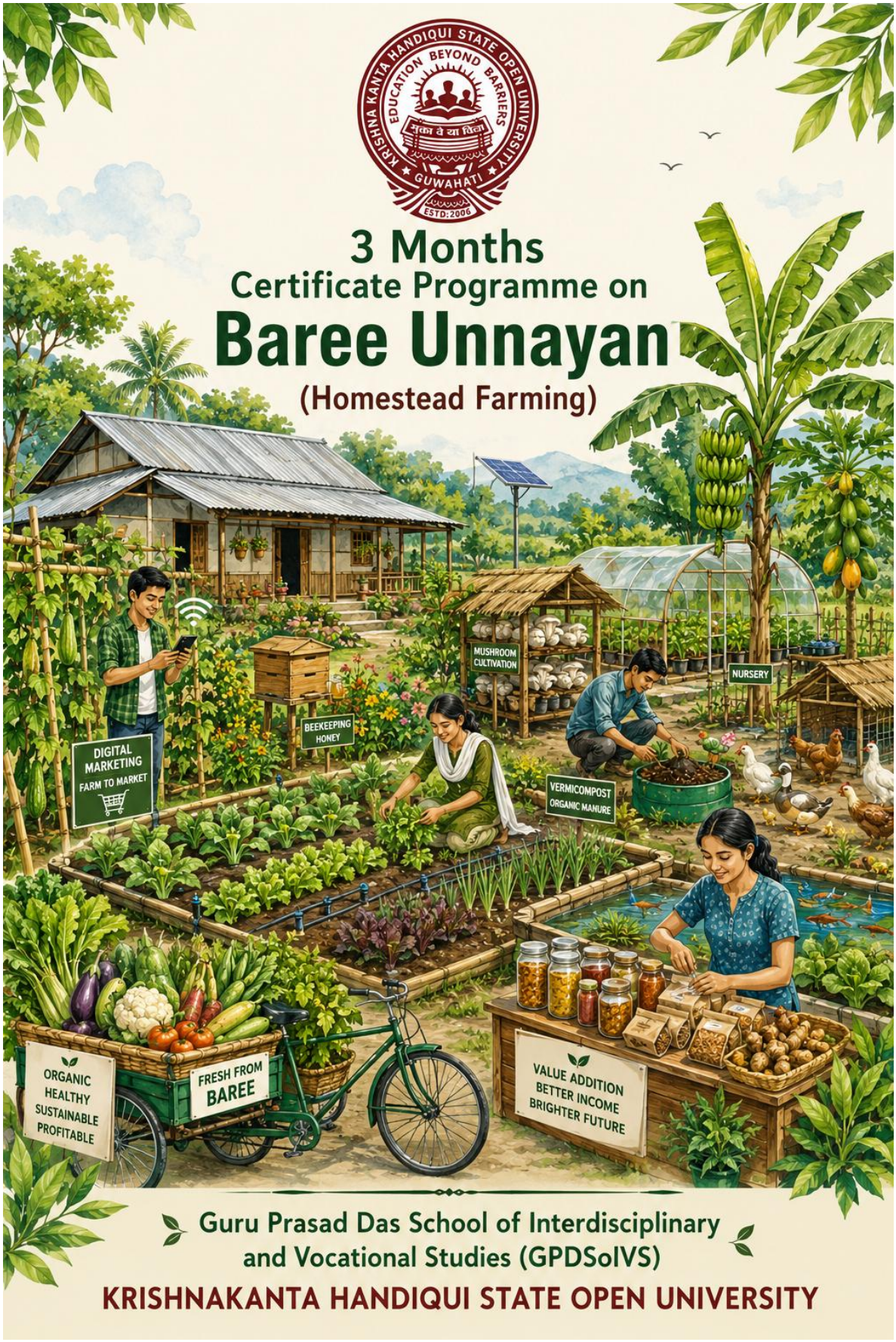

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EDUCATION BEYOND BARRIERS
मुक्तं वे या विद्या
GUWAHATI
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3 Months
Certificate Programme on
Baree Unnayan
(Homestead Farming)
DIGITAL MARKETING
FARM TO MARKET
BEEKEEPING
HONEY
MUSHROOM CULTIVATION
NURSERY
VERMICOMPOST
ORGANIC MANURE
ORGANIC
HEALTHY
SUSTAINABLE
PROFITABLE
FRESH FROM
BAREE
VALUE ADDITION
BETTER INCOME
BRIGHTER FUTURE
Guru Prasad Das School of Interdisciplinary
and Vocational Studies (GPDSoIVS)
KRISHNAKANTA HANDIQUI STATE OPEN UNIVERSITY

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Introduction

The **Certificate Programme on Baree Unnayan (Homestead Farming)** has been developed with a purpose to revive to strengthen and modernise the traditional *Baree* (homestead garden) system of Assam. A Baree is much more than a household garden; it is a time-tested agroecological production system that integrates crops, trees, livestock, water resources and local biodiversity to provide food, nutrition, livelihood and environmental sustainability.

In the context of climate change, declining soil health, biodiversity loss and increasing dependence on external agricultural inputs, the traditional Baree offers a resilient and sustainable model for rural development. By combining indigenous knowledge with modern agroecological principles, the programme equips learners with practical skills for developing productive, climate-smart and economically viable homestead farming systems.

The course consists of **14 units** that cover the philosophy, ecological significance and practical management of Barees. It introduces learners to agroecology, multistoreyed cropping, food forests, soil health management, organic bio-inputs, composting, seed conservation, biochar preparation, diversified farming systems, agroforestry, integrated farming, value addition, nutrition security, household economics, marketing, extension education and community-based livelihood development. Each unit is designed to provide practical knowledge that learners can directly apply in their own homesteads and communities.

The programme follows the **Open and Distance Learning (ODL)** approach of the University, enabling learners to study at their own pace through well-designed Self-Learning Materials (SLMs). However, a 10 days experiential/ field learning has been incorporated to get the better and in dept experiences

It is hoped that this programme will inspire learners to transform their Barees into productive, biodiverse and self-reliant ecosystems that contribute to food and nutritional security, household income, ecological restoration and community well-being. By preserving traditional wisdom while embracing scientific innovations, **Baree Unnayan** seeks to empower rural households and promote sustainable livelihoods for present and future generations.

UNIT 1: BAREES/BARI: OUR ANCESTRAL BLUEPRINT FOR CLIMATE-SMART FARMING

UNIT STRUCTURE

1.1 Learning Objectives
1.2 Baree/Bari: Our Ancestral Blueprint for Climate-Smart Farming
1.2.1 Meaning and Concept of Barees
1.2.2 Origin and Historical Development
1.2.3 Baree as Agroforestry Systems
1.2.4 Ecological Characteristics and Biodiversity
1.2.5 Baree in Assamese Society
1.3 Let Us Sum Up
1.4 Further Reading
1.5 Answers to Check Your Progress
1.6 Model Questions

1.1 LEARNING OBJECTIVES

After going through this unit you will be able to learn about

- explain the concept of Baree (homestead garden) in Assam.
- describe the historical evolution of the Baree system.
- discuss the ecological characteristics of Barees.
- examine the role of Barees in biodiversity conservation.
- understand the significance of Barees in sustainable agriculture and rural livelihoods.

1.2 BAREES/BARI: OUR ANCESTRAL BLUEPRINT FOR CLIMATE-SMART FARMING

1.2.1. Meanin and Concept



“Baree” (homestead gardens) are ancient, pervasive, and multi-functional in Assam. Ethnobotanical and agroforestry studies describe the Baree as the household homestead complex-house(s), kitchen garden, fruit and timber trees, bamboo, ponds, livestock shelters that has been part

of Assamese rural life for generations and functions as a reservoir of food, medicine, income and biodiversity. Modern studies and government reports treat the Baree as an on-farm conservation and livelihood system that has been practised for “time immemorial” and continues to be important today.

1.2.2 Origins and continuity (timeline)

The Barees evolved as a household practice over centuries alongside village settlement, agroforestry and the floodplain ecology of the Brahmaputra valley. Scientific surveys (peer-reviewed and institutional reports) document Baree systems across Upper Assam and the Brahmaputra floodplain and note their persistence through colonial and post-colonial periods;

The Baree system in Assam has existed since ancient times and has been mentioned in the accounts of several visitors and scholars, including the Chinese traveler Xuanzang (Hiuen Tsang) and the Mughal-era historian Shihabuddin Talish. The system became more organized and developed during the rule of the Ahom kings in the Brahmaputra Valley. During the reign of Swargadeu Pratap Singha (1603–1641 AD), the noted Ahom administrator Momai Tamuli Borbarua reorganized villages to strengthen revenue administration and transformed the Baree into a self-sustaining system that supported the economic well-being and self-reliance of farming households.

1.2.3 Baree/Bari as Agroforestry Stystem

In Assam, agroforestry has traditionally been practiced for generations through homestead farming systems. This practice is found across both the plains and hill regions of the state and is common among almost all indigenous communities, although it is known by different names in different languages and dialects. For example, it is called “bari” in Assamese, “intathingre” in Singpho, “gimrouck” in Tangsa, “nolai-haphai” in Dimasa, “kilou” in Zeme, “kho” in Kuki, “khou” in Hmar, and “shong” in Jayantia. Over time, this traditional system has emerged as an important form of natural capital in Assam, covering nearly 21.67 percent of the state’s total geographical area (Sarma, J.K, 2015)

W CHECK YOUR PROGRESS

Q1. What is a Baree? Explain its major characteristics.

Q2. Briefly discuss the historical development of Barees in Assam.

Q3. Why are Barees considered agroecological systems?

Q4. How do Barees contribute to biodiversity conservation?

1.2.4 Ecological Characteristics and Biodiversity

How "natural" are Barees? Ecological Characteristics and Biodiversity: Barees are essentially **managed mini-ecosystems** that mimic forest structure: multiple vertical strata (canopy fruit and timber, midstory shrubs, understory herbs, aquatic in ponds), high species richness, and strong interaction with wild fauna (birds, small mammals, pollinators). They are low-external-input, largely based on local planting material and traditional practices making them functionally close to a "semi-natural" or agroecological system rather than an industrial monoculture. Studies show Barees conserve economically and ecologically important species, provide habitat for birds, and maintain crop and tree genetic diversity.

1.2.5 Barees in Assamese Society

Momai Tamuli Borbarua, one of the most celebrated administrators of the Ahom kingdom in the early seventeenth century, is often remembered in Assamese history as a man who rose from humble beginnings as a **gardener**. This association is deeply symbolic: it reflects how the act of nurturing plants, managing homesteads, and maintaining ecological order was esteemed in the Ahom socio-political system. The homestead garden, or *Baree*, was not just a domestic space for subsistence, it embodied principles of care, observation, and natural balance that were also vital for governance. Momai Tamuli's early engagement with gardening reveals how knowledge of plant diversity, soil, and seasonal rhythms shaped leadership grounded in ecological wisdom.

1.3 LET US SUM UP

This unit introduced the concept of Barees, the traditional homestead farming system of Assam. It discussed their historical evolution, ecological characteristics, biodiversity value, and contribution to household food security and sustainable livelihoods. The unit also highlighted Barees as an excellent example of climate-smart and agroecological farming practices.

O 1.4 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University. https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam
2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 1.5 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q.1: Baree is a traditional Assamese homestead farming system integrating crops, trees, livestock and water bodies to ensure food, nutrition and livelihood security.

Answer to Q.2: Barees have evolved over centuries and became highly organized during the Ahom period under Momai Tamuli Borbarua.

Answer to Q.3: They integrate biodiversity, nutrient recycling, multiple enterprises and ecological balance, making them natural agroecological systems.

Answer to Q.4: Barees conserve indigenous plant species, provide habitats for wildlife and maintain genetic diversity.

Answer to Q.5: They provide food, nutrition, income, medicinal plants, ecological services and strengthen rural self-reliance.

M1.6 MODEL QUESTIONS

Q 1: Mention two characteristics of Barees.

Q 2: Who reorganized the Baree system during the Ahom period? .

Q 3: Explain the role of Barees in biodiversity conservation.

Q 4: Describe the importance of Barees in rural livelihoods.

Q 5: Explain the structure and functions of Barees as sustainable homestead farming systems.

*** ***** ***

UNIT 2: IMPORTANCE OF THE BAREES (HOMESTEAD GARDENS) IN ASSAMESE LIFE

UNIT STRUCTURE

2.1 Learning Objectives
2.2 The Foundation of the Assamese Household
2.3 Importance of Baree
2.4 The Way Forward
2.5 Let Us Sum Up
2.6 Further Reading
2.7 Answers to Check Your Progress
2.8 Model Questions

2.1 LEARNING OBJECTIVES.

After going through this unit, you will be able to**:**

- explain the importance of Barees in Assamese households.
- describe the multi-storeyed cropping system.
- discuss integrated farming practices in Barees.
- explain the nutritional, economic and ecological benefits of Barees.
- appreciate the cultural and emotional significance of Barees.

