



CAPACITY BUILDING PROGRAM ON “Biodiversity Conservation: Hydroponics in Flowers and Medicinal Crops”

Developed by:

EIACP (PC-RP)-ADRI, Patna

Under

Environmental Information, Awareness, Capacity
Building and Livelihood Programme

Ministry of Environment, Forest & Climate Change
Govt. of India

SHORT OVERVIEW OF THE COURSE:

This 10-day Capacity Building Programme on Hydroponics in Flower and Medicinal Plants is designed to empower farmers, rural youth, women, Self-Help Groups (SHGs), entrepreneurs, and agricultural practitioners with the knowledge and practical skills required for the cultivation of high-value flower and medicinal plants through hydroponic systems. Through hands-on training, system installation, nutrient management, crop production, quality enhancement, and entrepreneurship development sessions, participants will learn how to establish and manage sustainable hydroponic cultivation units for income generation and livelihood improvement. The programme promotes sustainable agriculture through efficient water use, resource conservation, and climate resilient farming practices while supporting environmentally responsible production systems. This initiative aligns with Mission LiFE, Skill India Mission, Atmanirbhar Bharat, and Sustainable Development Goals by fostering green entrepreneurship, agricultural innovation, and sustainable livelihood opportunities.

TARGET GROUPS:

Farmers, Rural Youth, Women Entrepreneurs, SHG Members, Progressive Farmers, Nursery Owners, Start-ups in Agriculture, NGOs and Community Organizations, Students of Agriculture and Horticulture

PREFACE

Agriculture is undergoing rapid transformation in response to increasing population pressure, declining land availability, climate change, and growing concerns regarding resource sustainability. Traditional farming methods often face challenges related to soil degradation, water scarcity, pest infestations, and fluctuating productivity. In this context, hydroponics has emerged as an innovative and sustainable cultivation technology that enables crop production without soil while utilizing water and nutrients more efficiently.

Hydroponic cultivation offers significant opportunities for the production of high-value flower and medicinal plants, which are increasingly demanded by pharmaceutical industries, floriculture markets, wellness sectors, and consumers seeking quality products. By providing controlled growing conditions, hydroponic systems enhance crop productivity, improve product quality, reduce water consumption, and enable year-round cultivation.

Recognizing the growing importance of climate-smart agriculture and resource-efficient technologies, the EIACP Resource Partner on Water Management and Climate Change at ADRI, Patna, has developed this Capacity Building Programme on "Hydroponics in Flower and Medicinal Plants." The programme aims to equip farmers, women, rural youth, entrepreneurs, and community institutions with practical skills and technical knowledge required for adopting hydroponic cultivation as a sustainable livelihood option.

The programme aligns with the objectives of Mission LiFE (Lifestyle for Environment), Skill India Mission, Atmanirbhar Bharat, and the Sustainable Development Goals (SDGs). By promoting efficient water use, reduced chemical dependence, and environmentally responsible production practices, the programme contributes to sustainable agricultural development while creating new opportunities for income generation and green entrepreneurship.

Through a combination of theoretical sessions, practical demonstrations, field exposure, and entrepreneurship training, participants will gain the competencies required to establish and manage hydroponic systems successfully. The programme is expected to contribute to sustainable livelihoods, agricultural innovation, environmental conservation, and enhanced economic opportunities for local communities.

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Duration & Mode of Delivery

Sl. No.	Module Name & Number	Theory (Hrs)	Practical (Hrs)	Total Duration
1.	Module 1: Introduction to Hydroponics and Sustainable Cultivation	4 hrs	6 hrs	10 hrs
	Unit 1.1: Introduction to Hydroponics and Soilless Farming	1 hr	0 hr	1 hr
	Unit 1.2: Importance of Hydroponics in Sustainable Agriculture	1 hr	1 hr	2 hrs
	Unit 1.3: Hydroponic Cultivation of Flower and Medicinal Plants	1 hr	1 hr	2 hrs
	Unit 1.4: Mission LiFE and Resource Efficient Farming Practices	1 hr	4 hrs	5 hrs
2.	Module 2: Hydroponic Systems, Infrastructure and Resource Management	4 hrs	16 hrs	20 hrs
	Unit 2.1: Types of Hydroponic Systems (NFT, DWC, Wick, Drip and Vertical Farming Systems)	1 hr	3 hrs	4 hrs
	Unit 2.2: Greenhouse and Protected Cultivation Structures	1 hr	4 hrs	5 hrs
	Unit 2.3: Growing Media and Water Management	1 hr	4 hrs	5 hrs
	Unit 2.4: Hydroponic Equipment, Installation and Maintenance	1 hr	5 hrs	6 hrs
3.	Module 3: Cultivation of Flower and Medicinal Plants under Hydroponics	4 hrs	20 hrs	24 hrs
	Unit 3.1: Cultivation of Flower Crops (Gerbera, Orchid and Carnation) under	1 hr	6 hrs	7 hrs

