

Enhancing crop productivity and livelihood security through improved technological interventions in Jabalpur district of Madhya Pradesh

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Location and selection of area

Jabalpur situated at 23.1815° N, 79.9864° E with an area of 5198 km² is one of the most populous districts of Madhya Pradesh and literacy rate of Jabalpur is 82.4%. Two adjoining villages namely Umariya Choube and Barauda under Panagar block of Jabalpur district were selected for implementation of the Farmer FIRST Programme which was initiated on 1 February 2017. There are about 366 households in Umariya Choube village and 243 households in Barauda village.

The major crops grown in this area are rice, wheat and gram. About 90% area is irrigated and 79% land is double cropped. Weeds are serious constraint in crop production. Burning of crop residues is a common practice. During summer, lands are mostly kept fallow. Farmers are mainly dependent on traditional agriculture and they are not much

inclined towards horticulture and other enterprises like bee keeping, mushroom cultivation, etc. Milch animals consist of cows and goats followed by buffaloes. These animals are non-descriptive types and appear to be local.

OBJECTIVES

- To conduct demonstration on improved technologies of integrated crop management in farmer participatory mode.
- To demonstrate technologies for utilization of weed biomass, bio-waste and crop residues for preparation of compost/vermi-compost.
- To manage invasive weeds like *Parthenium*.
- To include horticultural crops in the farming system.
- To bring about improvement in health of livestock.
- To conduct scientist-farmer

interface meetings for creating awareness on modern weed management and other technologies demonstrated.

- To conduct impact assessment of the disseminated technologies.

INTERVENTIONS

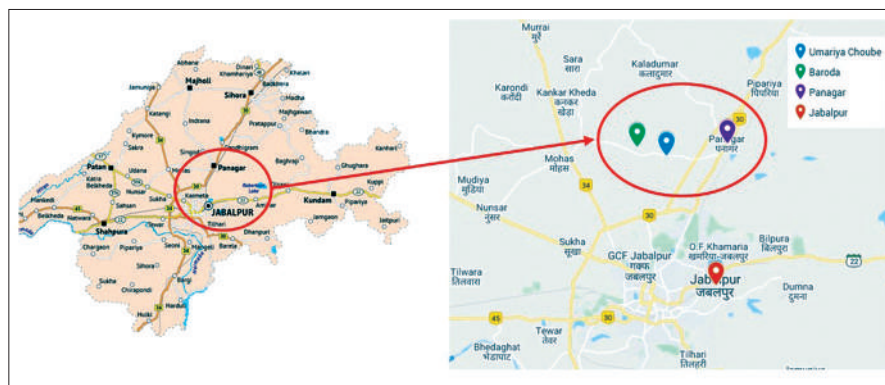
Crop based module

Objectives

- Increase weed control efficiency adopting improved weed management practices.
- To increase the crop productivity under conservation agriculture.
- To stop crop residue burning and improve environment quality.

Improved weed management under conventional and conservation agriculture in different crops

Rationale of the intervention: Majority of the farmers were burning the crop residues subsequently intensively tilling the land, it was deteriorating the soil health and also creating environmental pollution and health related problem. To minimize the above, farmers were exposed to training and awakened about the negative effect of intensive tillage and crop residue burning. Similarly, weeds are major listed problem in the study area, therefore, improved weed management package developed by ICAR-DWR, Jabalpur were adopted.

