

# Transfer of improved farm production technologies

for enhancement of rural livelihood security amongst the farm households of Kangra district of Himachal Pradesh

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## Location and selection of area

Kangra district having the largest cultivable area and operational holdings was chosen purposefully for this project to transfer improved farm production technologies. Majority of the holdings (about 90%) are marginal (< 1 ha) and small (1-2 ha). There are 15 developmental blocks in Kangra district, out of which Baijnath block was selected as it has more backward and tribal hilly area.

The study area falls in upper hilly regions of Baijnath block. Initially, three Panchayats namely, Deol, Dharer and Sehla and subsequently only Dharer panchayat having 7

villages were selected and retained for technological interventions.

## Number of farm families

Using proportional allocation, a sample of 500 farmers from pharer Panchayat were selected for benchmark survey.

## OBJECTIVES

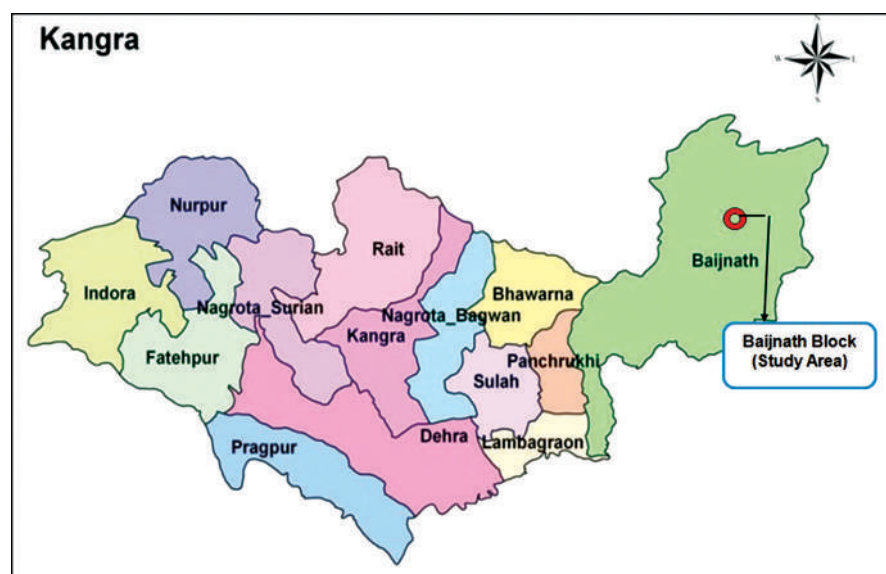
- Increase in the agricultural productivity through improved technological interventions.
- Empowerment through capacity building and skill development of both farm and non-farm enterprises.

## INTERVENTIONS

### Crop based module

Based on the PRA of the selected village cluster under FFP, it was inferred that the cluster was deficient in food grain production resulting in food insecurity among the farmers. The crop based modules were planned and implemented especially to increase the food grain production of wheat, maize and paddy for achieving food security amongst the farmers. Improved varieties, balanced fertilizer application, chemical weed control and IPM were the main interventions to bridge the productivity gap.

Demonstrations on improved varieties of paddy namely, HPR-1068, HPR-2143, Kasturi Basmati, HPR-2612 and hybrid F<sub>1</sub> Raja-369, Maize hybrid KH-517 and high yielding varieties of Wheat viz. HPW 368, HPW 349 and HPW 155 at selected farmers' fields covering a net area of 194.45 ha each during three years. The productivity of maize in the farmers' fields increased (33.5%) from 24.4 q/ha to 32.5 q/ha over local check (Table 1). Similarly, the increase in hybrid paddy (F<sub>1</sub> Raja 369) yield was 23.1% whereas for other recommended varieties were from 15.6 to 32.7% over the local check. The long grained, scented variety Kasturi Basmati was first time



Map showing the location of study area in Kangra district.



Large scale demonstrations on paddy, maize and wheat in the area.

introduced and demonstrated in the study area. The increase in yield in case of different recommended varieties of wheat was from 17.2 to 33.1% over the local check.

In addition to introduction of HYVs and hybrids, the increase in yields and B:C (benefit: cost) ratio were also attributed to timely chemical weed management, use of balanced doses of fertilizer and appropriate plant protection measures applied from time to time in these crops. The farmers of the area are very much impressed with the performance of HYV and with the adoption of HYV along with other improved production technologies. The selected village cluster has not only attained self-sufficiency in food grain production but surplus production is marketed for additional income generation.

