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Success Stories of Resource Utilization and IPM Interventions of Vegetable Growers

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ABSTRACT

Indian diets, across states and in different income groups, are unhealthy as most of Indians consume excess amounts of cereals rather than enough proteins, fruits, and vegetables. Apart from these, our country is still lagging in terms of recommended diet level of 300g per day as per capita consumption is only 135 g per day in India. Moreover, in near future, there is a need of around 56 million tons of food to feed our 1.3 billion Indian population expected by the year 2050. Our natural resources are scarce and shrinking day by day due to the expanding urbanization and deforestation and thus thereby posing obstacle to meet the requirement of future demand. Secondly, increased domestic requirement is the other limitations in crop production. In view of the economic importance of vegetable cultivation in Jammu and the magnitudes of the damage caused by the insect pest, it becomes imperative to keep continuous vigil on their bio-dynamics, pest- defender ratio (natural predators and parasitoids) and management studies which will pave the building block for development of effective Integrated Pest Management against major insect pest of important vegetable crops in Jammu region. The main objective of IPM is to reduce pesticide use to minimize/reduce risks to human health and environment.

Keywords: Indian diets, deforestation, vegetable, cultivation, resource utilization, Integrated Pest-management

Nutrition is not only a basic human requirement leading to a healthy life but also plays pivotal role in developing active human resource in the country. According to an estimate by NHP (2007), about 28% in the rural and 26% in the urban areas are below the poverty line wherein, the average calorie intake/person/day in both rural (2214 kcal) and urban (2169 kcal) India is less than the reference diet i.e., 2503 kcal (Sharma *et al*. 2020). Indian diets, across states and in different income groups, are unhealthy as most of Indians consume excess amounts of cereals rather than enough proteins, fruits, and vegetables. Apart from these, our country is still lagging in terms of recommended diet level of 300g per day as per capita consumption is only 135 g per day in India. Moreover, in near future, there is a need of around 56 million tons of food to feed our 1.3 billion Indian population expected by the year 2050.

Our natural resources are scarce and shrinking day by day due to the expanding urbanization and deforestation and thus thereby posing obstacle to meet the requirement of future demand. Secondly, increased domestic requirement is the other limitations in crop production. However, crop production has gained a great momentum

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through the introduction of high yielding varieties coupled with hybrids vegetable seeds and which simultaneously aggravated the insect pest problems in successful cultivation of vegetables. Of late, in the era of climate change, the extensive (virtual absence of resistance characters) and intensive cultivation (monocultures) of vegetables had also triggered the frequency of pest outbreaks. Simultaneously, new and emerging insect pests such as fall army worm (*Spodoptera frugiperda*), fruit/pod borer (*Helicoverpa armigera*), leaf miners (*Liriomyza trifolii,* and *Chromatomyia horticola*), vegetables mealybugs (*Phenacoccus solenopsis*), red spider mites (*Tetranychus urticae*), fruit flies (*Bactrocera cucurbitae* and *B. tau*) and many more, have aggravated in recent past and makes the situation so grim.

The extent of crop loss due to insects varies with the crop type, crop location, damage potential of the insect pests involved, and the cropping season. Overall, insect pests inflict crop losses of 30-40% in vegetable production (Shivalingswami *et al.* 2002) which have led to the growers to depend on chemical inputs to encounter the problem of insect pests. In the 1990s, pesticide use on vegetable crops accounted for 13-14% of the total pesticide use on 2.6% of the cropped area in Indian agriculture (Sardana, 2001). It is evident from the study by Sharma *et al.* (2015), the estimated pesticide use in vegetable crops was 10,596 metric tons (21% of the total pesticide use) in 2010-2011, which was about 1.247 kg/ha. These excessive and injudicious use of pesticides has induced several ecological consequences like pesticidal poisoning, resistance, resurgence, destruction of natural enemy fauna, effect on non- target organisms, residues in foods including ground water contamination and reducing the fertility of soil (Chitra *et al.* 2006). To overcome the negative consequences of pesticide use in Indian agriculture, the Government of India, promoted the Integrated Pest Management (IPM), in 1985, as the main strategy for plant protection (Raghunathan, 1995). Its activities have been intensified only since 1993 (Peshin and Kalra, 2000), after the introduction of the Farmer Field School (FFS) training methodology, for disseminating IPM technologies. In these contexts, to feed our burgeoning population, we must have to increase the production through diversification of crops and timely intervention of ecologically integrated pest management (Abrol and Shankar, 2019; Kumar *et al.* 2022). These will surely pave the way to meet out the requirements of growing demands in future.

Integrated Pest Management Interventions and their impact

The state of Jammu and Kashmir (32-36°N, 73-80°E) has varied habitats and climatic conditions that have encouraged the commercial cultivation of a large number of vegetable crops. Jammu division is known for quality vegetable production ranging from subtropical to intermediate and temperate areas. They are the prime source of vitamins and minerals and also the important source of income generation among vegetable growers in peri urban areas. The commercial cultivation of vegetables is four times more remunerative than the cereals and fetches higher income to the farming community. The area under production of vegetable crops has increased about three-fold in the last six decades. This has resulted in about a nine-fold increase in vegetable production (Kodandaram *et al.* 2013).

Among the various vegetable crops produced in Jammu, tomato, brinjal, cucurbits, okra, cole crops, cowpea, beans, peas etc are the important ones that add handsome amount of revenue to the state. The major constraints in the production of these crops are the ravages caused by various insect pests and diseases which not only result in the low production of vegetables but also drastically impair the quality, wherein, IPM interventions are the only remedy to reduce the externalities of harmful chemicals vegetables.

