

Technology application and up-scaling

for sustaining natural resources and augmenting farm income: Farmers led market linked approach

Prabhjot Kaur*, Pankaj Kumar and Jagwinder Singh

Punjab Agricultural University, Ludhiana, Punjab 141 004

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Location and selection of area

The project is operating in the Sangrur district of Punjab. Wheat-paddy is the most dominant crop rotation covering more than 85% of the cropped area. The project covers two villages forming a cluster namely Chatha Nanhera and Taranji Khera. In Chatha Nanhera, paddy-wheat was the most predominant rotation cultivated and other crops grown are basmati and cotton in *kharif* and mustard and oats in *rabi*. Sugarcane is also cultivated in the village.

Number of farm families

Village Chatha Nanhera has 796 farming families, 205 agricultural labour households and 193 non-farming households, and 81% literacy rate. Taranji Khera village has 210 farming and 72 non-farming families; literacy rate is 55.2%.

OBJECTIVES

- To assemble, integrate and assess technically feasible, economically viable, socially compatible and commercially up-scalable technology options for sustainable agriculture.
- To design and test suitable technologies, crop choices, networks, linkages and institutional models for marketing and value addition of agricultural produce for enhancing the income of farming families.
- To analyse the impact of the technological interventions, identify factors of success/failure,

INTERVENTIONS

Intervention	Villages covered	Area covered (ha)/Animal (no)	Number of Households covered
NRM Module			
Short duration varieties of rice	Taranji Khera and Chatha Nanhera (Sangrur)	0.4 ha each	300
Direct Seeded Rice by Lucky Seed Drill	T. Khera and Chatha Nanhera	0.4 ha each	100
PAU Happy Seeder for wheat sowing for <i>in situ</i> paddy straw management	T. Khera and Chatha Nanhera	0.4 ha	300
drip irrigated sugarcane with onion as intercrop	T. Khera and Chatha Nanhera	4 kanal	4
Green manurig	T. Khera and Chatha Nanhera	0.4 ha	50
Diversification			
Summer Moongbean in Rice-Wheat System	T. Khera and Chatha Nanhera	0.4 ha	50
Rapeseed (<i>Gobhi sarson</i>)	T. Khera and Chatha Nanhera	0.2 ha	75
Chickpea	T. Khera and Chatha Nanhera	0.2 ha	50
Vegetable Crops			
vegetable varieties/hybrids	T. Khera and Chatha Nanhera	2 kanals	60
Low tunnel cultivation of vegetables	T. Khera and Chatha Nanhera	1 kanal	10
Value addition			
Primary processing unit for oilseeds, pulses and vegetables, mini spice grinder	T. Khera and Chatha Nanhera	1	400
Subsidiary Enterprises			
Beekeeping	T. Khera and Chatha Nanhera	35 Colonies	13
Mushroom production	T. Khera and Chatha Nanhera	12 x 15 feet	40
Livestock based Modules			
Deworming and feeding of mineral mixture	T. Khera and Chatha Nanhera	100 cattle/buffalo	50
Prevention and control of mastitis	T. Khera and Chatha Nanhera	50 cattle/buffalo	50

suggest strategy for up-scaling of successful technologies and provide feedback to the research system of un-successful technologies for their modification.

- To build capacity of farmers and farmwomen to sustainable technologies and practices as well as to promote subsidiary enterprises/secondary agriculture for income enhancement.

NRM based module

Timely guidance and supervision right from the sowing to harvesting was provided through various extension methods i.e. field visits, personal meetings, group meetings, phone calls, WhatsApp etc. used for the successful cultivation and persuasion of the farmers for its adoption.

Short duration varieties of rice

In Sangrur long duration rice varieties which were not recommended for cultivation by the Punjab Agricultural University, were being cultivated; and due to cultivation these varieties, groundwater table was declining at an alarming rate (@ 96 cm/year during 1998 to 2015). So the demonstrations on cultivation of short duration varieties of paddy (PR 126 and PR 121) were conducted in June (Table 1). The yield of the variety PR 126 was 75.6 q/ha and of PR 121 74.9 q/ha. Farmers were satisfied with the obtained yield and they were convinced enough that although yield may be less up to 2 q/ha but in the meantime cost of cultivation was less and two to three week early crop was there which could help in paddy straw management.