#### Horticulture based module:

##### *Crop diversification through off-season vegetable cultivation*

The farmers of the study area were motivated to diversify from cultivation of cereals to high value cash crops on commercial scale in certain selected pockets. Since the selected cluster falls in mid hill areas, the emphasis was given to grow niche based potential off-season vegetable crops like french bean, radish (summer crop), peas and cauliflower to fetch higher returns. Improved varieties/hybrids, appropriate sowing time to capture

early/late market, balanced fertilizer application and disease and insect-pests management were the main interventions earmarked and executed under vegetable based module.

Though, the demonstrations on almost all summer and winter season vegetable crops were conducted but the main focus was to popularize the cultivation of more money spinning crops like french bean, cauliflower, peas and summer radish. The demonstrations on french bean and summer radish were conducted during the months of February to April so as to harvest fresh vegetables before the onset of monsoon to fetch premium prices in the market. Similarly, demonstrations on Peas, Radish and Cauliflower were conducted just after the receding of monsoon rains in the month of August. The produce of these winter vegetables was available for sale right from the month of November. The average sale rate, productivity and economics of these vegetable is given in Table 2.

A perusal of Table 2 indicates that

**Table 1.** Performance of demonstrations on cereals under FFP

| Crop  | Variety/<br>hybrid | Seed<br>(kg) | Area<br>covered<br>(ha) | No. of<br>farmers<br>covered | Av. yield (q/ha) |                                         | %<br>increase<br>over local | B:C ratio |       |
|-------|--------------------|--------------|-------------------------|------------------------------|------------------|-----------------------------------------|-----------------------------|-----------|-------|
|       |                    |              |                         |                              | Demo             | Local                                   |                             | Demo      | Local |
| Maize | KH 517             | 2660         | 133                     | 475                          | 32.5             | 24.35                                   | 33.5                        | 2.79      | 2.39  |
| Paddy | Raja 369           | 480          | 24                      | 395                          | 38.2             | 31.02                                   | 23.1                        | 2.38      | 1.93  |
|       | HPR 1068           | 100          | 5                       | 82                           | 32.6             | 24.56                                   | 32.7                        | 2.25      | 1.70  |
|       | HPR 2143           | 400          | 10                      | 396                          | 28.4             | 24.56                                   | 15.63                       | 1.96      | 1.70  |
|       | Kasturi            | 100          | 5                       | 137                          | 21.7             | New introduction<br>to the project area |                             | 2.22      | -     |
|       | Basmati            |              |                         |                              |                  |                                         |                             |           |       |
| Wheat | HPR 2612           | 60           | 3                       | 69                           | 30.9             | 24.56                                   | 25.8                        | 3.16      | 1.70  |
|       | HPW 368            | 670          | 6.7                     | 78                           | 43.4             | 32.6                                    | 33.1                        | 2.56      | 1.35  |
|       | HPW 349            | 625          | 6.25                    | 166                          | 40.7             | 32.6                                    | 24.8                        | 2.23      | 1.35  |
|       | HPW 155            | 150          | 1.5                     | 45                           | 38.2             | 32.6                                    | 17.2                        | 2.13      | 1.35  |



Higher maize production 2018-19.



Summer Radish



Cauliflower

Large scale demonstrations on off-season vegetables.

**Table 2.** Productivity and economics of off-season vegetables

| Crop                    | Variety/<br>hybrid | Av. yield (q/ha) |       | % increase<br>over check | Av. sale<br>rate (₹/kg) | B:C ratio |       |
|-------------------------|--------------------|------------------|-------|--------------------------|-------------------------|-----------|-------|
|                         |                    | Demo             | Check |                          |                         | Demo      | Check |
| French bean             | Arka Komal         | 98.6             | 68.0  | 45.0                     | 25.00                   | 3.18      | 2.34  |
| Peas                    | GS-10              | 86.5             | 65.5  | 32.1                     | 25.00                   | 3.66      | 2.77  |
| Radish<br>(Summer crop) | Ivory              | 125.8            | 90.85 | 38.5                     | 15.00                   | 3.54      | 2.56  |
| Cauliflower             | White              |                  |       |                          |                         |           |       |
|                         | Maharani           | 242.3            | 180.3 | 44.4                     | 20.00                   | 3.79      | 2.90  |
|                         | 626 F1             | 222.9            | 180.3 | 23.6                     | 20.00                   | 2.57      | 2.90  |

peas, radish and cauliflower were sold at wholesale rates at local vegetable markets (Mandies) at an average sale rate of ₹ 25, 25 and 20 per kilogram, respectively. The per cent increase in productivity ranged from 20.2 to as high as 45% as compared to local check. Similarly, the benefit cost ratio (B:C) was found to be more due to various interventions in all the demonstrated vegetables. Farmers of the area are now cultivating summer radish, french bean, cauliflower and peas on commercial scale and are sustaining their livelihood.

