



# **TRAINING MANUAL ON ECOFRIENDLY PLANT HEALTH MANAGEMENT IN IMPORATNT VEGETABLE CROPS**

**Manual No.: ICARNEH-ML-TM-2022-28**



**Sandip Patra  
Rumki H. Ch. Sangma  
Bijoya Bhattacharjee  
Pankaj Baiswar  
Jayanta Layek  
Samarendra Hazarika**

**ICAR Research Complex for NEH Region,  
Umroi Road, Umiam, Meghalaya-793103.**



# **Ecofriendly Plant Health Management in Important Vegetable Crops**

**(2022)**

**Manual No.: ICARNEH-ML-TM-2022-28**

## **Compiled and Edited by:**

Sandip Patra

Rumki H. Ch. Sangma

Bijoya Bhattacharjee

Pankaj Baiswar

Jayanta Layek

Samarendra Hazarika

© ICAR Research Complex for NEH Region,  
Umroi Road, Umiam, Meghalaya-793103

## **Published by:**

Director

ICAR Research Complex for NEH Region,

Umroi Road, Umiam, Meghalaya-793103

## Content

Sl. No.	Title	Page No.
1	Ecofriendly Pest Management in Cruciferous Vegetables <i>Rumki H. Ch. Sangma, Sandip Patra, Hammyliende Talang and Bijoya Bhattacharjee</i>	1-8
2	Biointensive Pest Management in Important Solaneceous Vegetables <i>Sandip Patra, Rumki H. Ch. Sangma and Bijoya Bhattacharjee</i>	9-19
3	Integrated Disease Management in Vegetable Crops <i>Pankaj Baiswar</i>	20-24
4	Integrated Insect Pest Management in Tuber Crops <i>Rumki H. Ch. Sangma, Sandip Patra, Hammyliende Talang and Bijoya Bhattacharjee</i>	25-33
5	Biotechnological approaches in Insect – Pests Management for Sustainable Agriculture <i>Bijoya Bhattacharjee, Sandip Patra and Rumki H. Ch. Sangma</i>	34-48
6	Good Agricultural Practices for Minimizing Biotic Stress in Horticulture Crops <i>H.D. Talang, S. Hazarika, H. Rymbai, M.B. Devi, S.R. Assumi, Vanlalruati, P. Rymbai and G. Mawlong</i>	49-55
7	Capacity Building on Plant Protection: A Vital Sector for Proper Crop Management in Farming Communities <i>Kamni P. Biam, N. Uttam Singh, Pampi Paul, C. Gowda H. R., Hammylliende Talang and Heiplanmi Rymbai</i>	56-61
8	Nutritional knowledge of vegetables and fruits for smart dietary habit <i>Chubasenla Aochen, Rumki H. Ch. Sangma and Bijoya Bhattacharjee</i>	62-67

## **Capacity Building on Plant Protection: A Vital Sector for Proper Crop Management in Farming Communities**

Kamni P. Biam, N. Uttam Singh, Pampi Paul, C. Gowda H. R., Hammylliende Talang and Heiplanmi Rymbai

*ICAR-Research Complex for North Eastern Region, Umiam, Meghalaya-793103*

### **Introduction**

Every year as much as 40% of the world's agricultural crops are lost to pests (IPPC Secretariat 2021). World over, the damage by fungi to rice, wheat and maize alone costs \$70 billion per year and the fungal diseases destroy 125 million tonnes of rice, wheat, maize, potatoes and soybeans each year. Stemming fungal diseases alone in the world's five most important crops could feed more than 600 million people. In India, every year pests and diseases eat away, on an average, 20-30% of food, worth about Rs. 45,000 crore, produced by the farmers. "Green Revolution" during the 1960s and 1970s, has considerably increased the crop production and made India self-sufficient in food. However, as per estimates the complex of pests that have attacked crops throughout India for thousands of years can have a potential global losses due to insect and vertebrate pests, diseases and weeds varies from crop to crop, it has been estimated that these pests possibly destroy up to 30% of the production of food by reducing crop yield and causing losses in storage (Agriculture Today: The National Agriculture Magazine, July 2015). It is, therefore, essential to control the pests and diseases through Primary Plant Protection for providing sufficient food security to the growing population of the country.

In India, the agricultural sector is under increasing pressure and increase in agricultural productivity at a scale is increasingly complex. It challenges the capacity of both extension workers, farmers, farming systems and even the environment. In the absence of best practices, farmers use low quality agricultural inputs. Strengthening local capacities and institutions remains a major challenge for the effective design and implementation of agricultural programs. Farmers live in rural areas and depend directly or indirectly on agriculture for their livelihoods. The productivity enhancement business model activities provide farmers with access to low-cost techniques and quality inputs, and capacity building services to use these yield enhancing solutions effectively. The major areas include: agribusinesses, farmer organizations, conservation services, extension services and agricultural education. Capacity development refers to a process of change in which people; organizations and institutions improve their performance and refine, strengthen and adapt their capacity over time in response to changing circumstances. It is highly adaptive and context specific, involving individual and collective learning. Various local mechanisms may enable farmers to express their technology needs and participate in designing, testing and disseminating appropriate technologies. There is increasing evidence and recognition that what matters for development, more than natural resources and man-made physical capital, is the capability of people to be effective and productive economic agents, in short, human capital (FAO 2010). In the particular case of agriculture, most studies on the subject establish that



the education and skills of agricultural people are significant factors in explaining the inter-farm and inter-country differences in agricultural performance, along with the more conventional factors such as availabilities of land and water resources, inputs, credit. The needs of farmers are constantly changing with time and farmers socio-economic attributes. This places the capacity building need for the farmers into the domains of different agricultural management practices particularly plant protection so that they can learn and adapt with the change.