2.2 THE FOUNDATION OF THE ASSAMESE HOUSEHOLD

The *Baree* (homestead garden) is the living heart of rural Assam. Rooted in tradition and ecological wisdom, Assamese Barees are self-sustaining, multi-layered food systems that have supported families for generations. Long before “organic farming” became a policy discussion, Barees functioned as naturally regenerative, biodiversity-rich spaces ensuring food, nutrition, and cultural continuity.

Barees are not merely gardens—they are integrated agroforestry-based farming systems that embody balance, diversity, and co-existence.

2.3 IMPORTANCE OF BAREE

The following discussion highlights the importance of the *baree* (home garden) in Assam and its various contributions to rural livelihoods, biodiversity, and household well-being.

A Balanced Multi-Storeyed Cropping System

The Baree follows a **multi-storeyed cropping pattern**, mimicking a natural forest structure:

- **Upper canopy:** Coconut, arecanut, jackfruit, mango, bamboo
- **Middle layer:** Banana, papaya, citrus, guava
- **Shrub layer:** Vegetables, turmeric, ginger, chilli
- **Ground layer:** Leafy greens, medicinal herbs
- **Climbers:** Gourds, beans, betel vine

This vertical integration maximizes land use efficiency, sunlight capture, soil moisture retention, and biodiversity. It ensures year-round production and resilience against climatic stress.

Integrated Farming within the Baree

Barees represent a naturally evolved **Integrated Farming System (IFS)**:

- **Pukhuris (ponds):** Function as rainwater harvesting systems and provide local fish varieties.
- **Beekeeping:** Supports pollination and produces honey.
- **Livestock & poultry:** Provide manure and protein.
- **Firewood trees:** Supply household energy needs.
- **Sericulture:** Rearing of silkworms sustains traditional weaving and cultural identity.

Each component complements the other—nothing is waste; everything is resource.

Nutritional and Economic Security

The Baree ensures:

- Diverse fruits, vegetables, herbs, and spices
- Balanced nutrition throughout the year
- Reduced dependence on market purchases
- Savings through self-sufficiency
- Organic and chemical-free food

Surplus produce generates income through local sales and value addition. Pickles, dried vegetables, spices, honey, silk threads, and handwoven textiles create micro-enterprises within households.

W CHECK YOUR PROGRESS

Q 1: Why are Barees called the foundation of Assamese households?

Q 2: What is a multi-storeyed cropping system?

Q 3: Explain integrated farming in Barees.

Q 4: Discuss the ecological importance of Barees.

Q 5: Mention the cultural importance of Barees.

Ecological Significance

Barees function as:

- **Carbon sinks** absorbing atmospheric carbon
- **Oxygen zones** improving microclimate
- **Biodiversity hotspots** conserving indigenous species
- **Soil regenerators** through organic recycling
- **Water conservation systems** via ponds and mulching

In the era of climate change, the Baree is a decentralized model of climate resilience and ecological restoration.

Emotional, Cultural and Aesthetic Value

Beyond food and income, the Baree offers:

- A green, peaceful landscape
- Seasonal flowers and natural beauty
- A space for reflection and emotional support
- A nurturing environment for children
- A living classroom for ecological learning

The Baree creates a sense of belonging, contentment, and harmony with nature. It is the emotional and cultural anchor of Assamese life.

2.4 THE WAY FORWARD

For sustainable and organic development of Assamese society, Barees must be recognized as:

- Models of agroecological farming
- Foundations of food sovereignty
- Centers of nutritional security
- Engines of rural micro-economies
- Living examples of compassionate coexistence

Revitalizing and strengthening Barees is not a return to the past—it is a forward-looking pathway toward resilient, organic, and dignified living.

2 2.5 LET US SUM UP

- The Assamese Baree is a **food forest, carbon sink, economic buffer, cultural hub, and emotional sanctuary**—all within the homestead. It sustains life materially and spiritually.
- If nurtured and supported, Barees can lead the way toward an organic, balanced, and contented Assamese lifestyle rooted in ecological harmony and happiness.

O 2.6 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University. https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam
2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 2.7 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q. 1. They provide food, shelter, livelihood and ecological security.

Answer to Q. 2. It is the cultivation of crops in different vertical layers.

Answer to Q. 3. It combines crops, livestock, fish, trees and other farm enterprises.

Answer to Q. 4. They conserve biodiversity, improve soil and water, and sequester carbon.

Answer to Q. 5. They preserve traditions, festivals, medicinal knowledge and family values.

M2.8 MODEL QUESTIONS

Q 1: What is an Integrated Farming System (IFS)?

Q 2: Mention two economic benefits of Barees.

Q 3: Define food sovereignty.

Q 4: State two cultural values associated with Barees.

Q 5: Explain the multi-storeyed cropping pattern in Barees.

Q 6: Discuss the nutritional importance of Barees.

*** ***** ***

UNIT 3: BAREE AS A STRUCTURED EXAMPLE OF AGROECOLOGICAL PRACTICES

UNIT STRUCTURE

3.1 Learning Objectives
3.2 Understanding AgroEcology
3.3 Agroecology and Barees
3.4 Let Us Sum Up
3.5 Further Reading
3.6 Answers to Check Your Progress
3.7 Model Questions

3.1 LEARNING OBJECTIVES

After going through this unit, we will be able to,

- define agroecology.
- explain the agroecological principles reflected in Barees.
- describe the structure of Barees.
- discuss climate resilience through Barees.
- explain their socio-cultural importance.

3.2 UNDERSTANDING AGROECOLOGY

Agroecology, as defined by the Food and Agriculture Organization (FAO), is *an integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of sustainable agriculture and food systems*.

It seeks to optimize interactions between plants, animals, humans, and the environment while addressing the need for socially equitable food systems.

In simple terms, agroecology is farming **with nature, not against it**.

The traditional Assamese *Baree* (homestead garden) is a living, time-tested example of agroecology in practice.

Barees as Structured Agroecological Systems

Barees are not random plantations. They are **structured, multi-layered, biodiverse, and integrated systems** designed for resilience, food security, and ecological balance.

Key Structural Features of the Baree:

- **Multi-storeyed cropping pattern** (forest-like structure)
- **Integration of trees, crops, livestock, fish, and bees**
- **Rainwater harvesting through pukhuris (ponds)**
- **Nutrient recycling through organic waste and biomass**
- **Cultural integration with weaving, sericulture, and food traditions**
- **Local seed conservation and indigenous knowledge transmission**

W CHECK YOUR PROGRESS

Q 1: Define agroecology.

Q 2: How do Barees represent agroecological systems?

Q 3: Mention any five principles of agroecology reflected in Barees.

This structured diversity aligns deeply with the core principles of agroecology.

The 13 Principles of Agroecology Reflected in Barees

The 13 principles (**HLPE High-Level Panel of Experts on Food Security and Nutrition** (framework) is clearly visible in the design and functioning of Barees:

1. **Recycling**
   Organic waste, crop residues, livestock manure, pond silt—all is recycled within the Baree. Nothing becomes waste; everything becomes resource.
2. **Input Reduction**
   Barees depend primarily on local resources—seeds, compost, biomass—minimizing external chemical inputs.
3. **Soil Health**
   Continuous mulching, leaf litter, tree cover, and organic matter build living soil rich in microbes and earthworms.
4. **Animal Health**
   Livestock and poultry are raised in low-stress, natural environments with access to diverse feed.
5. **Biodiversity**
   Multiple species of trees, vegetables, herbs, fish, pollinators, and livestock coexist, enhancing resilience and productivity.
6. **Synergy**
   Interactions between components—bees pollinating crops, trees providing shade, ponds moderating temperature—create mutual benefits.

7. **Economic Diversification**

Income flows from fruits, vegetables, honey, fish, silk threads, firewood, and value-added products.

8. **Co-creation of Knowledge**
   Knowledge of Baree management is passed through generations, combining traditional wisdom with adaptive learning.
9. **Social Values and Diets**
   Barees ensure culturally appropriate, diverse, and nutritionally balanced diets.
10. **Fairness**
    Self-sufficiency reduces dependency and strengthens household autonomy and dignity.
11. **Connectivity**
    Barees link households to local markets, seed exchange networks, and weaving traditions.
12. **Land and Natural Resource Governance**
    The Baree is family-managed, conserving indigenous varieties and local biodiversity.
13. **Participation**
    All family members—women, elders, youth—participate in managing the Baree, strengthening social cohesion.

Ecological and Climate Significance

Barees function as:

- Carbon sinks
- Oxygen-rich microclimates
- Biodiversity conservation spaces
- Rainwater harvesting systems
- Climate-resilient food forests

Their multi-layered tree structure mimics natural forests, making them decentralized climate action units at the household level.

Socio-Culural and Emotional Dimensions

Beyond ecological productivity, Barees provide:

- Nutritional security
- Economic savings
- Aesthetic beauty and flowering landscapes
- Emotional well-being
- Cultural continuity through sericulture and traditional weaving

They form the foundation of a contented and dignified Assamese lifestyle.

W CHECK YOUR PROGRESS

Q 1: Explain the climate significance of Barees.

Q 2: Why are Barees considered socially sustainable?

Barees: The Way Forward

In an era of climate uncertainty and input-intensive agriculture, Barees demonstrate that agroecology is not a new invention—it is a lived tradition.

Strengthening and revitalizing Barees can:

- Promote organic and regenerative farming
- Reduce rural poverty
- Improve nutrition
- Restore ecological balance
- Inspire policy models for decentralized sustainable development.

2 3.4 LET US SUM UP

- The Assamese Baree is a structured agroecological system rooted in diversity, recycling, integration, and cultural wisdom.
- It embodies all 13 principles of agroecology in practice—long before they were formally articulated.
- Reviving and recognizing Barees is not merely about conserving tradition; it is about shaping a resilient, equitable, and ecologically harmonious future for Assam and beyond.

O3.5 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University. https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam
2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 3.6 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q 1: Agroecology is the application of ecological principles in agriculture.

Answer to Q 2: They integrate crops, trees, livestock, recycling and biodiversity.

Answer to Q 3: Recycling, biodiversity, soil health, synergy and participation.

Answer to Q 4: They conserve carbon, water and biodiversity while reducing climate risks.

Answer to Q 5: They promote food security, traditional knowledge and community participation.

M3.7 MODEL QUESTIONS

Q 1: Explain AgroEcology

Q 2: Describe the concept of Agroecology in Barees

Q 3: Describe the socio-cultural importance of Baree

*** ***** ***

UNIT 4: MULTISTOREYED CROPPING PATTERN AND FOOD FOREST

UNIT STRUCTURE

4.1 Learning Objectives
4.2 Introduction
4.3 Multistoried Cropping Pattern
4.4 What is Food Forest
4.5 Benefits of Multistoreyed Cropping
4.6 Let Us Sum Up
4.7 Further Reading
4.8 Answer to Check Your Progress
4.9 Model Question

4.1 LEARNING OBJECTIVES

After going through this unit, we will be able to,

- explain the concept and principles of multistoreyed cropping.
- describe the structure and functioning of a food forest.
- identify different vegetation layers in a multistoreyed cropping system.
- discuss the ecological, economic and nutritional benefits of multistoreyed cropping and food forests.
- examine the role of food forests in climate-resilient and sustainable agriculture.

4.2 INTRODUCTION

In Assam, many of our traditional homestead gardens (Barees) already show how nature can guide farming. When we observe a natural forest, we see tall trees, medium trees, shrubs, herbs, grasses, and climbers all growing together. No one plants only one type of tree in a forest—yet the forest remains healthy, green, and productive.

4.3 WHAT IS A MULTISTOREYED CROPPING PATTERN?

A **multistoreyed cropping pattern** means growing different crops of different heights together on the same land in layers—just like the floors of a building or the layers of a forest.

Think of it like this:

- **Top Floor (Tall Trees):** Coconut, arecanut, jackfruit, bamboo
- **Second Floor (Medium Trees):** Mango, guava, citrus
- **Third Floor (Shrubs):** Banana, papaya, chilli
- **Ground Floor (Small Plants):** Vegetables, turmeric, ginger, leafy greens
- **Ground Cover:** Creepers and legumes that spread on the soil
- **Climbers:** Gourds and beans climbing on trees or supports

All these crops grow together without disturbing each other.

Why Do We Grow Crops in Layers?

Growing crops in layers gives many benefits:

1. **Better Use of Sunlight**
   Tall trees take strong sunlight. Smaller plants grow well in partial shade. No sunlight is wasted.
2. **Better Use of Soil Nutrients**
   Some plants have deep roots; some have shallow roots. They take nutrients from different soil levels.
3. **Soil Protection**
   Leaves fall and cover the soil. This keeps moisture inside and improves soil health.
4. **Reduced Risk**
   If one crop fails, other crops still produce. Farmers do not depend on only one crop.
5. **More Food from Small Land**
   Small land can produce fruits, vegetables, spices, and even timber together.

W CHECK YOUR PROGRESS

Q 1: What is meant by multistoreyed cropping? How does it differ from monocropping?

Q 2: Explain the concept of a food forest. Mention its major components.