#### Livestock based module

The farmers had knowledge about crossbred Jersey cows for domestic milk production and 85% households were rearing crossbred cows. The milk production/cow was, however, low owing to non-availability of green fodder, imbalanced feeding practices, improper animal healthcare, unhygienic conditions and prevalence of ecto- and endo-parasites infestation in animals in the study area. The interventions for the enhancement of milk yield were: introduction of location specific milk ration developed by the University, inclusion of mineral mixture in

animal diet, supplementation of locally fed ration with mineral mixture, UMMB and control of ecto- and endo- parasites through proper scheduling of medicines/vaccination. UMMB, milk ration and mineral mixture were administered to selected lactating cows i.e. UMMB @ one brick for 15 days/animal, milk ration @ 2-3 kg/animal per day and mineral mixture @ 50 g/animal/day in order to enhance milk yield per animal. During veterinary clinical camps, all the animals of the area were treated for various ailments besides control of ecto- and endo-parasites. With these interventions, the milk yield increased from 4.75 kg to 5.80 kg/day/ animal, almost 1.05 kg. During subsequent years, similar trend was observed. Significant health

improvement of the treated animals was observed. Their reproductive health has also improved. The milch animals came to heat at proper time allowing for timely artificial insemination. Milk yields have increased among all treated milch animals (Table 3).

Demonstrations on management of grassland for year round availability of green fodder were also laid out in public/private land by providing 66,667 saplings of Setaria grass.

#### Enhancing nutritional security through nutri-gardens

Demonstrations on nutri-gardens (small kitchen gardens) of 200 m<sup>2</sup> each were given to ensure the nutritional security and availability of year round fresh green vegetables to the rural households. Tomato, brinjal, chilli, okra, french bean, colocasia, radish, palak, turnip, peas, cauliflower and coriander were demonstrated in small plots of 10-50 m<sup>2</sup> area in the vicinity of selected farmers' house. The farmers were provided with latest varieties of these vegetables along with technical know-how. The farmers

**Table 3.** Effect of balanced ration, mineral mixture, UMMB, and control of ecto and endo parasites on average milk yield

| Intervention                             | Quantity<br>(kg) | No. of<br>farmers/<br>animal | Av. milk yield* (Litre/day) |         | Av. increase<br>in milk yield<br>(Litres/day) |
|------------------------------------------|------------------|------------------------------|-----------------------------|---------|-----------------------------------------------|
|                                          |                  |                              | After<br>interventions      | Control |                                               |
| Mineral mixture                          | 703              | 303                          | 5.80                        | 4.75    | 1.05                                          |
| Milk ration                              | 2250             | 303                          |                             |         |                                               |
| UMMB (Nos.)                              | 2242             | 303                          |                             |         |                                               |
| Treatment for ecto<br>and endo-parasites | -                | 303                          |                             |         |                                               |

\* Cumulative effect of all the interventions and data from randomly selected cows.

were also advised to go for staggered sowing/planting of these vegetables for their availability round the year. Impact of nutri-gardens on the availability of fresh vegetables round the year for domestic consumption and money saved on the purchase of fresh vegetables from the markets are given in Table 4.



Grassland development in study area.

### Enterprise based module

Owing to small to marginal land holdings in the study area, some non-farm interventions for income generation were also initiated during the second year 2018-19. These included, Mushroom cultivation, Bee-keeping and post-harvest value addition of locally available raw material like *Rhododendron* as juice, Mushroom, *Diplazium* (Lungru) and vegetables as pickle, etc.

**Mushroom production:** During the year 2018-19, demonstrations were laid out on cultivation of white button mushroom in the selected panchayat at 78 locations where in 600 bags of 20 kg capacity each, while 1300 bags of 20 kg capacity for 176 units were provided after short duration training. This led to a significant increase in the income of the farmers. The farmers were provided with 5 to 15 mushroom bags depending on the availability of

space with the farmers. All the technical guidance was provided to these farmers during the course of growing small scale Mushroom units from time to time. Frequent visits of project staff were organized along with PI and Co-PIs of the project.

### Output and outcome

The detail of units, mushroom production, income and B:C ratio is given in the Table 5.

The average mushroom production per bag of 20 kg capacity was 5.03 kg during 2018-19 and 4.75 kg during 2019-20 with a range from 3.8 kg to 6.2 kg/bag. The benefit: cost ratios were 1:3.77 and 1:3.72 per rupee invested on cultivation of mushroom in the study area. The farmers have now taken up the cultivation of mushroom as an enterprise. The team of scientists

have linked these farmers with State Department of Horticulture for the procurement of the mushroom compost and spawn bags at subsidized rates from now onwards with a technical backstopping from the university experts.