	Hydroponics			
	Unit 3.2: Cultivation of Medicinal Plants (Tulsi, Ashwagandha, Aloe Vera, Lemongrass, Moringa and Giloy) under Hydroponics	1 hr	6 hrs	7 hrs
	Unit 3.3: Nursery Raising, Seed Germination and Transplanting Techniques	1 hr	5 hrs	6 hrs
	Unit 3.4: Crop Monitoring, Harvesting and Post-Harvest Management	1 hr	3 hrs	4 hrs
4.	Module 4: Nutrient Management, Crop Health and Quality Enhancement	4 hrs	8 hrs	12 hrs
	Unit 4.1: Preparation and Management of Nutrient Solutions	1 hr	3 hrs	4 hrs
	Unit 4.2: Water Quality Monitoring, pH and EC Management, and Water Recycling Techniques	1 hr	2 hrs	3 hrs
	Unit 4.3: Pest and Disease Management in Hydroponic Systems	1 hr	2 hrs	3 hrs
	Unit 4.4: Quality Enhancement and Yield Optimization	1 hr	1 hr	2 hrs
5.	Module 5: Entrepreneurship, Marketing, Assessment and Future Planning	4 hrs	10 hrs	14 hrs
	Unit 5.1: Business Planning and Cost Analysis	1 hr	2 hrs	3 hrs

	Unit 5.2: Marketing, SHG-based Enterprises and Value Chain Development	1 hr	2 hrs	3 hrs
	Unit 5.3: Exposure Visit and Demonstration of Hydroponic Units	1 hr	4 hrs	5 hrs
	Unit 5.4: Assessment, Feedback and Future Action Planning	1 hr	2 hrs	3 hrs
TOTAL		20 hrs	60 hrs	80 hrs

Module 1: Introduction to Hydroponics and Sustainable Cultivation

Unit 1.1: Introduction to Hydroponics and Soilless Farming

Theory (1 hour)	Practical (0 hour)
• Concept and principles of hydroponics • Evolution and scope of soilless cultivation • Advantages of hydroponic farming over conventional agriculture	

Unit 1.2: Importance of Hydroponics in Sustainable Agriculture

Theory (1 hour)	Practical (1 hour)
• Water-efficient agriculture practices • Climate-resilient farming systems • Resource conservation and environmental benefits	• Demonstration of different hydroponic models • Identification of hydroponic system components

Unit 1.3: Hydroponic Cultivation of Flower and Medicinal Plants

Theory (1 hour)	Practical (1 hour)
• Scope of hydroponics in floriculture and medicinal plant cultivation • Commercial importance of flower and Medicinal crops • Market demand and livelihood opportunities	• Observation of flower and medicinal plants grown under hydroponics

Unit 1.4: Mission LiFE and Resource-Efficient Farming Practices

Theory (1 hour)	Practical (4 hours)
• Mission LiFE principles and sustainable lifestyles • Efficient use of water and nutrients Green entrepreneurship opportunities in hydroponics	• Demonstration of water-saving practices • Exposure to sustainable hydroponic farming techniques

Module 2: Hydroponic Systems, Infrastructure and Resource Management

Unit 2.1: Types of Hydroponic Systems (NFT, DWC, Wick, Drip and Vertical Farming Systems)

Theory (1 hour)	Practical (3 hours)
• Types and working principles of hydroponic systems • Advantages and limitations of different systems	• Demonstration of NFT, DWC, Wick and Drip systems • Observation of vertical farming models

Unit 2.2: Greenhouse and Protected Cultivation Structures

Theory (1 hour)	Practical (4 hours)
• Greenhouse concepts and protected cultivation • Environmental control for hydroponics	• Demonstration of greenhouse structures and equipment

Unit 2.3: Growing Media and Water Management

Theory (1 hour)	Practical (4 hours)
• Types of growing media (cocopeat, perlite, vermiculite, rockwool) Water management principles	• Preparation and handling of growing media • Water management exercises

Unit 2.4: Hydroponic Equipment, Installation and Maintenance

Theory (1 hour)	Practical (5 hours)
• Components of hydroponic systems • Installation procedures and maintenance requirements	• Assembly and installation of hydroponic units • Routine maintenance practices