Q 3: State three ecological benefits of multistoreyed cropping and food forests.

4.4 WHAT IS A FOOD FOREST?

A **food forest** is a farm designed like a natural forest but mainly for producing food.

In a food forest:

- Many types of fruit trees grow together
- Vegetables grow under the trees
- Herbs and medicinal plants grow in between

- Sometimes fish ponds, bees, and poultry are also included

It looks like a forest but works like a farm.

In Assam, our traditional Barees are examples of food forests.

4.5 BENEFITS OF HOW MULTISTOREYED CROPPING

Benefits of Farmers

This system helps farmers in many ways:

- Provides food throughout the year
- Improves family nutrition
- Reduces need to buy vegetables from market
- Saves money
- Provides extra income from surplus produce
- Protects soil and water
- Increases biodiversity

It is both environmentally friendly and economically helpful.

Climate Benefits

Multistoreyed farms:

- Reduce heat by providing shade
- Hold rainwater in the soil
- Prevent soil erosion
- Absorb carbon dioxide
- Produce more oxygen

Such systems are helpful in dealing with climate change..

In Assam, structured multistoreyed and food forest systems have been demonstrated under the SPREAD NE model and supported by the GIZ SuATI project as an example of climate-resilient farming. These models show that traditional knowledge, when properly designed, can become a strong livelihood system

Let us compare multi-storeyed cropping with mono cropping

Monocropping	**Multistoreyed Cropping**
One crop only	Many crops together
High risk	Low risk
Soil often exposed	Soil always covered
Depends on chemicals	Mostly natural inputs
Income once or twice a year	Income throughout the year

2 4.6 LET US SUM UP

- A multistoreyed cropping pattern is simply growing crops in different layers like a forest. It is smart farming that uses sunlight, soil, water, and space wisely.
- For rural Assam, this system is not new—it is part of our tradition. By understanding and improving it, students and young farmers can build farms that are productive, climate-resilient, and sustainable for the future.

O4.7 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University. https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam
2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 4.8 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q. 1: Multistoreyed cropping is a farming system in which crops of different heights and growth habits are grown together on the same piece of land. Unlike monocropping, which involves cultivating only one crop, multistoreyed cropping utilizes vertical space efficiently, increases biodiversity and enhances overall farm productivity.

Answer to Q. 2: A food forest is a sustainable farming system designed to imitate the structure and functions of a natural forest while producing food and other useful products. Its major components include tall canopy trees, small fruit trees, shrubs, herbs, climbers, root crops and ground-cover plants.

Answer to Q. 3: The major ecological benefits are:

- Conservation of biodiversity and natural habitats.
- Improvement of soil fertility through nutrient recycling and organic matter addition.
- Better moisture conservation, carbon sequestration and enhanced resilience to climate change.

M4.9 MODEL QUESTIONS

Q 1: Define multistoreyed cropping. Explain its major characteristics.

Q 2: Discuss the concept and structure of a food forest. How does it contribute to sustainable agriculture?

Q 3: Explain the ecological and economic advantages of multistoreyed cropping in Baree-Unnayan.

Q 4: Differentiate between monocropping and multistoreyed cropping with suitable examples.

Q 5: Describe the different vegetation layers of a food forest and explain their functions in maintaining ecological balance.

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UNIT 5: SOIL CARE PRACTICES IN BAREES– BUILDING AND PROTECTING LIVING SOIL

UNIT STRUCTURE

5.1 Learning Objectives
5.2 Introduction: Soil is a Living System
5.3 Understanding Living Soil
5.4 Soil Care Practices in Barees**:** Identifying Local Resources for Soil Care
5.5 Building Healthy Soil for Sustainable Baree-Unnayan
5.6 Let Us Sum Up
5.7. Further Reading
5.8 Answers to Check Your Progress
5.9 Model Questions

5.1 LEARNING OBJECTIVES

After going through this unit, we will be able to,

- explain the concept and importance of living soil in sustainable agriculture.
- identify the factors affecting soil health and fertility.
- describe various soil care practices followed in Barees.
- understand the role of organic matter, microorganisms and bio-inputs in maintaining soil productivity.
- appreciate the importance of soil conservation for climate-resilient and sustainable farming.

5.2 INTRODUCTION: SOIL IS A LIVING SYSTEM

In a Baree (homestead garden), soil is not just dirt—it is a living system. Healthy soil contains millions of microorganisms such as bacteria, fungi, actinomycetes, protozoa, and earthworms. These invisible workers:

- Break down organic matter
- Release nutrients for plants
- Improve soil structure
- Help roots absorb water
- Protect plants from diseases

When soil is alive, plants grow stronger, crops become more nutritious, and farming becomes sustainable.

5.3 WHAT IS LIVING SOIL?

Living soil is soil rich in organic matter and full of microbial activity. It has:

- Good crumb structure (soft and porous)
- Dark color (due to humus)
- Earthworm presence
- Good moisture-holding capacity
- Natural fertility without chemical dependency

The goal of soil care in Barees is to **feed the soil, not just the crop**.

5.4 IDENTIFYING LOCAL RESOURCES FOR SOIL CARE

One strength of the Baree system is the availability of local organic materials. These include:

1. **Dry Leaves**
   Fallen leaves from trees provide carbon-rich biomass. They improve humus formation and protect soil as mulch.
2. **Cow Manure**
   A rich source of beneficial microbes and nutrients. It improves soil fertility naturally.
3. **Chicken Litter**
   High in nitrogen. It must be composted before use to avoid burning plants.
4. **Crop Residues**
   Stems, roots, and vegetable waste return nutrients back to the soil.
5. **Pond Silt**
   Nutrient-rich sediment from pukhuris enhances soil texture and fertility.
6. **Kitchen Waste**
   Biodegradable waste can be composted to recycle nutrients.
   Using these materials reduces dependence on chemical fertilizers.

4. **Composting: Turning Waste into Wealth**
   Composting is the controlled decomposition of organic matter into nutrient-rich humus.

Benefits:

- Improves soil structure
- Increases microbial population
- Enhances nutrient availability
- Improves water retention

Types of composting in Barees:

- Heap composting

- Pit composting
- Anaerobic composting
- Vermicomposting

Compost acts as food for soil microbes.

5. **Vermicomposting**

   Vermicomposting uses earthworms to break down organic waste into fine compost.

Benefits:

- Produces nutrient-rich vermicast
- Improves soil aeration
- Enhances microbial activity
- Promotes root growth

Earthworms are indicators of healthy soil.

6. **Bamboo Biochar**

   Biochar is charcoal made from biomass like bamboo under limited oxygen.

   Benefits:

   - Improves soil structure
   - Increases water-holding capacity
   - Provides habitat for microbes
   - Reduces nutrient loss
   - Sequesters carbon

When mixed with compost or liquid manures, biochar becomes even more effective.

7. **Liquid Organic Manures**

   Liquid preparations boost microbial life in soil.

1. **Jeevamrit**

   A fermented mixture of cow dung, cow urine, jaggery, pulse flour, and soil.

   - Increases beneficial microbes
   - Enhances nutrient availability

2. **GhanJeevamrit**

   A solid form of Jeevamrit.

   - Easy to apply
   - Slow-release microbial booster

3. **Mycomix**

   A microbial inoculant mixture that supports fungal networks in soil.

   - Improves nutrient absorption
   - Strengthens plant immunity

   These preparations enhance biological activity in soil.

8. No-Tillage Raised Beds

No-tillage farming means avoiding deep ploughing.

Why Avoid Tillage?

- Tillage destroys soil structure
- Kills beneficial microbes
- Increases erosion

Raised beds:

- Improve drainage
- Protect roots from waterlogging
- Encourage better root development
- Maintain soil aeration

When beds are permanent and not disturbed, soil life increases over time.

9. Bio-Intensive Raised Beds

Bio-intensive beds are:

- Densely planted
- Deeply composted
- Always mulched
- Carefully managed

Benefits:

- High yield from small space
- Improved soil organic matter
- Efficient water use
- Continuous biomass addition

10. Diversified Cropping Pattern

Growing different crops together:

- Supports different root depths
- Encourages diverse microbes
- Reduces pest pressure
- Maintains soil cover

Monocropping weakens soil; diversity strengthens it.

11. Role of Big Trees in Rebuilding Soil

Large trees in Barees play a major role in soil health:

- Deep roots bring nutrients upward
- Leaf litter forms natural mulch
- Shade regulates soil temperature
- Root exudates feed soil microbes
- Tree-fungal partnerships (mycorrhiza) improve nutrient cycling

Trees act as natural soil builders.

12. Importance of Microbes in Soil

Soil microbes:

- Convert organic matter into plant nutrients
- Fix atmospheric nitrogen
- Solubilize phosphorus
- Decompose toxins
- Form symbiotic relationships with roots

Without microbes, soil becomes lifeless and dependent on chemicals.

Healthy soil = High microbial activity.

W CHECK YOUR PROGRESS

Q 1: What is living soil? Why is it important for sustainable agriculture?

Q 2: Explain any three soil care practices followed in Barees.

Q 3: How do soil microorganisms and organic matter contribute to soil fertility?

5.5 BUILDING HEALTHY SOIL FOR SUSTAINABLE BAREE-UNNAYAN

1. **Add Organic Matter Regularly**

   Compost, mulch, manure.

2. **Avoid Chemical Overuse**

   Chemicals harm microbial life.

3. **Keep Soil Covered**

   Use mulch or cover crops.

4. **Reduce Disturbance**

   Practice no-tillage or minimum tillage.

5. **Promote Biodiversity**

   Grow multiple crops and trees.

6. **Use Microbial Preparations**

   Jeevamrit, GhanJeevamrit, Mycomix.

7. **Integrate Trees and Livestock**

   Natural nutrient recycling strengthens soil.

2 5.6 LET US SUM UP

- Soil care in Barees is about nurturing living soil. When soil is biologically active, crops become healthier, yields become stable, and farming becomes sustainable.
- By using local organic resources, practicing composting, maintaining raised beds, integrating trees, and applying microbial preparations, farmers can rebuild soil naturally.
- Healthy soil is the foundation of healthy plants, healthy food, and healthy families. Protecting soil today ensures prosperity for future generations.

O5.7 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University. https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam
2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 5.8 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q. 1: Living soil is biologically active soil rich in microorganisms, earthworms and organic matter. It improves nutrient availability, enhances soil structure, conserves moisture and supports healthy plant growth, making it essential for sustainable agriculture.

Answer to Q. 2:

Three important soil care practices in Barees are:

- Application of compost and farmyard manure to improve soil fertility.
- Mulching with leaves or crop residues to conserve soil moisture and suppress weeds.
- Minimum soil disturbance (no-tillage) to preserve soil structure and microbial activity.

Answer to Q. 3:

Organic matter supplies nutrients, improves soil structure and increases water-holding capacity. Soil microorganisms decompose organic residues, recycle nutrients, fix nitrogen and enhance nutrient availability, thereby maintaining fertile and productive soil.

M5.9 MODEL QUESTIONS

Q 1: Define living soil. Explain its characteristics and importance in sustainable agriculture.

Q 2: Discuss the different soil care practices adopted in Barees to build and protect living soil.

Q 3: Explain the role of organic matter, earthworms and soil microorganisms in maintaining soil health.

Q 4: Discuss the importance of composting, mulching and minimum tillage in sustainable soil management.

Q 5: Explain how healthy soil contributes to climate resilience, sustainable agriculture and Baree-Unnayan.

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UNIT 6: IMPORTANCE OF BIO-INPUTS IN BAREE-UNNAYAN AND PREPARATION OF ORGANIC INPUTS

UNIT STRUCTURE

6.1 Learning Objectives
6.2 Introduction
6.3 Bio-Inputs: Concept and Importance
6.4 Bio-Resources Available in a Baree
6.5 Preparation of Organic Inputs
6.6 Benefits of Bioreources
6.7 Let Us Sum Up
6.8 Further Reading
6.9 Answers to Check Your Progress
6.10 Model Questions

6.1 LEARNING OBJECTIVES

After going through this unit, we will be able to,

- explain the concept and importance of bio-inputs in Baree-Unnayan.
- identify locally available materials for preparing organic inputs.
- describe the preparation and uses of different organic inputs.
- explain the role of bio-inputs in improving soil health and crop productivity.
- appreciate the importance of bio-inputs in promoting sustainable and climate-resilient agriculture.

6.2 INTRODUCTION

The traditional **Baree** (homestead garden) of Northeast India is one of the most resilient and sustainable farming systems evolved by communities over generations. A Baree is not merely a place where vegetables grow; it is a **living ecosystem** where trees, crops, animals, soil organisms, insects, and humans coexist and support each other. In the Baree-Unnayan approach, strengthening this natural system depends largely on **bio-inputs derived from local resources**.

