khangchendzonga Conservation Committee	Barsey Rhododendron Sanctuary, Sikkim	Eastern Himalayas	Large Cardamom Nursery	140
Laya	Papikonda National Park, Andhra Pradesh	Deccan Plateau	Tuber Cultivation, Vegetable and Fruit Nursery Development	249
Manas Ever Welfare Society	Manas National Park, Assam	Bengal and Assam Plains	Lemon Plantation	10
WWF India	Ranthambore Tiger Reserve Rajasthan	Northern Plain and Central Highlands including Aravallis	High Value Organic Farming, Vegetable Cultivation	192
River Research Centre	Parambikulam Tiger Reserve, Kerala	Western Ghats and Coastal Plains	Vegetable Cultivation, Vegetable Nursery	135
Society for Rural Development and Action	Nargu Wildlife Sanctuary, Himachal Pradesh	Western Himalayas	Vegetable square meter gardening, Reintroduction of finger millets, dolma etc.	284
Sahyadri Wildlife and Forest Conservation Trust	Dandeli Anshi Tiger Reserve, Karnataka	Western Ghats and Coastal Plains	Tuber Cultivation, Nursery Development of forest and fruit saplings	110
			Total	1820

Capacity Building and Technology Outreach

Introduction of better quality seeds, scientific technology and techniques like LEISA, seed treatment has led to enhanced farm productivity in 1820 HHs in 55 villages around 12 Protected Areas (PA).

On site training programmes have been conducted for farmers at the diverse sites. Some of techniques introduced at household level were:

1. Low External Input Sustainable Agriculture (LEISA)
2. System of Rice Intensification
3. System of Wheat Intensification
4. Zero tillage farming
5. Square meter vegetable cultivation
6. System of crop intensification
7. Scientific intercropping of cotton crop
8. Low cost polyhouse for seedlings and vegetable
9. Rhizome based cardamom cultivation

Capacity building of farmers was carried out to promote organic farming by introducing scientific techniques for preparation of compost especially vermi compost, *Trichoderma* , matka khad, cow pad pit, Nadep compost and matka pesticide. Farmers were encouraged to use green manure to reduce usage of chemical fertilizers.

Demonstration done for
421 HHs
Improved Techniques Adopated in
1060 HHs

Adoption of farm based activities

Tribes who did not practice agriculture like the Kadars, a particularly vulnerable tribe, have been encouraged to cultivate vegetables in home gardens and raise nursery of NTFPs and other forest species. Tuber cultivation was also adopted by Kunbi tribal households to reduce collection from forests and also document the variety of tuber availability in their villages. A total of 1335 HHs around 11 PAs have adopted cultivation of vegetables and tubers for the first time leading to enhanced food security.

Tuber and Vegetable Cultivation Adopted, Food Security Enhanced in

1335 HHs
11 PAs

Field Demonstrations

Demonstration of scientific technique for LEISA and vegetable cultivation has been done with 421 HHs. This has been well received by farmers and an additional a 1060 HHs have also adopted these techniques in the project villages around Valmiki Wildlife Sanctuary, Bihar and Hazaribagh National Park, Jharkhand on their own.

Low External Input Sustainable Agriculture

...has been demonstrated to reduce the farmer's dependency on products that are purchased from markets (pesticides, fertiliser, urea) and decrease the input costs of the farmers. Introduction of composting and recycling like vermicompost, pit compost, Cow Pat Pit, Nadep Compost had been done depending upon the area available and the crops grown by farmers. Capacity building of farmers has been to develop and use biofertilizers and bio-pesticides like *Trichoderma.* The biofertilizers used on the crops instead of the market bought fertilizers and pesticides has led to enhanced productivity and reduced the pest attacks. The farmers are also adding PSB (Phosphate Stabilizing Bacteria) culture, rhizome culture, and other biofertilizers to the seeds for treatment before sowing to prevent fungal attacks. The core of the LEISA technique is effective use of local resources to bring down input costs of the farmer. Some of the crops cultivated under this technique are sugarcane, banana, and cauliflower.

Sugarcane
23 HHs
Input Cost/Acre before LEISA
₹32920
Input Cost/Acre After LEISA
₹25575
Yield Increase from **200** quintals to **250** quintals/acre

1. Sugarcane (Bo-91) has been cultivated by 23 household in one acre each. Before the intervention the input cost per acre was Rs. 32920. The input cost after the introduction of LEISA has now decreased to Rs.25575 per acre because of the decrease in use of fertilizers and pesticides. The yield has increased from 200 quintals to 250 quintals per acre. This has resulted in an average annual increase of HH income by Rs. 26,345 per household.

Banana
17 HHs
Input Cost/Acre before LEISA
₹56000
Input Cost/Acre After LEISA
₹48500
Yield Increase from **260** quintals to **310** quintals/acre

2. Banana (G-9) has been cultivated by 17 households in one acre each. Before the intervention the input cost per acre was Rs. 56000. The input cost after the introduction of LEISA has now decreased to Rs. 48500 per acre because of the decrease is in use of fertilizers and pesticides. The yield has increased from 260 quintals to 310 quintals per acre resulting in an average annual increase in HH income by Rs. 58,500 per household.

Cauliflower
11 HHs
Input Cost/Acre before LEISA
₹17930
Input Cost/Acre After LEISA
₹11525
Yield Increase from **73** quintals to **101** quintals/acre

3. Cauliflower (Madhuri) has been cultivated by 11 households in 0.5 acre per household. Before the intervention the input cost per acre was Rs 17930. The input cost after the introduction of LEISA has now decreased to Rs. 11525 per acre because of the decrease in use of fertilizers and pesticides. The yield has increased from 73 quintals to 101 quintals per acre. This has resulted in an average annual increase in HH income by Rs. 38,382 per household.

Square Meter vegetable cultivation

...has been introduced in villages located in the mountains to maximise land utilisation in areas with small and terraced land holdings. This has also led to increase in food security and augmented HH incomes. This technique requires only 20% of the space of a conventional row garden and can produce a variety of vegetables at the same time. A standard size plot of 8 feet by 4 feet was established for vegetable cultivation. Compost is also added to these plots to get a high yield. The vegetables cultivated in these plots were Radish (Red and White Varieties), Squash (Green and Yellow varieties), French beans, Coriander, Spinach, Spring Onions and bokchoy. The produce harvested has been used mainly for self consumption.