Module 3: Cultivation of Flower and Medicinal Plants under Hydroponics

Unit 3.1: Cultivation of Flower Crops (Gerbera, Orchid and Carnation) under Hydroponics

Theory (1 hour)	Practical (6 hours)
• Selection of flower crops for hydroponics Growth requirements and production techniques	• Cultivation practices for Gerbera, Orchid and Carnation

Unit 3.2: Cultivation of Medicinal Plants (Tulsi, Ashwagandha, Aloe Vera, Lemongrass, Moringa and Giloy) under Hydroponics

Theory (1 hour)	Practical (6 hours)
• Selection of medicinal plants • Economic and medicinal importance of crops	• Demonstration of cultivation techniques for selected medicinal plants

Unit 3.3: Nursery Raising, Seed Germination and Transplanting Techniques

Theory (1 hour)	Practical (5 hours)
• Nurserymanagement principles Seed germination requirements	• Seed sowing, germination transplanting exercises

Unit 3.4: Crop Monitoring, Harvesting and Post-Harvest Management

Theory (1 hour)	Practical (3 hours)
• Growth monitoring and crop management Harvesting and post-harvest handling practices	• Monitoring plant growth and harvesting demonstrations

Module 4: Nutrient Management, Crop Health and Quality Enhancement

Unit 4.1: Preparation and Management of Nutrient Solutions

Theory (1 hour)	Practical (3 hours)
• Essential plant nutrients and their functions Nutrient solution preparation and management	• Preparation of nutrient solutions and dosage calculations

Unit 4.2: Water Quality Monitoring, pH and EC Management, and Water Recycling Techniques

Theory (1 hour)	Practical (2 hours)
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• Importance of pH and EC in hydroponics • Water quality standards and recycling methods	• Measurement of pH and EC levels • Demonstration of water recycling systems
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Unit 4.3: Pest and Disease Management in Hydroponic Systems

Theory (1 hour)	Practical (2 hours)
• Common pests and diseases in hydroponics Integrated Pest Management (IPM) approaches	• Identification of pests and disease symptoms

Unit 4.4: Quality Enhancement and Yield Optimization

Theory (1 hour)	Practical (1 hour)
• Factors affecting crop quality and yield • Good agricultural and hydroponic practices	• Evaluation of crop quality parameters

Module 5: Entrepreneurship, Marketing, Assessment and Future Planning

Unit 5.1: Business Planning and Cost Analysis

Theory (1 hour)	Practical (2 hours)
• Hydroponic enterprise opportunities • Cost-benefit analysis and financial planning	• Preparation of a simple business plan

Unit 5.2: Marketing, SHG-based Enterprises and Value Chain Development

Theory (1 hour)	Practical (2 hours)
• Marketing channels and branding strategies • SHG-based entrepreneurship models	• Preparation of marketing and value chain plans

Unit 5.3: Exposure Visit and Demonstration of Hydroponic Units

Theory (1 hour)	Practical (4 hours)
• Learning from successful hydroponic enterprises • Best practices and innovation in hydroponics	• Exposure visit and field interaction with practitioners

Unit 5.4: Assessment, Feedback and Future Action Planning

Theory (1 hour)	Practical (2 hours)
• Review of learning outcomes • Future opportunities and action planning	

Assessment Strategy

The assessment of the Capacity Building Programme on "Hydroponics in Flower and Medicinal Plants: Promoting Sustainable Agriculture and Green Entrepreneurship" will focus on evaluating participants' understanding of hydroponic cultivation techniques, practical skills, resource management practices, and entrepreneurial competencies. The assessment process will be continuous and participatory, ensuring that learners gain both theoretical knowledge and hands-on experience throughout the programme.

1. Participation and Attendance

Participants will be assessed based on their regular attendance, active involvement in classroom discussions, practical sessions, demonstrations, field visits, and group activities conducted during the programme.

2. Practical Skill Assessment

Assessment will be carried out during practical sessions to evaluate participants' ability to:

- Identify and operate different hydroponic systems.
- Prepare and manage nutrient solutions.
- Monitor pH and EC levels.
- Handle growing media and hydroponic equipment.
- Perform nursery raising, transplanting, harvesting, and crop management practices.

3. Demonstration and Hands-on Exercises

Participants will be encouraged to demonstrate the installation and operation of hydroponic units, preparation of nutrient solutions, water management practices, and cultivation techniques for flower and medicinal plants. Their performance during these exercises will form an important component of the assessment process.