6.3 BIO-INPUTS: CONCEPT AND IMPORTANCE

Bio-inputs are organic materials prepared from farm and household biological resources such as animal manure, plant residues, herbs, and local seeds. When these resources are properly utilized, they convert what is often seen as “waste” into **valuable farm inputs and income opportunities**. Thus, Baree-Unnayan promotes the philosophy of **“Bio-Resources to Bio-Income.”**

6.4 BIO-RESOURCES AVAILABLE IN A BAREE

A typical Baree naturally generates a variety of biological resources that can be converted into useful farm inputs. These include:

- **Cow dung and cow urine**
- **Goat manure and poultry litter**
- **Pig manure and other permissible animal wastes**
- **Fallen dry leaves and crop residues**
- **Kitchen waste and green biomass**
- **Herbs, spices, and locally available plants with pesticidal properties**
- **Local seeds from healthy mother plants**
- **Bamboo waste and woody biomass**

Instead of treating these materials as waste, the Baree-Unnayan system encourages farmers to **process and recycle them within the farm**, thereby strengthening the soil and reducing dependence on external inputs.

W CHECK YOUR PROGRESS

Q 1: What are bio-inputs? Mention any four examples.

Q 2: Why are bio-inputs preferred over chemical fertilizers and pesticides in sustainable agriculture?

Q 3: Name any three organic inputs that can be prepared at home and mention one use of each.

6.5 PREPARATION OF ORGANIC INPUTS

Converting Animal Resources into Soil Nutrition

Animals are integral to the Baree ecosystem. Their wastes are among the most valuable organic inputs.

Cow dung and cow urine are widely used for preparing organic fertilizers and microbial inoculants such as fermented liquid manures. These preparations stimulate microbial life in the soil and enhance nutrient availability for crops.

Goat manure and poultry litter are rich in nutrients like nitrogen and phosphorus. When composted properly and applied to soil, they improve plant growth and increase crop productivity.

Similarly, **pig manure and other livestock wastes**, when carefully composted or converted through anaerobic methods, become excellent soil conditioners. These inputs enrich the soil with organic matter and beneficial microorganisms.

Through proper composting, these animal wastes are transformed into **safe and nutrient-rich organic fertilizers**, turning livestock into an important pillar of soil fertility management.

Fallen Leaves and Plant Biomass: Nature's Free Fertilizer

In a Baree, trees constantly shed **dry leaves, twigs, and organic matter**. In natural forests, these materials decompose and form humus that sustains the entire ecosystem. Baree-Unnayan follows the same principle.

Fallen leaves and crop residues can be used for:

- Compost preparation
- Mulching of vegetable beds
- Soil organic matter restoration

Mulching with dry leaves protects soil from heat and erosion, conserves moisture, and gradually releases nutrients as the material decomposes. Over time, this process **builds humus-rich living soil**, improving soil structure and fertility.

Bamboo Waste into Biochar

Bamboo is abundant in many homestead landscapes. Often the leftover bamboo pieces and waste are burnt or discarded. However, through controlled burning, bamboo waste can be converted into **biochar**.

Biochar plays an important role in soil health by:

- Increasing **soil water-holding capacity**
- Improving soil aeration and structure
- Providing habitat for beneficial microorganisms
- Reducing nutrient loss from the soil

When applied in combination with compost and organic manure, bamboo biochar becomes a powerful tool for **long-term soil regeneration**.

Herbal Bio-Pesticides and Natural Repellents

Another important component of bio-inputs in Baree-Unnayan is the preparation of **botanical pest management solutions**. Many plants, herbs, and spices available locally possess natural insect-repelling properties.

Leaves, seeds, and extracts from locally available plants can be used to prepare **bio-pesticides and repellents**. These natural formulations help control pests while maintaining ecological balance.

Unlike chemical pesticides, herbal preparations:

- Do not harm beneficial insects
- Do not contaminate soil and water
- Do not leave toxic residues on food

Thus, farmers can protect their crops while maintaining a safe and healthy food system.

6.6 BENEFITS OF BIOREOURCES

Importance of Local Seeds

Local seeds collected from **healthy mother plants** are another vital bio-resource in the Baree system. Saving seeds ensures:

- Preservation of traditional crop diversity
- Better adaptation to local climate and soil conditions
- Reduced dependence on purchased hybrid seeds

Seed saving also allows farmers to select the most resilient and productive plants, strengthening the genetic base of crops over time.

Reducing Cost of Cultivation

One of the most important benefits of using bio-inputs is the **significant reduction in the cost of cultivation**. Chemical fertilizers, pesticides, and hybrid seeds require continuous financial investment. In contrast, bio-inputs rely mainly on materials already available within the farm.

By preparing fertilizers, compost, mulches, and pest repellents at home, farmers:

- Save money on external inputs
- Reduce dependency on markets
- Improve self-reliance in farming

This approach is especially beneficial for small and marginal farmers, as it allows them to cultivate crops with minimal financial risk.

Improving Soil Health and Water Retention

Organic inputs enrich the soil with **organic carbon and microbial life**, which are essential for building living soil. Healthy soils with high organic matter content have greater capacity to:

- Retain moisture
- Improve nutrient cycling
- Support beneficial microorganisms
- Resist drought and environmental stress

The increased **water-holding capacity** of organic soils is particularly important in areas facing irregular rainfall and climate change.

Healthier Food and Safer Farming

Using bio-inputs ensures that crops grow without exposure to harmful synthetic chemicals. This results in **clean, nutritious, and safe food** for farm families and consumers.

Farmers themselves also benefit because they are no longer exposed to toxic agrochemicals during spraying and application. Thus, bio-input-based farming protects both **human health and environmental health**.

Building a Self-Reliant Baree Economy

When bio-resources are efficiently utilized, the Baree becomes a **self-sustaining production system**. Waste materials are recycled, soil fertility improves, and crop diversity increases.

This system transforms the Baree into a **biological economy**, where resources generated within the farm contribute directly to food production and income generation. By converting bio-resources into bio-inputs, farmers not only nurture their soil but also build a resilient and economically viable farming system.

Activity 1: Identify Local Bio-Resources

Visit your Baree or nearby homestead and prepare a list of locally available organic materials (such as leaves, cow dung, crop residues, kitchen waste, ash and weeds) that can be used to prepare bio-inputs.

Activity 2: Prepare Compost

Collect biodegradable household and farm waste and prepare a small compost pit or compost heap. Observe the decomposition process for four weeks and record the changes.

2 6.7 LET US SUM UP

- The success of Baree-Unnayan depends on recognizing the immense value of local biological resources. Cow dung, animal manure, dry leaves, herbal extracts, bamboo waste, and traditional seeds are not wastes but **valuable assets for sustainable farming**.

- By converting these resources into organic inputs, farmers can restore soil health, reduce cultivation costs, improve water retention, and produce healthy food.
- Most importantly, this approach strengthens the self-reliance of farmers and reconnects agriculture with the ecological wisdom embedded in traditional homestead systems.
- In essence, **bio-inputs are the foundation of a living Baree**, where nature's cycles are respected, resources are recycled, and farming becomes both productive and sustainable.

O6.8 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University. https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam
2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 6.9 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q 1: Bio-inputs are naturally derived materials used to improve soil fertility, plant growth and pest management. Examples include compost, farmyard manure (FYM), Jeevamrit, vermicompost, Panchagavya and botanical bio-pesticides.

Answer to Q 2: Bio-inputs improve soil fertility, enhance microbial activity, reduce environmental pollution, produce safe food, conserve biodiversity and lower the cost of cultivation. Unlike chemical inputs, they promote long-term soil health and sustainability.

Answer to Q 3:

- **Compost:** Improves soil fertility and organic matter content.
- **Jeevamrit:** Enhances microbial activity and nutrient availability.
- **Botanical extract (e.g., neem extract):** Controls insect pests naturally.

M6.10 MODEL QUESTIONS

Q 1: Define bio-inputs. Discuss their importance in sustainable Baree-Unnayan.

Q 2: Explain the preparation and uses of any four organic inputs used in homestead farming.

Q 3: Discuss the advantages of bio-inputs over chemical fertilizers and pesticides.

Q 4: Explain how bio-inputs contribute to improving soil health, crop productivity and environmental sustainability.

Q 5: Describe the role of locally available biological resources in the preparation of organic inputs for climate-resilient agriculture.

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UNIT 7: PREPARATION OF BIO-INPUTS AT HOME FOR SUSTAINABLE BAREE-UNNAYAN

UNIT STRUCTURE

7.1 Learning Objectives
7.2 Introduction
7.3 Importance of Compost in Baree-Unnayan
7.4 Methods of Compost Making
7.5 Preparing a no-tillage bed in the Baree
7.6 Seed Keping & Seed Treatment before sowing in Barees
7.7 Bamboo Biochar: Preparation and Importance
7.8 How to make a Bio intensive raised bed for your Baree
7.9 How to prepare Jeevamrit for your Baree
7.10 How to prepare Ghanjeevamrit for your Baree
7.11 Let Us Sum Up
7.12 Further Reading
7.13 Answers to Check Your Progress
7.14 Model Questions

7.1 LEARNING OBJECTIVES

After going through this unit, we will be able to,

- prepare different bio-inputs using locally available materials at home.
- explain the preparation and application of compost, Jeevamrit, Panchagavya and botanical extracts.
- prepare natural plant protection formulations using indigenous resources.
- understand methods of seed conservation and natural seed treatment.
- adopt low-cost and eco-friendly techniques for sustainable Baree-Unnayan.

7.2 INTRODUCTION

Compost is a **nutrient-rich organic manure produced by the natural decomposition of plant residues, animal wastes, and other biodegradable materials** through the action of microorganisms such as bacteria, fungi, and earthworms.

During composting, organic materials like dry leaves, weeds, crop residues, and animal manure break down into a dark, crumbly, soil-like substance known as **humus**. This humus becomes an excellent soil conditioner that nourishes crops and supports the life of beneficial soil microbes.

Compost is often called **"black gold" for farmers** because it converts farm waste into a valuable input for soil fertility.

7.3 IMPORTANCE OF COMPOST IN BAREE-UNNAYAN

Compost plays a central role in strengthening the soil ecosystem of the Baree. Its importance includes:

1. **Improves Soil Fertility**
   Compost supplies essential nutrients such as nitrogen, phosphorus, potassium, and micronutrients that plants need for healthy growth.
2. **Builds Living Soil**
   Compost increases the population of beneficial microorganisms in the soil. These microbes help in nutrient cycling and support healthy plant growth.
3. **Improves Soil Structure**
   Regular addition of compost makes the soil loose and crumbly, improving aeration and root penetration.
4. **Increases Water Holding Capacity**
   Soils rich in organic matter can hold more moisture, helping crops withstand dry periods.
5. **Reduces Waste**
   Composting converts farm waste, kitchen waste, and fallen leaves into valuable organic manure instead of allowing them to rot unused.
6. **Reduces Cost of Cultivation**
   Farmers can prepare compost at home using locally available materials, reducing the need to purchase chemical fertilizers.
7. **Produces Healthy and Chemical-Free Food**
   Compost-based farming helps grow nutritious food without harmful chemical residues.

W CHECK YOUR PROGRESS

Q 1: Why is it beneficial to prepare bio-inputs at home?

Q 2: Name any three organic nutrient inputs and any two botanical plant protection inputs prepared at home.

Q 3: Why are seed conservation and natural seed treatment important in sustainable farming?

7.4 METHODS OF COMPOST MAKING

Different methods can be used to prepare compost depending on the availability of space and materials. The common methods suitable for Baree systems are:

1. Heap Compost
2. Three Pit Compost
3. Trench Compost

Heap Compost Method

Heap compost is one of the simplest and most effective methods suitable for homestead gardens.

Site Selection

Choose a place that meets the following conditions:

- Near a **tree providing partial shade and sunlight**
- **No water stagnation**
- Easy access for adding materials and turning the heap

Size of the Compost Heap

Prepare an area:

- **3 feet wide**
- **6 feet long**

Remove the grass from this area before starting.

Preparation of Liquid Microbial Mixture

Prepare a liquid mixture to sprinkle in each layer:

- **20 litres water**
- **1 kg fresh cow dung**
- **500 ml rice-wash water**

Mix thoroughly. This mixture helps activate microbial decomposition.

Layering Process

Composting is done by arranging organic materials in layers.

First Layer (Base Layer)

- Spread **1 inch layer of dry twigs**
- Twigs should not be thicker than **pencil thickness**

This layer allows proper air circulation from the bottom.

Sprinkle the **liquid microbial mixture** over this layer.

Second Layer

Add a **4-inch layer of green biomass**, such as:

- Fallen green leaves
- Weeds without roots
- Water hyacinth cut pieces
- Banana pseudostem pieces
- Kitchen waste

Sprinkle the liquid mixture over the layer.

Third Layer

Add **6 inches of dry leaves**.

Sprinkle the liquid mixture.

Fourth Layer

Add **2 inches of dry animal manure or finished compost**.

This layer provides additional microbes to speed up decomposition.

Sprinkle the liquid mixture.

Fifth Layer

Add another **4 inch layer of green materials**.

Sprinkle the liquid mixture.

Sixth Layer

Add **6 inches of dry leaves**.

Sprinkle the liquid mixture again.