Drip irrigated sugarcane with onion as intercrop

Demonstration on drip irrigation and fertigation in Sugarcane with onion as intercrop was laid in the month of February each year. The farmers were provided with seeds, drip irrigation system. Farmers were given demonstrations of method on the planting of cane sets and transplanting of onion nursery. The onion was planted on raised beds in four rows with 20 cm spacing between rows and sugarcane was planted in rows with 120 cm spacing between rows. An average gross returns of ₹ 96,800/0.2 ha was obtained by the farmers in which ₹ 58,800 and 38,000 was obtained from sugarcane and onion respectively. In this way ₹ 38,000 was additional income obtained despite saving the precious water resource. Two farmers have even increased area

Table 1. Economic analysis of the FLDs on short duration varieties of rice

Particulars	Demonstration on PR 126 (Amt. in ₹/ha)	Local Check Pusa 44 (Amt. in ₹/ha)	Demonstration on PR 121 (Amt. in ₹/ha)	Local Check Pusa 44 (Amt. in ₹/ha)
Total cost incurred	33922	37753.67	33202	36190.67
Yield in quintal	78.26	78.03	78.09	80.513
Gross returns	130543.3	141624	130217.3	134347.2
Net returns	96620.67	100852	97015	98156.5
B:C ratio	2.863	2.47	2.936	2.72

to 0.4 ha under this technology at their own.

Horticulture based module

Low tunnel cultivation of vegetables

Demonstrations were conducted with low tunnel cultivation of vegetables (cucumber, bottle gourd and tomato) during the winter of each year. Farmers actively participated on the trainings organized for low tunnel technology cultivation of vegetables under Farmer FIRST project and they come to know the benefits of low technology for raising more valuable off season produce which can be sold at higher prices in the market. Some of the innovative farmers have also started doing intercropping at their own under low tunnels. There are about 20 farmers in both of the villages who are practicing low tunnel technology successfully. S. Hakam Singh of village Taranji Khera has also received Innovative Farmer Award from NAARM Hyderabad for innovating intercropping of brinjal with cucumber under low tunnel technology. Farmers were convinced that vegetables were giving more

returns than cereals. The use of low technology provides them with high value produce but price fluctuations and more labour intensity were the major concerns among farmers. Despite all these apprehensions great success was achieved in as far the adoption of low tunnel technology is concerned.

Enterprises based module

Beekeeping

Beekeeping is an important subsidiary occupation which is suitable for small and marginal farmers, unemployed youth and farmwomen as it does not require land, shed, sophisticated and costly equipment and capital resource and in the same time can enhance farmer's income despite not putting any pressure on the land or water resources. Farmers, at community level and individual level, were apprised with benefits of beekeeping and the process to start the enterprise. Hands-on practical training in beekeeping was provided to the farmers. The trained farmers were provided with a total of 70 honey bee colonies along with 70 bee



Campaign against stubble burning



Bed preparation for sowing of onion sugarcane intercrop



Farmers engaged in setting up low tunnels for vegetable production

hives with super chamber and queen excluder, feeders, bee veils, hive tools, comb foundations and sulphur etc. So every selected farmer got a unit of five bee boxes along with honey bees and other required equipment. These beekeepers produced 20-60 kg honey worth ₹ 5000-15000 from their beekeeping unit of five colonies. Most (87%) of the beekeepers were able to multiply their bee stock as well. As far the marketing of the honey is concerned most of the farmers have done direct marketing of honey and obtained price as good as ₹ 300/kg of honey, however some of them had also sold for ₹ 250/kg. Two farmers have sold their honey through self-help group at various platforms like kisan melas, exhibitions, SHG shop etc. Although they got handsome price but they had fear in their mind that if production increased marketing would be difficult. With the help of project team they were linked to self-help group as well as consumers from nearby big city Ludhiana and present situation is that they are not able to meet the demand of honey. Net gain per person ranged from ₹ 6200-16800. The B:C ratio calculated for the beekeeping intervention was 2.04.

Mushroom growing

The adoption of mushroom cultivation as subsidiary occupation started with the introduction of Farmer First Project in the villages. The farmers came to know the prospects of mushroom cultivation

from the scientists involved in the project. The trainings regarding cultivation of mushrooms were imparted to the farmers interested in opting mushroom cultivation. At present although 40 farmers are growing mushrooms at domestic level but there are five mushroom growers in the village that are actively involved in the production of mushrooms at commercial level and have increased their farm income by adopting subsidiary occupation. The mushroom cultivation offers daily source of income to the farmers and they are increasing their earnings by direct marketing of the produce in the market. The farmers are planning for a joint retail outlet from where they can sell the produce gathered from all the mushroom growers of village and also trying to establish links with the urban restaurants which are having quite large demand for the mushrooms.