### TRAINING

Ten off-campus and 5 on-campus training programmes were organized in 2017-18.

Similarly, 13 off-campus and 3 on-campus training programmes were organized in 2018-19. And, in 2019-20 more than 18 trainings were organized.

### IMPACT

#### Economic impact

Impact of various interventions on farm income in the project area is presented in Tables 6 and 7. Interventions carried out under different modules have a significant impact on farm income in the project area. The component-wise impact revealed that due to high productivity, the income from food grain crops increased by about 81% from ₹ 16,416 to ₹ 29,667. The income from vegetables was more than doubled per farm. This is despite the fact that area under vegetable crops increased only marginally after project intervention. The major increase in the farm income was noticed in dairy which showed an increase of 52.38%. The income from ancillary enterprises (mainly mushroom) also doubled showing an increase of about 117%. Overall, the total farm income that was estimated ₹ 70,290/farm before project increased to ₹ 1,17,269/ farm after project interventions. This clearly shows a significant addition to the income worth of ₹ 46,979/farm. Therefore, the total income in the project area increased by about 67% as a result of various technological interventions.

The distribution of beneficiary households according to the magnitude of income enhancement is given in Table 7. The income of the

Table 4. Feedback/Output

| Name of vegetables | Area (m <sup>2</sup> ) | Average yield (kg) | Prevailing market rate (₹/kg) | Amount (₹) |
|--------------------|------------------------|--------------------|-------------------------------|------------|
| Okra               | 30                     | 48.60              | 20/-                          | 972.00     |
| Cucumber           | 20                     | 36.53              | 18/-                          | 657.54     |
| Bitter gourd       | 15                     | 31.20              | 25/-                          | 780.00     |
| Bottle gourd       | 15                     | 42.25              | 25/-                          | 1056.25    |
| Brinjal            | 10                     | 18.34              | 15/-                          | 275.10     |
| Chilli             | 20                     | 11.35              | 35/-                          | 397.25     |
| French bean        | 20                     | 19.65              | 30/-                          | 589.50     |
| Colocasia*         | 30                     | 46.16              | 40/-                          | 1846.40    |
| Ginger*            | 40                     | 50.34              | 60/-                          | 3020.40    |
| Cauliflower        | 30                     | 63.80              | 25/-                          | 1595.00    |
| Garlic             | 40                     | 41.18              | 40/-                          | 1647.20    |
| Turnip             | 20                     | 17.75              | 10/-                          | 177.50     |
| Radish             | 20                     | 51.20              | 15/-                          | 768.00     |
| Peas               | 50                     | 35.15              | 40/-                          | 1406.00    |
| Palak*             | 30                     | 45.32              | 25/-                          | 1133.00    |
| Coriander*         | 10                     | 5.68               | 60/-                          | 340.80     |
|                    |                        |                    | Total                         | 16004.00** |

\*Farmers used their own seed; \*\*Including labour and other charges.



Glimpse of nutri-gardens established at farmers' fields.



Training on integrated agriculture at Bada.

40% farmers got doubled or more than doubled while the income of 10% of the farmers increased by more than 75%. The income of 9.33% farmers increased in the range of 50-75% while income of about 11% of the farmers increased to the extent of 25-50%. The income of 12% of the farmers recorded a meager increase in the income (less than 25%) and there was no change in the farm income of 18% of the beneficiary farmers. In this way, the increased income was recorded on about 82% of the farm households that clearly embarks the appreciable impact of the project activities in the study area.

### Social impact

A positive attitude towards scientific agriculture was observed among the farming community. Farmers are socially motivated to

continue good agricultural practices as they observed profit and social recognition. With the excess income that they earned due to intervention under Farmer FIRST Programme, their social status has upscaled and their livelihood is becoming secure. Migration is being checked as rural youths are getting employment opportunity in the villages.

### DRAWBACKS AND LESSONS LEARNT

- Moisture stress during crop growing period causes lesser yield in some of the farming situations in the adopted villages. Intervention was considered but could not be implemented due to shortage of funds.
- Unavailability of inputs in time due to multifaceted problems on the part of the government

agencies.