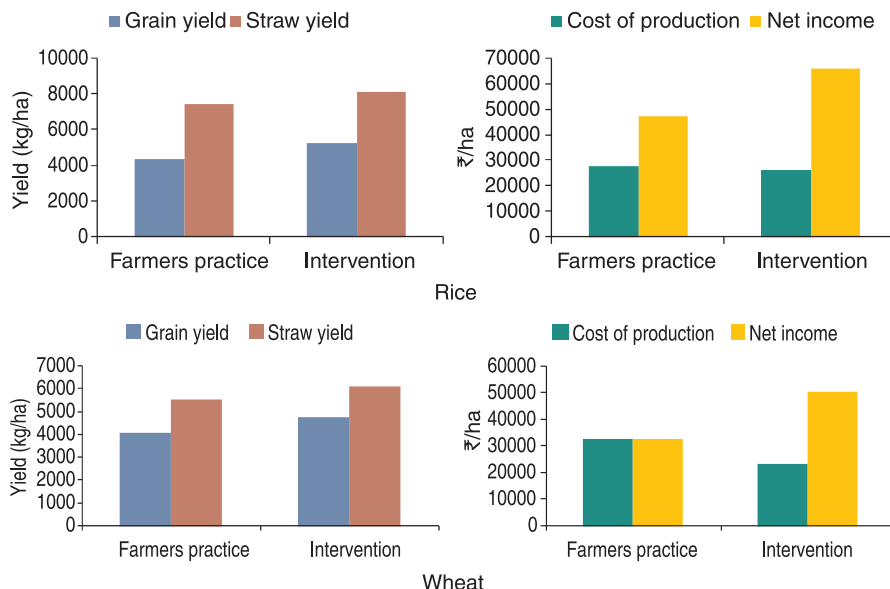


Map of the location

Rice

Replacement of variety: Traditional varieties of rice were replaced with hybrid rice i.e. Arize Gold-6444 which gave 12.9% additional grain yield, with saving of cost of cultivation of ₹ 2190/ha, and additional net return of ₹ 19,047/ha over farmers' practice. Higher yield and lower production cost increased the B:C ratio (3.87) which was 44% higher than farmer practice.

Weed management in rice: Demonstration of weed management techniques with broad-spectrum herbicide provided considerable weed control by 28% thereby higher grain yield by 11.1-15.8% with increase in B:C ratio by 16.5-21.5%. This was achieved with the introduction of bispyribac sodium (25 g/ha) and pretilachlor + bensulfuron (600+60) herbicides and their application at right time, right dose, right method etc. than that of farmers' practice.



Wheat

Weed management under conservation agriculture: In this, GW-273 wheat varieties, old seeds were replaced with certified GW-273 and were sown with the help of happy seeder at 30% crop residue load and broad-spectrum herbicide i.e. clodinafop+ metsulfuron (60+4 g/ha) were demonstrated. It was found that over the years of demonstration, there was increase in 17.1% of grain yield (4.77 t/ha), 10.2% of straw yield (6.12 t/ha), with 29% reduction in cost of production (₹ 23,586/ha), 53% higher net return (₹ 50,510/ha) and 63% more benefit to cost ratio (3.7) over farmers' practice.

yielding variety 'Samrat' was introduced under conservation agriculture with broad-spectrum weed management through imazethapyr (100 g/ha). Results of three years reveals that the technology package has provided 25.7% additional yield (1109 kg/ha), 11.4% more stover yield (2450 kg/ha), 21% reduction in production cost (₹ 19,448/ha), 129% more net return (₹ 26,960/ha) and thereby 71% more benefit to cost ratio (2.5) over farmers practice.

Blackgram

In blackgram, short duration high yielding variety 'PU-31' was introduced under conservation agriculture with broad-spectrum weed management through imazethapyr (100 g/ha). Results of two years reveals that the technology package has provided 25.3% additional yield (1,304 kg/ha), 15% reduction in production cost (₹ 21,020/ha), 229% more net return (₹ 25,122/ha) and thereby 51% more benefit to cost ratio (2.5) over farmers practice.