Here young farmer Boota Singh (23) from village Chatha Nanhera (Sangrur) is worth mention who started small scale production of mushrooms at village level. He is earning approximately ₹ 2000 daily from small mushroom production unit. The microbiologists from University provided him with basic training and spawns for trial production. After attaining the proper training from the University, he started preparing his own compost and put button mushroom spawn in it. His first harvesting of mushrooms was in December 2018 and has generated additional income of

₹ 60,000 from 30 q compost within two months of starting mushroom cultivation.

TRAINING

Capacity building/HRD trainings (92) were conducted for farmer-scientist interface (2017-20) according to intervention.

DRAWBACKS AND LESSONS LEARNT

- Initially the project team observed mental inertia that (i) farmers were not happy with their existing farming practices but did not want to change their practices such as high yielding long duration varieties of paddy, burning of paddy straw, etc., (ii) government should provide subsidies, jobs etc. for their development, and (iii) government should act to change their existing conditions.
- The project team initially started working as per their expectation i.e. providing inputs and farm machinery free of cost so as to make their agriculture sustainable and enhancing income.
- In the due course of time they were made well aware through participatory mode that existing farming practices need to be changed for sustainability and did not be a job seekers but become job providers by adopting different enterprises.
- As a result in the last year most of farmers did not ask for inputs and laid demonstrations at their own



Training on Bee-Keeping



Training on use of Lucky seed drill for direct sowing of rice

cost under the supervision of project team. They even enhanced area under drip irrigation at their own without any subsidy. Many of them has started subsidiary enterprises like mushroom growing, beekeeping, vegetable cultivation etc. and scaled up at their own level. Many have purchased machinery required for paddy straw management, viz. happy seeder, mulcher etc.

- Not to give-up with initial undesired situation or resistance, but keep on working with existing situation and devise some alternate methods to change the existing undesirable conditions. Efforts to bring abrupt change may result resistance but participatory and continuous efforts must bring change.

IMPACT

- 70% area of the adopted villages was burning free.
- 65% area was under recommended short-duration varieties– Short-duration varieties saved ₹ 3310/ha input cost.

- 70% area was under wheat sown with happy seeder – Additional profit of ₹ 5425/ha was yielded in wheat sown with happy seeder.
- Direct seeding of rice was adopted by 100 farmers– DSR saved ₹ 5357/ha.
- Six farmers started raising vegetables nursery like chilli and onion on commercial level.
- Mushroom cultivation was first time started in the adopted villages by 40 farmers, 17 are small scale commercial growers.
- Beekeeping as an enterprise was adopted by 13 farmers– Beekeeping gave ₹ 16400/10 boxes/year.
- Five drip irrigation systems (total area 2.5 acre) were first time installed in adopted villages.
- Sugarcane-onion intercropping was introduced in villages– Drip irrigated sugarcane with onion has earned about ₹ 4.0 lakh /ha/year.
- Eight small scale drip irrigation systems (total area 1.0 acre) were installed in vegetable fields. Two farmers have increased area by 0.5 acre each as in vegetable

cultivation net income is 2 to 2.5 times more than paddy wheat rotation.

- Low tunnel cultivation of vegetables adopted by 20 growers.
- Seed production of paddy, wheat, chickpea, canola sarson and summer moong.
- Summer moong - ₹ 54,072/ha an addition return.
- Mushroom growers had got ₹ 1113/m² from button mushroom without competing with crops.
- 7 adjoining villages - benefitted from seed, technical know-how and farm machinery Happy seeder, and short-duration varieties of paddy.

WAY FORWARD

- Seed multiplication.
- Scale up of enterprise.
- Group approach – marketing, custom hiring.
- Processing of mushrooms.
- Developing market network.

*Corresponding author's email: Prabhjot1962@pau.edu.

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INDIAN FARMING

Directorate of Knowledge Management in Agriculture
Indian Council of Agricultural Research
Krishi Anusandhan Bhavan I,
Pusa, New Delhi 110 012

indfarm@icar.org.in