### **What is plant protection and why it is a vital sector for proper crop management in farming communities?**

Plant protection is the act of overseeing climate, weeds, pests and diseases that harm or repress the development of natural product, vegetable and other crops. Appropriate plant protection is critical to create better yields with insignificant wastage. This increment in efficiency prompts less land, water and work being needed for food crops. With less land being utilized biodiversity is saved and less ozone depleting substances are transmitted. It additionally guarantees more food arrives at the shops and markets in great condition, which assists with holding the costs down. Hence, it is vital that farmers in particular are trained and developed in the field of plant protection to help them achieve the economics of scale of their produce.

There are four fundamental ways to deal with effective plant protection, each with changing levels of progress; pesticide-based measures, organic nuisance control, obstruction techniques and creature brain science (Baque 2021).

1. Pesticides: Pesticide Based measures are utilized to pull in and additionally obliterate nursery bugs. There are three primary strategies in like manner practice; Herbicides are utilized to murder undesirable plants and weeds, Insecticides are utilized to execute creepy crawlies, and Fungicides are utilized to slaughter organisms, some of which can make genuine harm farming.
2. Organic: Natural pest control is the act of controlling creepy crawlies, weeds and infections by utilizing other living beings. A ladybird populace can be 'developed' or kept up to control aphids in the nursery. Aphids are the most dangerous vermin to vegetable plants. Having a decent populace of useful creepy crawlies will take alot of the difficult work and grief out of nuisance control.
3. Barriers: Barrier strategies are whatever successfully makes a hindrance among plants and irritations, climate or illnesses. These incorporate butterfly and bird netting, micromesh, garden downy, plant collars and nursery cloches. Electronic irritation obstructions additionally fall under this class as they make an imperceptible hindrance.
4. Brain science: Animal psychology method incorporates whatever stop nuisances, creatures or birds utilizing psychological techniques. The most well-known illustration of this is ordinary scarecrow; there are huge varieties of more bird scarers available.

## **Concept of Capacity Building**

The term capacity has many different meanings and interpretations depending on who uses it and in what context. To begin with, capacity building as a concept is closely related to education, training and human resource development. This conventional concept has changed over recent years towards a broader and more holistic view, covering both institutional and country base initiatives (Kumari & Khanduri 2019). Capacity building in general relates to enhancing or strengthening a person's or organization's capacity to achieve their goals (Lusthaus et al. 1999). Capacity building also increases the abilities and resources of persons, communities and organizations to manage change (Eele. 1994). Improving the capacity building of individuals, groups, organizations and communities is necessary for rural development, poverty alleviation and environment protection (Martinussen 2002).

To summarize, capacity building (or capacity development) is a process that improves the ability of a person, group, organization, or system to meet objectives or to perform better. In the context of capacity building on plant protection, it is the process of inculcating and imparting knowledge and skill to the farmers to empower them to effectively be well equipped to prevent and control pest and disease infestation.

### **“CAPACITY BUILDING IS MUCH MORE THAN TRAINING”**

#### **Importance of capacity building for farmers on plant protection**

Many international studies indicate that smallholder and poorer farmers could make a major contribution to national economic growth if they receive opportunities to become more productive. Along with men, women play an important role in contributing to all activities in rural development, particularly in agriculture areas such as livestock production, fisheries, cropping, forestry, irrigation and horticulture. Farmers, who are living in remote areas, work hard in the field but their products are low in quantity and quality because they use traditional methods. They face with selling raw materials for low prices and experience food shortages, particularly of rice for consumption. Smallholder farmers particularly women have little access to farm inputs. Lack of marketing information, products of low standard and difficulties in transporting goods to market are other constraints. In addition, women farmers lack technical knowledge and skills to produce their products.

A range of techniques and technologies are available that will ensure a more effective way of protecting the crops from pest and disease infestation. Investments are required, but more importantly: advise, technical guidance and financial support to the farmers to make sure that the initial constraints linked to the management of crops against pest an disease techniques and technologies are adequately addressed. Capacity to learn technical skills is critical to success which is influenced by the capacity building methods. The objective of enhancing the capacity of farmers is to intensify in a sustainable manner agricultural production through improve control of



pest and diseases by farmers, to improve food security and farm income and raise livelihoods in particular for the small-holder.

### **Levels of Capacity Building**

Capacity building has three levels:

#### **1. Individual Level:**

Individuals being the tissues of organizations and societies are the first layer of capacity. If societies or organizations want to transform and grow; they need skilled, knowledgeable, and experienced individuals. At this level, capacity building requires development and improvement of individuals to build existing knowledge and skills. It also deals with the establishment of conditions in which individuals engage in learning and adapting process.