Greengram

In greengram, short duration high

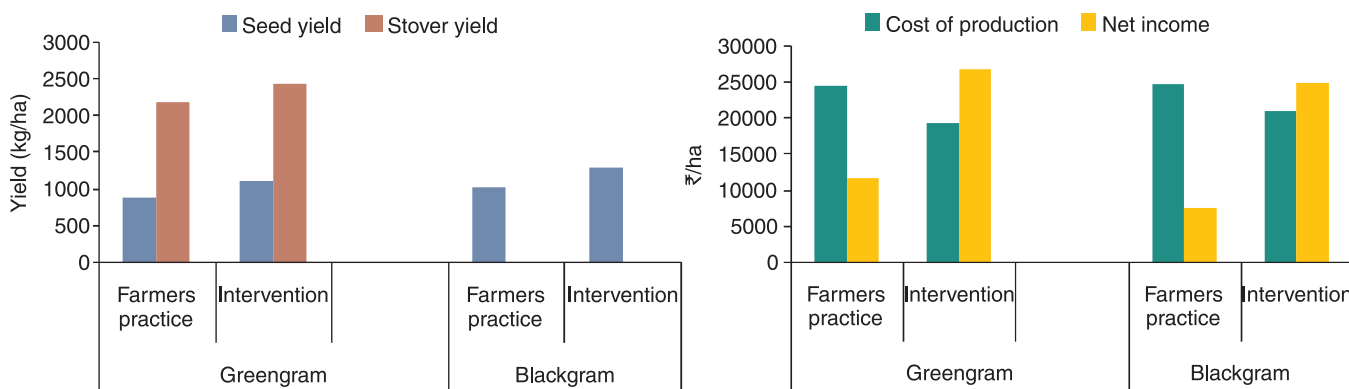
Outcome

Results revealed that there was significant improvement in yield and economics after adopting suggested technologies under the module.

Drawbacks: The availability of happy seeder/seed drill which can operate with crop residue load are not available in villages and availability of tractor with >50 HP is also very less. In the area, combine harvester is in operation has no attachment of straw management systems. Therefore, straw management is problem in large scale adoption.

Lessons learnt: ICAR-DWR, Jabalpur has been sharing its machinery with the farmers for demonstration but as majority of the operation run parallel at institute and village so sharing for longer time is not possible. Hence, these CA based machinery may be promoted through state or centrally sponsored custom hiring centre so that majority of the villagers can use it.

Training: ICAR-DWR, Jabalpur has been providing regular training to





Sh. Atul Patel, from Barauda village has cultivated wheat crop under zero tillage sowing with Happy seeder



Sh. Manish Mishra, Umariya Choubey (Sowing of wheat through zero-till)

the farmers to adopt the novel technology. They are also brought to the Directorate to demonstrate the CA based technologies to boost their confidence. However, frequent training will further improve their know-how about technology and ultimately build their confidence.

Impact of CA technology: Farmers are very much convinced about CA technologies and adopting in *rabi* and summer crops. Farmers are retaining crop residue at the field to maximum extent, this helped in minimizing weed emergence, saving irrigation in numbers and duration, no inversion of soil is directly saving the cost of production and also retaining the carbon stock intact, build-up of soil organic carbon and improve the soil health. It has reduced the crop residue burning which is improving the environmental quality.

Way forward: Further, training and exposure visit to other institute where CA based technologies have been followed for longer time will certainly boost their confidence. They must be interlinked with state and centrally sponsored schemes. If possible, CA based machinery may be provided to community so that they will use it judiciously and can maintain it by adopting certain procedure at village itself. This technology has greater scope in future especially for *rabi* and summer season crops. So stakeholders must be supported to possible greater extent to achieve the benefits at large scale.

Enterprise based module

Intervention: Technology on mushroom cultivation was introduced

in the adopted villages viz. Barouda and Umariya Choubey. In the intervention, trainings were imparted to landless villagers and women for skill development in mushroom production. Critical inputs for mushroom cultivation like spawn, drum, disinfectants, polybags, rope, etc. were also provided to landless villagers and women farmers. Besides, training on preparation of mushroom products were also imparted to 15 women farmers and landless villagers.