IPM technologies have already developed against major insect pests of important vegetable crops but they vary from location to location throughout the country. Judicious integration of these IPM methods include management of nursery by soil solarization, seed treatment with bio-agents like *Trichoderma* spp., *Pseudomonas florescence* etc., covering the nursery beds with nylon agro-nets, low cost tunneling methods for nursery raising, selection of resistant varieties, use of botanicals, bio-agents and microbial pesticides (Neem oil, NSKE, Bt, NPV, GV and Mycopesticides), sex pheromones, light traps, and inter-cropping (either as trap crop or as deterrent crop) etc gives an extra impetus to the vegetable growers to fetch good remuneration from their quality produce. Apart from

these, If necessary, selective and safer chemicals have to identify and promoted to manage the pest populations as a last resort. This is an elegant way of reducing the amount of pesticides residues on these crops. The final crop produce obtained from these crops will fetch more value than the regular market vegetables.

In view of the economic importance of vegetable cultivation in Jammu and the magnitudes of the damage caused by the insect pest, it becomes imperative to keep continuous vigil on their bio-dynamics, pest- defender ratio (natural predators and parasitoids) and management studies which will pave the building block for development of effective Integrated Pest Management against major insect pest of important vegetable crops in Jammu region. The main objective of IPM is to reduce pesticide use to minimize/reduce risks to human health and environment. Therefore, present investigations have been planned to study the adoption of success indicators of few innovative farmers in Jammu region.

CASE STUDY-1

A Tailor Turned Tomato Grower

Sri Mani Ram, Village: Narayana (Akhnoor), Age: 50 years, Contact No. 7051353797

During the project on 'Development and promotion of IPM modules in important Vegetable crops of Jammu' village Narayana located near Akhnoor, Jammu was selected as one of the area for study. Despite the fact that, the area is excellent in vegetable production, the farmers were still found following the traditional methods of cultivation coupled with overuse of insecticides thereby incurring heavy expenditure and low marketing.

During these experimental trials, one of the farmer Sri Mani Ram who was working as a tailor having only 2 kanals of land, showing interest in vegetable cultivation was selected to demonstrate the latest technologies of vegetable production. The demonstration of IPM modules comprises, clipping of infested twigs and fruits, installation of pheromone traps, bird perches and use of microbial (NPV solutions) and botanical pesticides etc. This helped him to reduce the cost of pesticides and increase the production with better quality of vegetables without the use of chemicals having better marketing. Encouraged by the benefits resulting of adoption of latest technologies, he increased his production more than five folds and net income 500 per cent per annum. He has managed to purchase 10 kanals of additional land for vegetable cultivation. At present, his income is ₹ 3.00 to 3.50 lacs per annum which reflects his temperament and zeal in the field of agriculture. As per his version, he is now earning as given details below:

Economics of the farm:

Crops	Area in Kanal*	Cost of Production* (₹ Per unit)	Return (Per unit)	Net income (₹ Per unit)
Tomato	15 (Own land + land on lease)	2500	14,000	11,500
Bittergourd	18 (Own land + lease)	2000	11000	9,000
Knol-Khol	1	For family consumption and subsistence		
Wheat	2	For family consumption and subsistence		
Total	**18 Kanals**	**73,500**	**5,76,000**	**3,34,500**

*(1 kanal= 500 sq. m).

Fig. 1: Resouce utilization of sarkanda in shelter belt to tomato crop and later used as mulching to conserve moisture

Fig. 2: IPM intervention in tomato field and demonstration of trap catches at Narayana village

CASE STUDY- 2

Innovation in Use of Farm Resources and Conservation of Elite Brinjal Germplasm

Mr. Vijay Kumar, Village: Udheywalla (Marh Block, Jammu)),

Age: 45 years, Contact No. 9469460574

While conducting the experimental trials on 'Development and promotion of IPM modules in important Vegetable crops of Jammu', I came across a farmer named Mr. Vijay Kumar, who was fully qualified (graduate) and took keen interest in farming as his profession.

He decided to start the agriculture on parental land of 30 kanal area. With the substantial support of polyhouses from Agriculture department, he has started the cultivation of vegetables such as cauliflower, brinjal, cucumber, rajmash, beans, bittergourd etc. In this regard, he tried to learn latest techniques of farming from department of agriculture and also met with the university scientists. He has developed his own low-cost playhouse for the purpose using Sarkanda stem and leaves, bamboo and Behaya stem for raising the good quality seedlings and mulching for conserving the soil moisture.

Mr. Vijay is growing the elite Kashmiri pink brinjal which fetches a premium price in the market. He is also developing and multiplying the good quality brinjal seeds for future farming and thereby conserving the elite germplasm and making contributions in the Indian economy.

Economics of the vegetables Cultivation

Crops	Area in Kanal*	Cost of Production* (₹ Per unit)	Return (Per unit)	Net income (₹ Per unit)
Brinjal	20	5000 (1,00,000)	25,000 (5,00,000)	4,00,000
Cucumber	5	2500 (12,500)	15000 (75,000)	62,500
Bittergourd	5	2500 (12,500)	15000 (75,000)	62,500
Cauliflower	30	2000 (60,000)	10000 (3,00,000)	2,40,000
Total	**18 Kanals**	**1,85,000**	**9,50,000**	**7,65,000**

*(1 kanal= 500 sq. m), figures in parenthesis is the actual cost and return.

Fig. 3: Innovative use of farm resource utilization in making low-cost polyhouse for nursery raising

Fig. 4: Indigenous methods of producing elite Kashmiri brinjal seeds

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