Seventh Layer

Add **2 inches of dry animal manure or compost**.

Sealing the Compost Heap

After layering:

- Cover the entire heap with a **mud and cow dung plaster**
- Seal it from all sides

This helps maintain proper moisture and temperature for decomposition.

Aeration

Insert a **bamboo tube vertically in the centre of the heap**.

This allows air to enter and supports microbial activity.

Turning the Compost

- On the **15th day**, open the heap.

- Turn and mix the materials thoroughly.
- Rebuild the heap and **mud plaster again**.

Turning helps ensure uniform decomposition.

Harvesting the Compost

The compost becomes ready in **about 40 days**.

Signs of ready compost include:

- Dark brown or black color
- Earthy smell
- Crumbly texture

Sieving the Compost

After harvesting:

- Sieve the compost to obtain **fine powder compost**.
- The larger pieces left in the sieve can be used as **compost mulch** around plants.

Three Pit Compost Method

In this method, **three pits are prepared side by side**. Each pit is used at a different stage of decomposition.

Procedure

1. Organic materials are first filled in **Pit 1** with alternate layers of green biomass, dry leaves, and animal manure.
2. After about **15–20 days**, the partially decomposed materials are transferred to **Pit 2** and mixed well.
3. After another **15–20 days**, the material is shifted to **Pit 3** where it completes the decomposition process.

By the time the third pit is filled, compost in the first pit becomes ready.

Advantages

- Continuous compost production
- Better decomposition through turning
- Suitable for farmers producing large amounts of organic waste

6. Trench Compost Method

Trench composting is useful where space is limited and organic waste is available regularly.

Procedure

1. Dig a trench about **2–3 feet deep** and **3–4 feet wide**.
2. Fill the trench with alternate layers of:
    - Green biomass
    - Dry leaves

- Animal manure

3. Sprinkle water or microbial mixture between layers.
4. Cover the trench with soil.

The materials gradually decompose underground and turn into compost within **2–3 months**.

Advantages

- Conserves moisture
- Protects compost from drying
- Suitable for dry areas

7.5 PREPARING A NO-TILLAGE BED IN THE BAREE

What is a No-Tillage Bed?

A **no-tillage bed** is a planting bed prepared **without digging or turning the soil**. Instead of disturbing the soil, organic materials such as dry leaves, compost, and biomass are layered on the surface to create a fertile growing bed. Over time, soil organisms like microbes, earthworms, and insects break down these materials and naturally incorporate them into the soil.

This method mimics the way soil builds up in forests, where fallen leaves and organic matter slowly decompose on the surface and form rich humus.

Why No-Tillage Beds are Important in the Baree

In traditional **Barees (homestead gardens)**, soil health is maintained through natural recycling of organic matter. However, in many Barees some areas have become **monocropped**, particularly with crops like arecanut or fruit trees where the soil surface often remains bare.

Creating **no-tillage beds around these trees or palms** helps restore the ecological balance of the Baree.

These beds can be prepared:

- Around **arecanut palms**
- Around **fruit trees**
- Along pathways or open spaces in the Baree

The beds act as **compost mulch around the trees**, while also providing space to grow herbs, spices, creepers, and vegetables.

Benefits of No-Tillage Beds

1. **Protects Soil Life**

   No digging ensures that soil microorganisms, fungi, and earthworms remain undisturbed, helping maintain living soil.

2. **Improves Soil Fertility**
   The layered organic materials slowly decompose and release nutrients to plants.
3. **Conserves Moisture**
   The thick organic mulch reduces evaporation and increases water retention in the soil.
4. **Reduces Weed Growth**
   The leaf layer suppresses weeds naturally.
5. **Utilizes Baree Resources**
   Dry leaves, compost, and bamboo biochar available in the Baree are efficiently recycled.
6. **Diversifies the Baree**
   Even under arecanut or fruit trees, farmers can grow additional crops such as herbs, spices, and creepers.

No-Tillage Beds in Arecanut and Fruit Tree Systems

Many Barees have **arecanut plantations as the main crop**. The base of the arecanut palms can be converted into **round no-tillage beds**, where herbs and creepers can be grown.

Similarly, fruit trees in the Baree can be surrounded with these beds. The organic layers act as **continuous compost mulch**, enriching the soil around the tree while also producing additional crops.

This practice helps convert monocropped spaces into **multi-layered productive systems**, improving both biodiversity and productivity in the Baree.

How to Prepare a No-Tillage Bed

1. **Select the Area**
   Choose an area in the Baree. For example:
   - **3 feet wide**
   - **6 feet long**

   Remove any large weeds if present.
2. **Add the Base Layer**
   Pile up a **12-inch-thick layer of dry leaves** on the selected area.
   Dry leaves act as the carbon base and gradually decompose to form humus.
3. **Add Compost and Soil Layer**
   On top of the dry leaves add:
   - **3 inches layer of compost**
   - Mixed with **virgin topsoil**

   This layer provides nutrients and a suitable medium for seed germination.
4. **Add Bamboo Biochar**

Mix **bamboo biochar** with the compost and soil layer.

Biochar helps:

- Improve soil structure
- Increase water holding capacity
- Provide habitat for beneficial microbes

5. Planting

After preparing the bed, sow seeds or plant saplings of herbs and vegetables.

Suitable Crops for No-Tillage Beds

No-tillage beds are ideal for many herbs, spices, and creepers commonly grown in the Baree.

Examples include:

- **Pudina (mint)**
- **Coriander**
- **Maan Dhaniya**
- **Masandari**
- Other local medicinal herbs
- **Betel vine**
- **Gourds**
- **Black pepper**
- Leafy vegetables

These crops grow well in the moisture-rich, organic environment created by the bed.

Conclusion

No-tillage beds are a simple but powerful method for improving soil health and productivity in the Baree. By layering dry leaves, compost, soil, and biochar without disturbing the soil, farmers can recreate the natural soil-building process found in forests.

When practiced around **arecanut palms and fruit trees**, no-tillage beds act as living compost systems that enrich the soil while producing herbs, vegetables, and spices. This practice strengthens biodiversity, improves soil fertility, and helps transform the Baree into a **multi-layered, resilient, and productive homestead farming system**.

7.6 SEED KEPING & SEED TREATMENT BEFORE SOWING IN BAREES

Seed is Freedom

Seed is the foundation of farming and food sovereignty. **Seed is freedom** because it represents the farmer's independence and the continuity of traditional food systems. For generations, farming families have inherited seeds that are adapted to their soil, climate, and food culture. These seeds give communities **health, livelihood, and identity**, and often create unique value in local markets.

Traditional seeds grown in Barees are resilient and adapted to local conditions. They usually possess better taste, nutritional quality, and resistance to local pests and climate variations. When farmers keep their own seeds, they protect themselves from dependence on commercial seed systems and maintain control over their agriculture.

Therefore, **keeping seeds is one of the key principles of agroecological transformation**. It preserves biodiversity, strengthens local food systems, and empowers farmers to sustain their farming traditions.

Selection of Mother Plants

Successful seed saving begins with the careful selection of **strong mother plants**. These plants should represent the best characteristics of the crop.

Important criteria for selecting mother plants include:

- The plant must be **healthy and disease-free**.
- It should show **vigorous growth and good yield**.
- Fruits should be **true to the local variety and well developed**.

Seeds from such plants carry strong genetic qualities that help produce healthy crops in the next season.

Scientific Collection of Seeds

Seeds should be collected carefully to maintain their viability.

Key practices include:

- Seeds should be collected from **fully ripened fruits on the plant or tree**.
- Avoid collecting seeds from immature fruits.
- Seeds should be **cleaned and dried properly in shade** before storage.

Proper drying helps prevent fungal infection and increases seed longevity.

Traditional Seed Storage

After drying, seeds must be stored properly so they remain viable until the next planting season.

Traditional storage methods include using:

- **Bamboo cans**

- **Earthen pots**
- **Glass jars**
- **Paper envelopes**

A small quantity of **bamboo biochar** can be mixed with the stored seeds. Biochar absorbs excess moisture and helps prevent fungal infection and pest damage, increasing the shelf life of the seeds.

Importance of Seed Treatment

Before sowing, seeds should undergo **seed treatment**, an important agroecological practice that protects seeds from diseases and improves germination.

Seed treatment helps:

- Protect seeds from fungal and bacterial pathogens
- Improve germination and seed vigor
- Promote beneficial microbial activity
- Ensure healthy seedling growth

Two simple seed treatment methods suitable for Barees are **Beejamrit seed treatment** and **herbal seed treatment**.

Method 1: Beejamrit Seed Treatment

What is Beejamrit?

Beejamrit is a **natural microbial seed treatment solution prepared from cow-based ingredients and local soil**. It is widely used in natural farming to protect seeds from soil-borne diseases and enhance early seedling growth. Beneficial microorganisms present in the solution colonize the seed surface and young roots, improving plant health and nutrient uptake.

Ingredients for Beejamrit

To prepare Beejamrit for seed treatment:

- **20 litres water**
- **5 kg fresh desi cow dung**
- **5 litres desi cow urine**
- **50 grams lime**
- **A handful of fertile soil from the farm or near tree roots**

These ingredients provide beneficial microbes and nutrients that protect seeds from pathogens.

Preparation Method

1. Fill a clean container with **20 litres of water**.
2. Tie the **5 kg cow dung in a cloth** and immerse it in the water for about **10–12 hours** so that its microbial extract mixes into the water.

3. In a separate container, dissolve **50 grams lime in 1 litre water** and allow it to settle overnight.
4. Next day, squeeze the cloth bundle in the water so the dung extract mixes thoroughly.
5. Add the **handful of local soil** to introduce native microorganisms.
6. Add **5 litres desi cow urine** and the prepared lime water.
7. Stir the mixture well with a wooden stick.

The Beejamrit solution is now ready for seed treatment.

How to Use Beejamrit for Seed Treatment

- Coat the seeds with the prepared Beejamrit solution by mixing them thoroughly by hand.
- Alternatively, dip the seeds briefly in the solution.
- Spread the seeds in shade and allow them to dry before sowing.

This treatment protects seeds from disease and promotes vigorous germination.

Method 2: Herbal Seed Treatment

Another effective seed treatment can be prepared using herbs and locally available materials.

Ingredients

- **100 grams raw turmeric paste**
- **One whole garlic bulb (crushed with skin)**
- **100 grams marigold or papaya leaves paste**
- **25 grams bamboo biochar**
- **100 ml desi cow urine**
- **100 ml rice-wash water**
- **2 litres water**

Preparation

1. Mix all ingredients in **2 litres of water**.
2. Keep the mixture in a **closed container overnight**.
3. The next day, **filter the extract**.

Seed Treatment Procedure

1. Tie the seeds in a **muslin cloth**.
2. Dip the cloth in the filtered solution for **about 20 minutes**.
3. Remove the seeds and **shade dry them**.
4. Sow the treated seeds in prepared beds.

Use of Remaining Extract

The remaining liquid extract should be diluted with **three times water** and used to **drench the seed bed**. This helps protect the soil around the germinating seeds and supports beneficial microbial activity.

7.7 BAMBOO BIOCHAR: PREPARATION AND IMPORTANCE

What is Bamboo Biochar?

Bamboo biochar is a form of charcoal produced by heating bamboo pieces in a **low-oxygen environment** through a process called **pyrolysis**. Unlike ordinary charcoal used for fuel, biochar is prepared specifically for **soil application**. During pyrolysis, most volatile compounds in bamboo burn off while the **stable carbon structure is retained**, creating a porous material that is extremely beneficial for soil health.

Because bamboo grows rapidly and is widely available in many Barees, it becomes an ideal local resource for producing biochar.

Importance of Bamboo Biochar in Baree Farming

Bamboo biochar plays an important role in improving soil quality and supporting agroecological farming.

1. **Improves Soil Structure**
   Biochar has a porous structure that helps loosen compact soils and improves aeration around plant roots.
2. **Increases Water Holding Capacity**
   The pores in biochar act like tiny reservoirs that store moisture and release it slowly to plants.
3. **Supports Beneficial Microbes**
   Biochar provides shelter for beneficial soil microorganisms, helping them multiply and strengthen the living soil system.
4. **Reduces Nutrient Loss**
   Biochar can hold nutrients in the soil and prevent them from being washed away by rain.
5. **Enhances Compost and Organic Inputs**
   When mixed with compost, manure, or liquid manures, biochar absorbs nutrients and becomes a powerful soil amendment.
6. **Utilizes Local Bamboo Waste**
   Waste bamboo pieces from the Baree can be converted into a valuable soil input instead of being burnt or discarded.

Double Pit Method for Making Bamboo Biochar

One of the simple methods for preparing bamboo biochar in the Baree is the **double pit method**.

Step 1: Digging the First Pit

Select a safe open area in the Baree where there is no risk of fire spreading.

Dig a pit of:

- **2 feet × 2 feet size**
- **6 inches depth**

Ensure the **walls of the pit are straight and firm**.

Step 2: Digging the Second Pit

Inside the first pit, dig another pit at the **centre**.