Rationale of the intervention: In future, the ever-increasing population, depleting agricultural land, climate change, water scarcity and necessity for quality food products at competitive rates are going to be important issues. Thus, to meet these challenges and also to provide food and nutritional security to the farmers, it is important to diversify the agricultural activities. Mushrooms are one of the components that not only impart diversification but also help in addressing the problems of quality food, health and environment related issues. Addition of mushroom recipe in Indian diet will bridge protein gap and improve the general health of rural community. Beside, the production of mushroom may also be the source of extra income for



villagers especially for landless labourers who had no other source of income. Keeping in view this point, it was decided to introduce the technology of mushroom production in the villages adopted under FFP.

Outcome and Impact: The technology on Mushroom Production was provided to 30 families during 2017-18, 30 families during 2018-19 and 20 families during 2019-20. They were provided critical inputs for mushroom cultivation like spawn, drum, disinfectants, polybags, rope etc. along with training on mushroom production. They were able to produce approx. ₹ 400/kg spawn with the investment of ₹ 200 with B:C ratio as 1.95. Apart from these, they also consumed it as a good source of protein.

Drawbacks and Lesson learnt: There were some constraints in adopting this technology by all landless villagers and women farmers. One of them was the lack of nearest market for sale of mushroom as it is perishable item and cannot be stored for many days. Another major problem with this technology is that it is not possible to produce mushroom (Oyster) throughout the year.

Training: A four days training was imparted to 15 women for preparation of different products of mushroom. It was great success and as a result of this, all women farmers are ready to do it on a larger scale.

Way forward

- To include more families in the process of mushroom production as a source of extra income.
- To develop a unit for preparation of mushroom products and to make



Supplying cattle mineral mixture to the selected farmers



Sh. Bharat Patel from Barauda village has benefitted an additional increase of 16% milk production after feeding cattle mineral mixture

market available for their sale.

Livestock based module

Supplementation of animal nutrition through feeding cattle mineral mixture

Rationale of the intervention:

The farmers were educated about healthy way of milk production, animal rearing through *Kisan Gosthis*, field days and farmers-scientists interaction meetings. The cattle mineral mixture was introduced to the villages and was supplied to selected farmers time-to-time. They were briefed about the doses of mixture to be provided to different aged animals and procedure for feeding them. The improved health and production of the milk was monitored time-to-time.

Outcome: The animal health improved and milk production increased by 9-16%. The farmers were very much satisfied with the technology and encouraged the neighbouring farmers to practice the same. After the intervention, farmers were regularly purchasing the cattle mineral mixture from local market and feeding it to their animals. The additional increase in income per family per day after introducing the technology is given in Table 1.

Supplying of cattle mineral mixture to the selected farmers Sh. Bharat Patel from Barauda village has benefitted an additional increase of 16% milk production after feeding cattle mineral mixture

Table 1. Income after adoption of the livestock module

Year	No. of farm families covered	Increase in milk production (%)	Additional increase income per family (₹/day/family)
2018	100	10 to 15	up to 38
2019	100	9 to 16	up to 40

Drawbacks and Lesson learnt:

The affordability of cattle mineral mixture by the farmers was a major drawback. We learnt from the practical experiences that, educating the farmers about useful and advanced technologies is most important as they were unaware of such technologies.

Way forward

- To include more families to ensure the better nutrition of milch animals.

Introduction of improved variety of pullets and cocks for backyard poultry

Rationale of the intervention:

To provide additional income to the farm families, improved poultry variety of 'Narmadha Nidhi' was introduced to the adopted villages. Total pullets and cocks (115 numbers) were provided to 20 farm families for egg and meat production.

Outcome: The farm families used the supplied pullets and cocks for egg production, and got benefited an additional income of ₹ 2,500 to 3,000 per family per year with benefit-cost ratio of 2.12. The benefited farmers' further adopted pullets and cocks number for



Sh Mohamad Taj from Umariya Choube village earned an additional income of ₹ 3000 year by practicing egg production from backyard poultry farming.

backyard poultry farming.

Drawbacks and Lesson learnt:

The social influence and societal acceptance of poultry farming within the community hindered the success of introduced technology. However, the net rate of income from the technology influenced the farmers to adopt it.

Way forward

- To include more farm families and landless villagers especially women for poultry rearing.

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