



## RESOURCE CONSERVING TECHNOLOGIES TO IMPROVE YIELD AND INCOME FROM VEGETABLE CULTIVATION

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**B**iotech-Krishi Innovation Science Application Network (Biotech-KISAN) is an initiative of Department of Biotechnology, Ministry of Science and Technology to empower farmers, especially women farmers. It aims to understand the issues associated with soil, water, seed, marketing etc. of farmers and resolve those issues through simple solutions. Under this project, ICAR-National Institute of Biotic Stress Management (ICAR-NIBSM) selected 150 farm families from the three aspirational districts of Chhattisgarh state (Rajnandgaon, Mahasamund, and Korba). ICAR-NIBSM introduced more than 29 technologies under crop, horticultural, NRM, and livestock-based modules to improve the farm based livelihoods of the selected districts. One of the successful technologies among different interventions adopted by farmers was

'scientific vegetable cultivation using drip irrigation and poly mulching'. Shri. Dharam Das Sahu, a progressive farmer from the Sonsaytola village of Rajnandgaon district received very good return from his one hectare farmland using this resource conserving technology.

### CHALLENGES

Major constraints faced by the vegetable growers of the area were high biotic and abiotic stress factors, shortage of labour, lack of suitable varieties and low technical knowledge in scientific vegetable cultivation. Vegetable crops are very much sensitive to water stress at all growth stages hence, require adequate water throughout the season. However, regular irrigation promotes growth of more weed in the



fields that eventually create crop-weed competition for water and nutrients and these weeds also host insect pests and disease causing organisms.

### INTERVENTION

Advancement in agriculture made many technologies available to improve crop yields through conserving water and nutrients along with reducing weed pressure. Growing vegetables on beds covered with plastic mulches and fertigation through drips introduced by ICAR-NIBSM to its Biotech-KISAN beneficiary farmers is a micro-irrigation technique increasingly adopted by commercial vegetable growers across the country. In this technique, when plastic mulching prevents weed growth and conserve soil moisture, fertigation reduces water and fertilizer requirement to a greater extent while ensuring better crop yields.

Drip irrigation is practised widely for the fruit and vegetable crops and the technique has created interest due to its precise and direct application of water in the root zone frequently in small quantities. In the present scenario, this micro-irrigation system can be one of the best alternatives for the judicious use of available water and thus, conserving our depleting water resources.

Research show that through micro-irrigation technique 30-70% irrigation water can be saved compared to flood irrigation (Tyagi, 2021). Use of mulch is really important in horticulture crops as it protects soil from radiation and degradation, minimize crop-weed competition, increases soil water retention and Water Use Efficiency (WUE) compared to bare soil.

Availability of tractor drawn machineries that makes earthen beds in the fields along with spreading plastic mulches, putting drip lines under the plastic mulch, and making the holes for planting seedlings together in a single operation make this technology more convenient and less laborious for the farmers compared to the traditional open field cultivation of vegetables.

A number of researchers reported about the effectiveness of mulching with polythene sheets

and overhead irrigation system in improving the yield and Nitrogen Use Efficiency significantly in cucurbits and solanaceous crops (Kasirajan and Ngouajio, 2012; Abayomi et al, 2021). As variations in agro-climatic and soil conditions has resulted diverse response pattern of these crops to drip irrigation, it was essential to evaluate the effectiveness of drip irrigation along with polythene mulch for the sub-tropical climatic condition of Chhattisgarh. Under the project, Krishi Vigyan Kendra, Rajnandgaon, reported higher tomato and cucumber yield with black plastic mulch under field conditions.

### IMPACT AND LESSONS LEARNED

The combined effect of drip and polythene mulch has resulted higher yield with WUE in tomato and cucumber crops under field condition (Figure 1). A maximum yield of 40 t/ha attained from this system. Compared to the control plots (without mulch) this method saved nearly 50% of irrigation water and improved fruit production by 20–25%. The net income increase with the adoption of the intervention was in the range of 44-54% form these crops (Table 1).

Mulches showed a substantial beneficial influence on plant height, with the effect being stronger in lower water regime treatments than in higher water regime treatments. Fruit size and fruit weight were found the maximum in drip irrigation with mulches. The yield and yield-contributing characters in the mulched treatments for irrigation were significantly higher compared to those in the without mulched treatments.



Figure 1. Cucumber cultivated using polythene mulch and drip irrigation



Table 1. Economics of tomato and cucumber cultivation under the intervention and farmers practice

Particulars	Tomato		Cucumber	
	Farmer's Practice	Intervention	Farmer's Practice	Intervention
Cost of cultivation (Rs. ha <sup>-1</sup> )	1,60,000	3,18,800	1,92,500	3,16,250
Yield quintal (Rs. ha <sup>-1</sup> )	230	525	340	625
Net return (Rs. ha <sup>-1</sup> )	4,37,000	9,97,500	5,44,000	10,00,000
Gross return (Rs. ha <sup>-1</sup> )	2,77,000	6,78,700	3,51,500	6,83,750
B:C Ratio	2.73	3.13	2.83	3.16

### SUMMARY

Field level data and farmers' feedback shows that scientific management of crops using need based technologies and package of practices help to increase crop yields, reduce biotic stress and input cost, ensure high quality produce, and increase the market value of the produce. Growing the high-value horticultural crops with improved varieties gives more returns to the vegetable growers and helps to improve their economic condition. Through projects like Biotech-KISAN, scaling up of successful interventions to wider group of beneficiaries within and outside the villages is effortless.

### REFERENCES

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