The second pit should be:

- **1 foot × 1 foot size**
- **6 inches depth**

Now two pits exist within the same space. This structure is known as the **double pit system**.

Step 3: Lighting the Fire

Light a small fire at the **base of the inner pit**.

This fire will initiate the pyrolysis process.

Step 4: Adding Bamboo for Pyrolysis

Start placing **dry waste bamboo pieces of about 12 inches length** inside the inner pit.

The bamboo should be:

- Placed **horizontally**
- Arranged **layer by layer**

As the bamboo burns, continue piling additional layers.

The goal is to **restrict oxygen flow** by stacking bamboo pieces closely. This encourages **slow burning without strong flames**, which is essential for proper pyrolysis and for retaining carbon in the charcoal.

Step 5: Continue Layering Bamboo

Add bamboo **batch by batch**, allowing each layer to char gradually.

The burning should produce **very little flame**, indicating that the bamboo is converting into charcoal rather than completely burning to ash.

Continue the process until the inner pit becomes filled.

Step 6: Building the Upper Bamboo Layer

Once the smaller inner pit is filled, start adding **larger dry bamboo pieces of about 2 feet length** on top of the pit.

Continue arranging the bamboo in layers, maintaining the same **low-oxygen burning process**.

Step 7: Controlling the Fire

At some point, flames may begin to appear in the upper bamboo layer. At this stage:

- The centre bamboo pieces will already be turning **black**, indicating charcoal formation.

Immediately:

- Pour **one bucket of water** over the burning bamboo.
- This stops excessive burning and prevents the charcoal from turning into ash.

Step 8: Sealing the Pit

After pouring water:

1. Cover the pit with a **jute bag dipped in cow dung slurry**.
2. Cover the entire pit with **soil**.

This helps:

- Restrict oxygen entry
- Prevent white smoke from escaping
- Allow the pyrolysis process to complete slowly.

Step 9: Cooling Period

Leave the sealed pit **undisturbed for 24 hours**.

During this time, the bamboo completes its transformation into charcoal.

Step 10: Harvesting the Charcoal

After 24 hours:

- Remove the **soil cover**.
- Remove the **jute bag**.
- Collect the **charcoal pieces from the pit**.

These charcoal pieces are the **raw bamboo biochar**.

Activation of Biochar

After harvesting, the **activation process begins**. Raw biochar should not be applied directly to soil because it may temporarily absorb nutrients.

Instead, it should be **activated by mixing with compost, cow dung slurry, urine-based liquid manures, or microbial solutions**. This allows the pores of the biochar to absorb nutrients and beneficial microbes before being applied to the soil.

Once activated, bamboo biochar becomes a **powerful soil amendment** that improves soil fertility, microbial life, and crop productivity in the Baree.

The activation of bamboo biochar can also be enhanced by soaking the harvested biochar in **rice wash water** and then spreading it in the **root zone of large mother trees such as banyan-type trees** for about **48 hours**. The nutrient-rich rice water and the biologically active root zone attract **beneficial microorganisms, especially mycorrhizal fungi**, which colonize the porous spaces of the bamboo charcoal. This natural activation process enriches the biochar with microbial life before it is applied to the soil. For agricultural use, biochar with **50–65% carbon content** is considered ideal, as it provides stability and microbial habitat, while biochar with **more than 70% carbon content** may sometimes lead to temporary nutrient imbalance or nutrient adsorption in the soil.

7.8 HOW TO MAKE A BIO INTENSIVE RAISED BED FOR YOUR BAREE

What is a Bio-Intensive Raised Bed?

A **bio-intensive raised bed** is a planting bed where the soil is loosened deeply and enriched with organic matter so that crops grow in **soft, fertile, living soil**. The bed is slightly raised above ground level and farmers never step on it, allowing the soil to remain aerated and full of microbial life. This method helps produce more food in a small space while using locally available resources such as compost, dry leaves, manure, and bamboo biochar.

Why Bio-Intensive Raised Beds are Important in Barees

Bio-intensive raised beds bring several benefits to the Baree farming system.

First, they **improve soil fertility** because large amounts of organic matter are added during bed preparation. As this organic matter decomposes, it feeds soil microbes and gradually releases nutrients to plants.

Second, the raised structure allows **better drainage during heavy rain**, which is very useful in high rainfall regions.

Third, the soil in these beds can **hold more moisture**, reducing the need for frequent watering.

Fourth, the beds make it possible to grow **diverse crops in a small space**, including vegetables, herbs, spices, and medicinal plants.

Most importantly, the system uses **local bio-resources**, reducing the farmer's dependence on external fertilizers and chemicals.

Preparing a Bio-Intensive Raised Bed in the Baree

A **bio-intensive raised bed** is a small, carefully prepared bed designed to grow many crops together in a fertile, living soil system. It improves soil aeration, microbial activity, moisture retention, and nutrient cycling. Such beds are ideal for **Barees (homestead gardens)** where space is limited but diverse food crops like vegetables, herbs, and spices are grown.

Step-by-Step Method

- **Mark the Bed Area**
  Select a space measuring **3 feet wide and 6 feet long**. Mark the boundary clearly.
- **Divide the Bed into Three Blocks**
  Divide the lengthwise area into **three blocks of 2 feet each**.
- **First Block Digging**
  - Dig out **1 foot of soil** from the first block.
  - Keep the removed soil aside near the bed.
  - Loosen the soil at the bottom of the pit using a fork or spade.
  - Place a **1-inch layer of pencil-thick dry twigs or small dry branches** at the bottom.
- **Second Block Digging**
  - Dig the second block to **1 foot depth**.
  - Put this soil into the **first pit over the twig layer**.
  - Break the soil clods and level it.
  - Loosen the bottom of the second pit and add **1 inch of dry twigs or wood chips**.
- **Third Block Digging**
  - Dig the third block **1 foot deep**.
  - Move the soil to the **second pit**.
  - Break clods and level the soil.
  - Loosen the base of the third pit and place **1 inch of dry twigs or wood chips**.
- **Filling the Last Pit**
  Use the soil kept aside from the **first block** to fill the **third pit**, completing the double-digging cycle.
- **Build the Bed Frame**
  - Create a **6-inch-high bamboo wall** around the bed using equal-size bamboo pieces.

- Fix them firmly with nails to form a small enclosure.

➢ **Fill with Organic Biomass**

- Fill the bed with **dry leaves**.
- Moisten them with water. To save water, the leaves can be soaked beforehand.

➢ **Add the Fertile Top Layer**

Prepare a mix of:

- **Compost**
- **Virgin topsoil**
- **Powdered dry cow dung**

Spread a **3-inch layer** of this mixture over the leaves.

➢ **Add Bamboo Biochar**

Mix about **500 grams of bamboo biochar** into the top layer to enhance microbial life and nutrient retention.

➢ **Planting and Cropping**

Practice **mixed cropping** on the bed. Combine vegetables, herbs, and legumes such as:

- peas
- grams
- leafy vegetables
- local herbs

12. **Mulching**

Cover the bed with **paddy straw mulch** to conserve moisture, suppress weeds, and maintain soil life.

This bio-intensive raised bed system helps create **deep, loose, and biologically active soil**, allowing roots to grow easily while supporting diverse crops in a small Baree space. It also improves water retention and continuously feeds the soil with organic matter, strengthening the **living soil ecosystem**.

7.9 HOW TO PREPARE JEEVAMRIT FOR YOUR BAREE

What is Jeevamrit

Jeevamrit is a traditional liquid organic formulation used in natural and agroecological farming to enrich the soil with beneficial microorganisms. It is prepared from locally available natural ingredients such as cow dung, cow urine, jaggery, pulse flour, and soil. Rather than acting as a direct fertilizer, Jeevamrit works as a **microbial culture** that activates the biological life in the soil. When applied regularly, it helps convert organic

matter into plant-available nutrients and supports the development of a living and healthy soil ecosystem.

In natural farming systems, soil is considered a **living entity** full of microorganisms like bacteria, fungi, and actinomycetes. These microscopic organisms help in decomposing organic matter, releasing nutrients, and forming stable soil structure. Jeevamrit serves as food and a growth medium for these beneficial microbes, helping them multiply rapidly in the soil.

Why Jeevamrit is Important

The continuous use of chemical fertilizers often weakens soil biology and reduces microbial diversity. Jeevamrit helps restore this biological balance. Regular application improves soil fertility, enhances nutrient availability, strengthens plant health, and increases the soil's ability to retain moisture.

Some key benefits of Jeevamrit include:

- Enhances microbial population in the soil
- Improves decomposition of organic matter
- Helps plants absorb nutrients more efficiently
- Improves soil structure and aeration
- Reduces dependency on external chemical fertilizers
- Supports long-term soil regeneration

In Barees and natural farming systems, Jeevamrit is often applied to **raised beds, around fruit trees, and in vegetable gardens** to maintain soil vitality.

Ingredients Required

To prepare Jeevamrit, the following materials are commonly used:

- 10 kg fresh cow dung from indigenous cow
- 10 liters cow urine
- 2 kg jaggery (unrefined sugar)
- 2 kg pulse flour (such as gram flour)
- A handful of healthy topsoil from the farm or under a tree
- 200 liters of water

Each ingredient plays a role in building the microbial culture. Cow dung provides microorganisms, cow urine adds nutrients and enzymes, jaggery supplies energy for microbial growth, and pulse flour provides proteins and nitrogen that help microbes multiply. The handful of soil introduces diverse native microbes from the local ecosystem.

Method of Preparation

1. Take a large plastic drum or earthen container and add **200 liters of water**.

2. Add **10 kg of fresh cow dung** and mix it well in the water until it dissolves evenly.
3. Pour **10 liters of cow urine** into the mixture and stir thoroughly.
4. Add **2 kg jaggery** and dissolve it completely in the liquid.
5. Mix in **2 kg pulse flour** to provide nutrients for microbial growth.
6. Add a **handful of living soil** collected from a healthy farm area or from the root zone of a large tree.
7. Stir the mixture well with a wooden stick.

After mixing, cover the drum loosely with a cloth or lid to allow air circulation. Keep the container in a shaded place.

Fermentation Process

The mixture should be **stirred twice daily**, once in the morning and once in the evening, for proper aeration. Fermentation generally takes **3 to 5 days**, depending on the temperature. During this time, beneficial microorganisms multiply rapidly in the solution.

Once fermentation is complete, Jeevamrit is ready for use.

Application in the Baree

Jeevamrit can be applied in different ways:

- As a **soil drench** around vegetable beds and fruit trees
- Mixed with irrigation water
- Applied in **raised beds and no-tillage beds** to activate soil microbes

For small beds, about **1–2 liters of Jeevamrit diluted in water** can be applied around the root zone. Regular application every **10–15 days** helps maintain an active microbial population in the soil.

By using Jeevamrit regularly, farmers can strengthen the biological processes in the soil and move towards **self-reliant, low-cost, and regenerative farming systems** in their Barees and fields.

7.10 HOW TO PREPARE GHANJEEVAMRIT FOR YOUR BAREE

Ghan Jeevamrit: What, Why and How

What is Ghan Jeevamrit

GhanJeevamrit is the **solid form of Jeevamrit**, prepared using similar natural ingredients but converted into a dry, compost-like material. While Jeevamrit is a liquid microbial culture applied through irrigation or soil drenching, GhanJeevamrit is applied directly to the soil as granules or powder. It acts as a **microbial inoculant and soil**

activator, enriching the soil with beneficial microorganisms that help break down organic matter and release nutrients to plants.

This preparation is especially useful in Barees, orchards, raised beds, and vegetable gardens where a solid microbial amendment is easier to store and apply. Because it is dry, Ghan Jeevamrit can be stored for several weeks and used whenever needed.

Why Ghan Jeevamrit is Important

Healthy soil is full of living organisms that help plants grow naturally. Modern farming practices often reduce this biological activity. GhanJeevamrit helps rebuild this living soil by introducing and multiplying beneficial microbes.

Some important benefits include:

- Increases microbial activity in the soil
- Improves decomposition of organic matter
- Enhances nutrient availability to plants
- Improves soil structure and root growth
- Helps maintain soil moisture and fertility
- Reduces dependence on external fertilizers

In agroecological systems and Integrated Farming Systems (IFS), GhanJeevamrit supports the idea that **soil fertility should come from biological processes rather than chemical inputs**.

How to Prepare GhanJeevamrit

The preparation process is simple and uses locally available farm materials.

Ingredients

- 10 kg fresh cow dung (preferably from indigenous cow)
- 1–2 liters cow urine
- 1 kg jaggery (unrefined sugar)
- 1 kg pulse flour such as gram flour
- A handful of healthy topsoil from the farm or under a tree

Preparation Method

1. Take fresh cow dung in a clean container or on a plastic sheet.
2. Add cow urine and mix thoroughly with the dung.
3. Add jaggery and pulse flour to the mixture.
4. Add a handful of healthy farm soil to introduce diverse local microorganisms.
5. Mix all ingredients well until a uniform paste is formed.