- IFS–Problem of marketing and need of value addition.
- Need of skill development training on post-harvest, value addition and waste management (Pineapple wine preparation, local cow milk nutritional value, locally available fruits and vegetables).
- Stray cattle and wild animals attack on crops; interventions on the control of obnoxious weeds on the common properties, roadsides, forests and nearby was proposed but needs huge financial and human resource help to tackle the situation.
- Poor interest of the farmers especially the young generation as the agriculture is the least paying, hindering the uptake of proven technologies. The huge government subsidies and easy access to ration provided by the government and employment opportunity under the aegis of schemes like MGNREGA are keeping people out of interest in agriculture as every rupee earned

**Table 5.** Economics of mushroom cultivation

| No. of demos/<br>unit | Av. yield<br>(kg/bag) | Gross cost<br>(₹/bag) | Gross return<br>(₹/bag) | Net return<br>(₹/bag) | B:C<br>ratio |
|-----------------------|-----------------------|-----------------------|-------------------------|-----------------------|--------------|
| 78 (2018-19)          | 5.03                  | 140                   | 528.15                  | 388.15                | 3.77         |
| 176 (2019-20)         | 4.75                  | 140                   | 522                     | 382                   | 3.72         |



Training on post-harvest value addition at Tra and Lulani.



Training on Bee keeping.



Veterinary Clinical Camp at Lulani.



Training on Integrated Agriculture at Dharer.

**Table 6.** Impact of interventions on total farm income (₹/farm)

| Crop                                                 | Before project   | After project     | Mean difference      | % increase |
|------------------------------------------------------|------------------|-------------------|----------------------|------------|
| Food grains                                          | 16416<br>(12361) | 29667<br>(16269)  | 13251**<br>(1681.07) | 80.72      |
| Vegetables                                           | 3528<br>(10185)  | 7983<br>(11374)   | 4455**<br>(1865.32)  | 126.28     |
| Dairy                                                | 45846<br>(24011) | 69860<br>(25420)  | 24014**<br>(3146.14) | 52.38      |
| Others enterprises                                   | 4500<br>(1800)   | 9759<br>(3200)    | 5259**<br>(582.23)   | 116.87     |
| Food grains + dairy                                  | 62262            | 99527             | 37265                | 59.85      |
| Food grains + dairy + vegetables                     | 65790            | 107510            | 41720                | 63.41      |
| Food grains + dairy + other enterprises              | 66762            | 109287            | 42524                | 63.69      |
| Food grains + dairy + vegetables + other enterprises | 70290<br>(33253) | 117269<br>(45436) | 46979**<br>(4597.24) | 66.84      |

\*\*Significant at 1% level. Figures in parenthesis show standard deviation of means and standard errors of mean difference.

**Table 7.** Distribution of beneficiary households according to income enhancement

| Extent of increase in income | No. of farm families | Per cent farm families |
|------------------------------|----------------------|------------------------|
| >100 (more than doubled)     | 60                   | 40.0                   |
| 75-100                       | 15                   | 10.0                   |
| 50-75                        | 14                   | 9.3                    |
| 25-50                        | 16                   | 10.7                   |
| Less than 25                 | 18                   | 12.0                   |
| No change                    | 27                   | 18.0                   |
| Total                        | 150                  | 100.0                  |

in the agriculture is still the result of blood and sweat in these hilly tracts of the country.

- Small farms and scattered holdings are also the cause of poor uptake of technological interventions. However, the issue is not direct subject of scientific personnels.

### WAY FORWARD

Farmers' FIRST programme has become a ray of hope for the farmers in the adopted villages. The project has directly benefitted the farmers which they did not experience earlier

from any other extension agency. The farmers learnt to believe that they have strength in their available resources and their working knowledge is equally important like many others. Now, time has come to spread the benefit of the project to the nearby villages through Carpet extension or Horizontal extension approach. Further action is required to make all the intervention modules sustainable. Intervention is required towards value-addition of the raw materials like post-harvest processing of the vegetables and egg products which has tremendous market value.

Branding and lucrative packaging of the products under Farmers' FIRST is next target for capturing best market value. Proper agriculture waste management and biogas generation in the project villages needs to be done for healthy environment. The project villages may be developed as Agro-eco-tourism spots in public-private-partnership mode. Advanced trainings are required for achieving such objectives and support from the Government and policy makers.

- Rainwater harvesting structures to serve the problems of moisture stress condition.
- e-marketing of farm products. Establishment of collection and disposal centres for agricultural commodities at the Panchayat/ Samiti level will also help the farmers in getting their Minimum Support Price (MSP).
- Agro-Eco Tourism (PPP mode) will encourage in-house consumption of the farm produce.
- Incubator cum hatchery machine through Custom Hiring Centre to reduce the cost of production.
- Main emphasis may be given to the farm women and youths for the promotion of value-addition and Post-harvest technology.
- Strengthening the resource base (farm and surrounding) of the farmers which is supplemented by innovations, science and technology.

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