#### **2. Institutional/Organizational Level:**

It is the middle layer of capacity building. At this level capacity building may improve leadership, governance, mission and strategy, advocacy, management and administration, development and implementation of program, income generation, fund-raising, partnership, evaluation, policy making, and marketing, planning and positioning (Linnell, 2003).

#### **3. Societal Level:**

The last layer of capacity building is society which in this case involves the farmers. Mostly this level is neglected since many years. Traditionally, capacity building on individual and institutional level and this is common concept that after improvement of individuals, society will automatically improve. But this is wrong notion. On one hand transformation and change at this level overhauls and at the same time is driven by those factors that affects individuals that actually make the society. On the other hand values, customs, traditions, laws and policies, systems in the society are the elements that have direct influence on the individual's ability to develop and nourish their capacity in future. Capacity building at societal level involves the establishment of interactive, responsive and accountable individuals in a society that learns from its own actions and feedback from population. These levels of capacity building are equally important and strictly well-knitted and interdependent. If there are any interventions or disturbance on any level, the other level will disturb automatically and their working will be affected.

### **Capacity building methods for farmers on plant protection**

Capacity building methods may include conferences, workshops, consultations, study tours, participatory research and extension, demonstration plots, exposure visits, using Internet and other (e.g. many sources, friends, facilitators, advisers and consultants). There are four main tools for the development of capacities in crop management:

- Information dissemination
- Training

- Facilitation and mentoring
- Networking and feedback to promote learning from experience.

Training is often used as the main capacity building method. Training, on-job training and workshops are important activities of capacity building in the field of plant protection in agriculture. However, once the training is finished, there is often no follow up support for district extension staff or farmers. The learning-by doing approach has been an important part of education to develop capacity and insights in a wide range of settings. New knowledge is quickly applied to the benefit of individual, farmers and community goals. Demonstration plots, cross visits, study tours and Farmer Field School (FFS) are useful methods to transfer information and technology to staff and farmers, particularly in remote areas. The advantages of FFS are that both farmers and staff are able to gain knowledge, skills, good relationships, facilitator skills, communication skill and experiences. The importance of capacity development for farmers is an important input, as most of the farmers are aware of only the indigenous methods of plant protection. Farmers therefore require training by trainers who are well grounded in the unique crop protection technologies. Farmer-to-farmer learning, through exchange visits and field days, tend to bring in more practical aspects and led to faster replication of innovations.

***“Farmers should be effectively developed and trained in crop protection in such a manner that there is a striking balance between food safety and food security”***

### **Conclusion**

Crop Protection has become crucial during these times. Not only did the extent of damage due to pest infestation increase, the demand for food grains has also risen sharply putting an immense pressure on the dwindling resources in India. We are not left with many options but to ensure food to the teeming billions. Chemical pesticides have been able to contain some of the damage. But decades of chemically intensive agriculture has disfigured the environment. The future agriculture will have to thus strike a balance between food safety and food security and hence the years to follow will be more challenging for crop protection industry. To realize the motto of ‘More from less’, the produced crop must be protected from succumbing to losses from pest and diseases and hence capacity building of the farmers in particular on crop protection assumes significance especially in this context.

### **References**

Agriculture Today: The National Agriculture Magazine, July 2015 Retrieved 19<sup>th</sup> February 2022 from <https://www.agriculturetoday.in/magazine/2015/magazine-jul-2015.pdf>

Baque, A. (2021) Importance of Crop Protection Management. Agrotechnology 10: e134

Eele, G. (1994). Capacity Building within the GRZ/UNICEF Program. Zambia: UNICEF Lusaka.



FAO; World Agriculture Towards 2010: AnFAO Study. Food and AgricultureOrganization, Rome. 1995.

IPPC Secretariat. 2021. Scientific review of the impact of climate change on plant pests – A global challenge to prevent and mitigate plant pest risks in agriculture, forestry and ecosystems. Rome. FAO on behalf of the IPPC Secretariat <https://doi.org/10.4060/cb4769en>

Linnell, D. (2003). *Evaluation of Capacity Building: Lessons from the Field*. Washington, DC: Alliance for Nonprofit Management. Retrieved 16<sup>th</sup> February 2022 from [http://www.riv.csu.edu.au/research/ilws/International/EASLP/library/pdf\\_files/The\\_Role\\_of\\_Capacity\\_Building\\_for\\_Livestock\\_Extension\\_Staff\\_in\\_Lao\\_PDR.pdf](http://www.riv.csu.edu.au/research/ilws/International/EASLP/library/pdf_files/The_Role_of_Capacity_Building_for_Livestock_Extension_Staff_in_Lao_PDR.pdf)

Lusthanus, C., Adrien, M, H. and Perstinger M. (1999). Capacity development: Definitions, issues an implications for planning, monitoring and evaluation. *Universalia Occasional Paper* 35:1-25

Martinussen, J, D. (2002). Development Goals, Governance and Capacity Building: Aid as a Catalyst. , 33(2), 269–279. doi:10.1111/1467-7660.00253