After mixing, shape the mixture into **small balls or lumps** and place them in a shaded area for drying. The mixture should not be dried under direct sunlight, as extreme heat can reduce microbial activity.

Allow the lumps to **dry for about 2–3 days** until they become firm. Once dry, they can be crushed into small granules or powder.

Application in the Baree

GhanJeevamrit can be applied in several ways:

- Sprinkle **200–400 grams per plant** around the root zone of fruit trees.
- Apply along **vegetable beds and raised beds** before sowing or planting.
- Mix it lightly with soil or cover with mulch to maintain moisture.

When applied to the soil, moisture activates the microbes present in GhanJeevamrit, and they begin multiplying in the soil ecosystem.

By preparing GhanJeevamrit using farm resources, farmers can maintain **biologically active, fertile soils** in their Barees and fields while reducing the cost of external inputs.

t ACTIVITY

Collect kitchen waste, dry leaves and crop residues to prepare a compost pit or compost bin. Observe the decomposition process and record the changes over one month.

2 7.11 LET US SUM UP

- Compost making is one of the most important soil care practices in Baree-Unnayan. It converts farm and household waste into a **valuable organic fertilizer** that nourishes soil, supports microbial life, and improves crop productivity
- By adopting simple composting methods such as **heap compost, pit compost, and trench compost**, farmers can recycle local bio-resources and reduce their dependence on external inputs. This practice strengthens the ecological health of the Baree while producing safe and nutritious food for the family.
- Compost therefore serves as the **foundation of living soil and sustainable homestead farming**.
- For efficient composting in a **Baree-Unnayan system**, the Baree should be properly organized so that different bio-resources are collected and processed systematically.
- A **clean and well-managed cow shed** should have a designated **cow dung collection pit** where fresh dung can be stored for composting or preparation of liquid manures. Similarly, manure from other **permissible livestock such as**

goats, poultry, pigs, and ducks should be collected in separate **manure drying pits**, where it can be dried before being added to compost heaps.

- A **dry leaves collection pit** should be maintained to store fallen leaves from trees and crop residues, ensuring a steady supply of carbon-rich materials for compost preparation.
- There should also be a **green biomass collection area** where weeds, kitchen waste, banana pseudostem pieces, and other fresh plant materials are gathered, with a small space allocated for **removing roots from weeds** before composting to prevent regrowth.
- Organizing the Baree in this manner ensures that all organic resources are efficiently recycled within the farm. Composting thus becomes a key component of the **Integrated Farming System (IFS)**, where crops, trees, and livestock are interconnected, and wastes from one component become valuable inputs for another, creating a sustainable and self-reliant farming system.
- Seed saving and seed treatment are essential practices in agroecological Baree farming. By selecting strong mother plants, carefully collecting seeds, storing them properly, and treating them before sowing, farmers can maintain the vitality of traditional crops.
- These practices protect biodiversity, reduce dependency on external seed systems, and strengthen the resilience of farming communities. When farmers save their own seeds and nurture them carefully, they protect not only their crops but also the **future of food sovereignty and agroecological farming systems**.
- Bamboo biochar production using the **double pit method** is a simple and effective way to convert waste bamboo into a valuable soil input. This practice strengthens the agroecological system of the Baree by improving soil structure, increasing water retention, and supporting beneficial microorganisms.
- By transforming locally available bamboo waste into biochar, farmers can enhance soil health, recycle farm resources, and move towards a **more resilient and sustainable farming syste**

O7.12 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University.

https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam

2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 7.13 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q 1: Preparing bio-inputs at home reduces cultivation costs, utilizes locally available resources, improves soil health, reduces dependence on chemical inputs and promotes environmentally friendly farming.

Answer to Q 2: Organic nutrient inputs include compost, vermicompost, Jeevamrit, Ghan Jeevamrit and Panchagavya. Botanical plant protection inputs include neem leaf extract, chilli-garlic extract, Dashaparni Ark and cow urine-based bio-pesticides.

Answer to Q 3: Seed conservation protects indigenous crop varieties, preserves genetic diversity and ensures seed availability. Natural seed treatment improves germination, protects seeds from diseases and pests, and reduces dependence on chemical seed treatments.

M7.14 MODEL QUESTIONS

Q 1: Explain the importance of preparing bio-inputs at home for sustainable Baree-Unnayan.

Q 2: Describe the preparation and application of any four organic nutrient inputs used in homestead farming.

Q 3: Discuss the preparation and uses of botanical bio-pesticides for eco-friendly pest management.

Q 4: Explain the methods of seed conservation and natural seed treatment using indigenous practices.

Q 5: Discuss how home-prepared bio-inputs contribute to soil health, crop productivity and climate-resilient agriculture.

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UNIT 8: THE DIVERSIFIED AND COMPANION CROPPING PATTERN OF AGROECOLOGICAL TRANSFORMATION

UNIT STRUCTURE

8.1 Learning Objectives
8.2 Introduction
8.3 Importance of Diversity in the Baree
8.4 Multi-Storeyed Cropping and Agroforestry
8.5 Companion Cropping in No-Tillage Beds& Bio intensive Raised Beds
8.6 Live Fences for the Baree
8.7 Diversifying Farming Activities in the Baree
8.8 Designing the Baree for Agroecological Transformation
8.9 Bamboo as an Integral Part of the Baree
8.10 Let Us Sum Up
8.11 Further Reading
8.12 Answers to Check Your Progress
8.13 Model Questions

8.1 LEARNING OBJECTIVES

After going through this unit, we will be able to,

- explain the concepts of diversified cropping and companion cropping.
- identify suitable companion crop combinations for Barees.
- describe the ecological and economic benefits of crop diversification.
- explain how diversified cropping contributes to agroecological transformation.
- appreciate the role of traditional knowledge in promoting sustainable and climate-resilient farming.

8.2 INTRODUCTION

A **Baree (homestead garden)** has traditionally been a naturally diversified food production system. Unlike monocropping fields, the Baree grows many types of plants together-trees, vegetables, herbs, spices, creepers, and flowers. This diversity creates a **balanced ecosystem** where plants support each other, soil remains fertile, and pest

outbreaks are minimized. In agroecological transformation, the Baree becomes a living example of how **diversity can produce healthy food while maintaining ecological balance**.

8.3 IMPORTANCE OF DIVERSITY IN THE BAREE

Diversity is the foundation of a resilient farming system. When many different crops grow together, the farm becomes more stable and productive. Different plants have different root depths, nutrient needs, and growth habits. This allows them to share soil resources rather than compete heavily with each other.

A diversified Baree provides many benefits:

- Continuous supply of vegetables, herbs, fruits, and spices for the household
- Better soil fertility through natural nutrient cycling
- Reduced pest and disease incidence
- Improved biodiversity of beneficial insects and microorganisms
- Reduced risk of crop failure

Diversity also means **food security and nutritional security** for the family, as the Baree becomes a living food basket throughout the year.

8.4 MULTI-STOREYED CROPPING AND AGROFORESTRY

A well-designed Baree follows the principle of **multi-storeyed cropping**, where plants grow at different heights, just like a natural forest.

For example:

- **Upper layer:** large trees such as jackfruit, mango, bamboo, or other agroforestry trees
- **Middle layer:** fruit trees such as guava, citrus, papaya, banana, or arecanut
- **Lower layer:** shrubs, vegetables, medicinal herbs, and spices
- **Ground layer:** leafy vegetables and creepers
- **Vertical layer:** climbers such as gourds, black pepper, betel vine, beans, and cucumbers

This layered system allows better use of sunlight, soil nutrients, and space, making the Baree highly productive even in a small area.

8.5 COMPANION CROPPING IN NO-TILLAGE BEDS& BIO INTENSIVE RAISED BEDS

Within the Baree, vegetables and herbs can be grown in **no-tillage beds or zero-tillage beds**, where soil disturbance is minimal and organic matter is continuously added through compost and mulching.

In these beds, crops should be planted in **companion combinations** rather than monocrops. Companion cropping means growing plants together that support each other in growth, nutrition, or pest management.

For example:

- **Peas with tomato:** Pea plants fix nitrogen in the soil, which helps tomato plants grow better.
- **Marigold with vegetables:** Marigold flowers help repel many harmful insects and also attract beneficial insects.
- **Chilli with coriander:** The strong smell of coriander helps repel aphids and other pests from chilli plants.

Such combinations create a **natural pest management system** and improve soil health.

Avoid Growing Crops from the Same Family Together

When planning beds, farmers should avoid planting crops belonging to the **same botanical family** together. Plants from the same family usually have similar nutrient requirements and are often attacked by the same pests and diseases.

Some common crop families include:

- **Solanaceae family:** brinjal (eggplant), tomato, chilli
- **Brassicaceae family:** cabbage, cauliflower, mustard greens, leafy mustard
- **Leguminaceae family:** peas, beans, pulses, gram

If crops from the same family are planted together in large numbers, they may become **heavy feeders of the same nutrients** and may also attract the same insects and diseases. This increases the risk of pest outbreaks and soil nutrient depletion.

By mixing crops from different families, farmers create **biological diversity and natural protection** in the garden.

8.6 LIVE FENCES FOR THE BAREE

Another important element of a diversified Baree is the **live fence**. Instead of artificial fencing, farmers can plant living plants along the boundary.

Plants like **Assam lemon and round lemon** can be planted closely along the borders. These plants serve multiple purposes:

- They protect the Baree from animals
- They produce fruits for household consumption and sale
- Their roots help hold the soil and prevent erosion
- They provide nectar for pollinators

Live fences also create a microclimate that protects crops from wind and excessive sunlight.

8.7 DIVERSIFYING FARMING ACTIVITIES IN THE BAREE

A truly agroecological Baree also integrates **different branches of farming**, making it an integrated and resilient production system.

These may include:

- **Agronomical crops:** cereals, pulses, oilseeds
- **Horticultural crops:** vegetables, fruits, spices, and herbs
- **Sericultural crops:** plants like mulberry for silkworm rearing
- **Agroforestry trees:** timber, bamboo, and multipurpose trees
- **Floriculture:** flowers for pollinators and income
- **Apiary:** beekeeping to improve pollination and produce honey

When these activities are integrated, the Baree becomes a **self-sustaining ecosystem** where crops, trees, insects, and animals support each other.

8.8 DESIGNING THE BAREE FOR AGROECOLOGICAL TRANSFORMATION

Planning the Baree carefully helps farmers maximize productivity and ecological balance. The design should combine:

- Multi-storeyed cropping
- Agroforestry trees
- No-tillage vegetable beds
- Companion cropping combinations
- Live fencing
- Integration of different farming activities

Through such planning, the Baree becomes more than just a garden. It becomes a **living model of agroecological farming**, producing diverse, healthy food while protecting soil, biodiversity, and farmer livelihoods.

A diversified Baree is therefore not only a source of food but also a **pathway toward ecological farming, resilience, and sustainable rural prosperity**.

8.9 BAMBOO AS AN INTEGRAL PART OF THE BAREE

Bamboo is an important and integral component of the traditional Baree system. It acts as a **natural carbon sink**, absorbing large amounts of carbon dioxide from the atmosphere and storing carbon in its biomass and root system, thus contributing to climate resilience. Bamboo grows quickly and regenerates naturally, making it one of the most sustainable plants in the Baree. It provides multiple uses for the household and farm such as **construction materials, fencing, baskets, tools, stakes for climbing plants, and raw material for biochar preparation**. The fallen bamboo leaves also contribute organic matter to the soil and support soil microbial life. By planting and maintaining bamboo clumps in the Baree, farmers create a **renewable resource base that supports both ecological balance and rural livelihoods**

W CHECK YOUR PROGRESS

Q 1: What is diversified cropping? How does it differ from monocropping?

Q 2: What is companion cropping? Give any two suitable crop combinations followed in Barees.

Q 3: Mention three benefits of diversified and companion cropping in sustainable agriculture.

t ACTIVITY

Prepare a Crop Diversity Map

Visit your Baree and prepare a simple layout showing different crops grown together. Identify canopy trees, fruit trees, vegetables, spices and medicinal plants.

2 8.10 LET US SUM UP

- Diversified and companion cropping are key components of the traditional Baree system and form the basis of agroecological transformation.

- By growing different crops together in compatible combinations, farmers maximize resource use, improve soil fertility, conserve biodiversity and reduce dependence on chemical inputs.
- These practices enhance food and nutritional security, increase farm resilience to climate change and provide sustainable livelihoods.
- Barees demonstrate how indigenous knowledge and ecological principles can work together to create productive, resilient and environmentally friendly farming systems.

O 8.11 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University. https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam
2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 8.12 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q 1: Diversified cropping is the cultivation of a variety of crops on the same farm to improve productivity, reduce risk and maintain ecological balance. Unlike monocropping, it promotes biodiversity and efficient resource use.

Answer to Q 2: Companion cropping is the practice of growing compatible crops together for mutual benefit. Examples include:

- Banana with turmeric and ginger.
- Maize with beans.
- Papaya with vegetables.
- Arecanut with black pepper.