4. Group Activities and Business Planning

Participants will undertake group discussions and practical exercises related to hydroponic enterprise development, cost estimation, marketing strategies, and value

chain development. Their ability to prepare simple business plans and identify livelihood opportunities will also be evaluated.

5. Exposure Visit and Learning Documentation

Assessment will include observation of participants' engagement during exposure visits and demonstrations. Participants may be asked to document key observations, best practices, and lessons learned from successful hydroponic enterprises.

6. Feedback and Learning Review

At the end of the programme, participants will provide feedback on the training content, methodology, practical sessions, and overall learning experience. A review of learning outcomes will be conducted to assess knowledge gained and identify future training needs.

7. Certification

Certificates will be awarded to participants who successfully complete the programme, maintain satisfactory attendance, actively participate in practical sessions, and demonstrate adequate understanding of hydroponic cultivation and entrepreneurship concepts.

Glossary

Term	Definition
Hydroponics	A method of growing plants without soil by supplying water and nutrients directly to the plant roots.
Soilless Farming	A cultivation technique in which plants are grown without soil using nutrient solutions and alternative growing media.
Nutrient Solution	A mixture of water and essential plant nutrients required for healthy plant growth in hydroponic systems.
NFT (Nutrient Film Technique)	A hydroponic system where a thin layer of nutrient-rich water continuously flows over plant roots.
DWC (Deep Water Culture)	A hydroponic technique in which plant roots remain suspended in oxygenated nutrient solution.
Wick System	A simple hydroponic system that uses a wick to transport nutrient solution from a reservoir to plant roots.

Drip System	A hydroponic system where nutrient solution is supplied directly to plant roots through drip emitters.
Vertical Farming	A cultivation method in which crops are grown in vertically stacked layers to maximize space and resource efficiency.
Growing Media	Materials such as cocopeat, perlite, vermiculite, and rockwool that provide support to plant roots in hydroponic systems.
Cocopeat	A natural growing medium derived from coconut husk, widely used in hydroponic cultivation for moisture retention.

Perlite	A lightweight volcanic material used as a growing medium to improve aeration and drainage.
Vermiculite	A mineral-based growing medium that helps retain water and nutrients for plant growth.
Rockwool	A fibrous growing medium commonly used for seed germination and hydroponic crop production.
Greenhouse	A protected cultivation structure that provides controlled environmental conditions for plant growth.
Protected Cultivation	The practice of growing crops under controlled environmental conditions to improve productivity and quality.
pH	A measure of the acidity or alkalinity of water or nutrient solutions that affects nutrient availability to plants.
Electrical Conductivity (EC)	A measure of dissolved nutrient concentration in a hydroponic nutrient solution.
Water Recycling	The process of collecting, treating, and reusing water within a hydroponic system to reduce wastage.
Seed Germination	The process by which a seed develops into a seedling under suitable environmental conditions.
Transplanting	The transfer of seedlings from nursery trays or germination media into a hydroponic growing system.
Floriculture	The cultivation and management of flowering and ornamental plants for commercial purposes.
Medicinal Plants	Plants possessing therapeutic or medicinal properties used in traditional and modern healthcare systems.

Integrated Pest Management OPM)	An environmentally friendly approach that combines different methods to control pests and diseases effectively.
Crop Monitoring	Regular observation and assessment of plant growth, health, nutrient status, and environmental conditions.
Post-Harvest Management	Activities carried out after harvesting to maintain product quality, reduce losses, and enhance market value.

Resource Efficiency	The sustainable use of water, nutrients, energy, and other resources to maximize productivity.
Climate-Smart Agriculture	Agricultural practices that improve productivity while enhancing resilience to climate change and reducing environmental impacts.
Mission LiFE	A global initiative promoting environmentally responsible lifestyles and sustainable resource use.
Sustainable Agriculture	Farming practices that meet present agricultural needs while conserving resources for future generations.
Value Chain	The sequence of activities involved in production, processing, marketing, and distribution of agricultural products.
Entrepreneurship	The process of establishing and managing a business venture to generate income and employment opportunities.
SHG (Self-Help Group)	A community-based group, often consisting of women, engaged in savings, livelihood activities, and enterprise development.

Green Entrepreneurship	Business activities that promote environmental sustainability while generating economic and social benefits.
Yield Optimization	The process of improving crop productivity through efficient management of resources and cultivation practices.
Hydroponics	A method of growing plants without soil by supplying water and nutrients directly to the plant roots.
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