Answer to Q 3: Diversified and companion cropping:

- Improve soil fertility and biodiversity.
- Reduce pest and disease incidence naturally.
- Enhance food security, farm income and climate resilience.

M 8.12 MODEL QUESTIONS

Q 1: Define diversified cropping. Explain its importance in sustainable Baree-Unnayan.

Q 2: What is companion cropping? Discuss its principles and advantages with suitable examples.

Q 3: Explain how diversified cropping contributes to agroecological transformation and climate resilience.

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UNIT 9: AGROFORESTRY IN THE BAREES

UNIT STRUCTURE

9.1 Learning Objectives
9.2 Agroforestry: Concept and Principles
9.3 Live Fencing for Protection and Produce
9.4 Multi-storeyed Food Forest Planting Pattern
9.5 Let Us Sum Up
9.6 Further Reading
9.7 Answers to Check Your Progress
9.8 Model Questions

9.1 LEARNING OBJECTIVES

After going through this unit, we will be able to,

- explain the concept and principles of agroforestry.
- describe Barees as traditional agroforestry systems.

9.2 AGROFORESTRY: CONCEPT AND PRINCIPLES

Agroforestry Integration: The Northern Spine : Agroforestry is the backbone of the Baree system, providing **timber, shade, carbon sinks, biodiversity niches, windbreaks**, and **marketable produce**. On the **northern edge** of the homestead where sunlight is least obstructed-**tall timber-yielding species** like;**Titasopa (*Artocarpus chama*), Mahogany (*Swietenia macrophylla*), Gomari, Som, Bamboo (various indigenous species)** are planted to form a **wind-buffered and resource-rich wall**. These trees serve not just ecological functions but economic ones, such as **bamboo shoot and leaf tea production**, and **bamboo biochar manufacturing**.

Fodder grasses like **Napier** or **Stylosanthes** are also planted in this northern zone to support livestock units, thereby making fodder availability hyper-local and perennial.

9.3 LIVE FENCING FOR PROTECTION AND PRODUCE

The **perimeter of the homestead** is fortified using **live fencing**—a natural hedge made from **thorny citrus and fruit-bearing species**, including:

- **Assam Lemon** (*Citrus limon*)

- **Round Lemon**
- **Wood Apple (*Limoniaacidissima*)**
- **Poniol (*Flacourtiajangomas*)**
- **Native oranges**

These not only protect the homestead from grazing animals and trespassers but also provide **fruits, pickling material**, and **extra income**.

W CHECK YOUR PROGRESS

Q 1: Q1. What is agroforestry? Why are Barees considered traditional agroforestry systems?

Q2. Mention any three ecological benefits of agroforestry in Barees.

9.4 MULTI-STOREYED FOOD FOREST PLANTING PATTERN

The cropping pattern inside the homestead follows a **multi-tier system**:

- **Upper Layer:** Fruit trees like **Pomelo, Burmese plum, Garcinia, peaches, plums**, and other site-specific native varieties.
- **Middle Layer:Banana, papaya, moringa, mulberry**, and trellised crops like cucurbits.
- **Lower Layer:Turmeric, ginger, colocasia, yam, sweet potato**, **local chillies**, and **herbs** like tulsi and lemongrass.
- **Ground Layer:Medicinal ground covers** like **Centella asiatica**, **Thai coriander**, and various soil-binding creepers create a **live mulch** that protects and feeds the soil.

Each layer complements the others in nutrient cycling, moisture retention, and pest control.

2 9.5 LET US SUM UP

- Agroforestry is a sustainable land-use system that integrates trees, crops and livestock to improve productivity while conserving natural resources.
- The traditional Baree of Assam is an excellent example of an agroforestry system, where multistoreyed vegetation enhances biodiversity, improves soil fertility, regulates the microclimate and supports nutrient cycling.
- Agroforestry also contributes to food and nutritional security, carbon sequestration, climate resilience and diversified livelihoods. By combining

indigenous knowledge with modern agroecological principles, Barees demonstrate a practical model for sustainable rural development and environmental conservation.

O9.6 FURTHER READING

1) Ulman, Y., Kumar, A., & Sharma, M. (2022). Traditional agroforestry systems and practices of Assam. *Indian Journal of Traditional Knowledge, 21*(2), 414–424. https://doi.org/10.56042/ijtk.v21i2.31569

K 9.7 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q 1: Agroforestry is a land-use system that incorporates trees, crops and sometimes livestock on the same land with a objective to improve productivity and environmental sustainability. Barees are considered traditional agroforestry systems because they combine fruit trees, timber species, vegetables, spices, medicinal plants and livestock in a multistoreyed arrangement.

Answer to Q 2: Three ecological benefits of agroforestry are:

- Conservation of biodiversity and wildlife habitats.
- Improvement of soil fertility through nutrient recycling.
- Conservation of soil moisture and regulation of the local microclimate.

M9.8 MODEL QUESTIONS

Q 1: What is Agroforestry

Q 2: Explain how agroforestry contributes to sustainable Baree-Unnayan and climate-smart agriculture with suitable examples.

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UNIT 10: KEEPING THE BAREE HEALTHY

UNIT STRUCTURE

10.1 Learning Objectives
10.2 Growing Healthy Local Plants and Conserving Indigenous Seeds
10.3 Planning the Baree Layout
10.4 Maintaining an Integrated Farming System (IFS)
10.5 Bamboo Biochar and Farm Resource Management
10.6 Application of Organic Inputs and Ecological Pest Management
10.7 Livestock Integration in the Baree)
10.8 Water Management and Bio-resource Units
10.9 A Healthy Baree as a Living Agroecological System
10.10 Let Us Sum Up
10.11 Further Reading
10.12 Answers to Check Your Progress
10.13 Model Questions

10.1 LEARNING OBJECTIVES

After going through this unit, we will be able to,

- explain the essential components of a healthy Baree.
- understand the importance of local plant varieties and indigenous seed conservation.
- describe the role of integrated farming in maintaining a healthy agroecosystem.
- explain the importance of organic inputs, water management and nutrient recycling.
- appreciate how a healthy Baree functions as a self-sustaining agroecological system.

A healthy Baree is the foundation of a sustainable agroecological homestead. The health of the Baree depends on careful planning, proper integration of crops and livestock, recycling of bio-resources, and regular application of organic inputs. When managed properly, the Baree becomes a **self-sustaining living system** that produces healthy food while maintaining soil fertility and ecological balance.

10.2 GROWING LOCAL HEALTHY PLANTS AND KEEPING OWN SEEDS

The first step in maintaining a healthy Baree is to grow **locally adapted and healthy plant varieties**. Local crops are naturally suited to the climate, soil, and rainfall patterns of the region and often show better resistance to pests and diseases. Farmers should maintain **strong mother plants** and preserve their own seeds, ensuring independence and continuity of traditional crop varieties. Keeping seeds from healthy plants strengthens the local food system and maintains biodiversity in the Baree.

10.3 PLANNING THE BAREE LAYOUT

Proper planning of the Baree ensures efficient use of sunlight, water, and space. **Agroforestry trees should preferably be planted on the northern side** of the Baree so that they do not shade the vegetable beds and other crops. Fruit trees, palms, and timber species can be integrated with vegetables, herbs, spices, and creepers following a **multi-storeyed cropping system**.

At the base of palms and trees, **no-tillage beds** can be created using dry leaves and compost. These beds serve as compost mulch while also supporting herbs, spices, and small vegetables. Near the home, farmers can establish **bio-intensive raised beds** for growing frequently used vegetables and kitchen herbs.

10.4 MAINTAINING THE INTEGRATED FARMING SYSTEM (IFS)

A healthy Baree also integrates various components of an **Integrated Farming System (IFS)**. A small **pond (pukhuri)** can be developed to harvest rainwater, support fish culture, and maintain a cool microclimate. The edges of the pond can be planted with **fodder grasses and banana plants**, which stabilize the soil and provide additional resources for livestock.

A **live fence** made of plants such as Assam lemon or round lemon should be planted along the boundary. These fences protect the Baree while producing fruits and supporting pollinators.

Bee boxes can be placed in suitable areas where flowering plants are abundant. Bees improve pollination in crops and also provide honey as an additional source of income.

10.5 BAMBOO BIOCHAR AND FARM RESOURCE MANAGEMENT

Bamboo biochar preparation pits can be located near the **cow shed or compost area**. Bamboo residues can be converted into biochar and used to enrich soil. When bamboo is burned in a controlled way during **evening dusk**, the smoke can also help fumigate the cow shed and nearby plants, helping reduce pests and insects naturally.

10.6 APPLICATION OF ORGANIC INPUTS

Timely application of organic inputs is essential to keep crops healthy. Several practices can be followed:

- **Compost application as soil mulch** around plants to protect soil moisture and improve fertility.
- Periodic application of **compost mixed with bamboo biochar** to improve soil structure and microbial life.
- Use of **Jeevamrit and other liquid organic manures** during final land preparation.
- A second soil application of these liquid manures during the **flowering stage of crops** to support growth and fruiting.

Maintaining a **diversified cropping pattern** also contributes to plant health. In addition, simple ecological pest management practices such as **installing yellow sticky traps** and spraying herbal repellents like **five-leaf extract** can help control pests naturally.

10.7 LIVESTOCK AND ANIMAL COMPONENTS: HARMONIOUS INTEGRATION

Animals play an important role in nutrient cycling and livelihood in the Baree.

A **scientifically designed cattle shed** can be constructed using local materials to house indigenous cows such as the Lakhimi cow. The shed should be built on a gentle slope with proper systems for collecting **cow dung and urine**, which can then be used in composting and preparation of bio-inputs.

A **country chicken unit or duckery** can be established near water outlets or shaded bamboo areas. Poultry helps control insects while providing eggs and meat.

A **piggery unit** may be built at a hygienically safe distance from the house and other livestock units. Proper management allows pig waste to be composted or integrated with deep compost pits or biogas systems.

Beekeeping (apiculture) is another valuable component. Bees improve crop pollination and increase yields while also producing honey and other bee products.

Water Management: The Role of the Pukhuri (Pond)

Water is life for the Baree. A **rain-fed pond, locally called a pukhuri**, plays several important roles:

- Harvesting rainwater
- Providing irrigation during dry periods
- Supporting native fish culture
- Enabling duck farming and aquatic crops like water spinach or lotus
- Regulating temperature and humidity around the homestead

The pond also supports biodiversity and strengthens the ecological balance of the Baree.

10.8 BIO-RESOURCE UNITS: COMPOST AND BIOCHAR

To maintain a **chemical-free and self-reliant farming cycle**, every Baree should have dedicated bio-resource units such as:

- A **composting site** for kitchen waste, cow dung, and crop residues
- A **biochar pit** for converting bamboo and farm residues into charcoal
- A **bio-input preparation area** for making liquid manures and plant-based pest repellents such as Jeevamrit, Sanjeevak, and herbal extracts

These nutrient recycling systems reduce external input costs, improve soil fertility, and strengthen the ecological health of the Baree.

10.9 A LIVING SYSTEM OF HEALTH AND PRODUCTIVITY

When all these practices are followed together-diversified cropping, organic inputs, livestock integration, water management, and bio-resource recycling-the Baree becomes a **healthy, productive, and resilient ecosystem**. It provides nutritious food for the family, supports biodiversity, and sustains the farmer's livelihood while maintaining harmony with nature.

W CHECK YOUR PROGRESS

Q 1: Why is the cultivation of locally adapted plant varieties and seed conservation important in a Baree?

Q2: Mention any three practices that help maintain a healthy Baree.

2 10.6 LET US SUM UP

- A healthy Baree is a self-sustaining agroecological system where crops, trees, livestock, water bodies and bio-resource units function together in harmony.
- The cultivation of locally adapted crops, conservation of indigenous seeds, proper planning of the Baree layout and integration of agroforestry, livestock and fisheries enhance productivity and ecological balance.
- Organic inputs such as compost, Jeevamrit and bamboo biochar improve soil health, while ecological pest management reduces dependence on chemical pesticides.
- Efficient water management through ponds and continuous recycling of farm resources create a resilient farming system that supports biodiversity, food and nutritional security, environmental sustainability and rural livelihoods.

O10.11 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University. https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam
2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 10.12 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q 1: Locally adapted plant varieties are better suited to local climatic conditions and are often more resistant to pests and diseases. Conserving indigenous seeds preserves biodiversity, reduces dependence on external seed sources and strengthens household food security.

Answer to Q 2: Three important practices are:

- Application of compost and other organic inputs.
- Maintaining diversified and multi-storeyed cropping.
- Recycling farm wastes through composting and biochar production.

M10.9 MODEL QUESTIONS

Q 1: Explain the concept of a healthy Baree. Discuss the essential practices required for maintaining it.

Q 2: Discuss the importance of indigenous seed conservation, diversified cropping and proper Baree planning for sustainable homestead farming

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UNIT 11: STEP-BY-STEP GUIDE TO CREATING A HOMESTEAD FOOD FOREST – THE BAREE UNNAYAN

UNIT STRUCTURE

11.1 Learning Objectives
11.2. A Practical Directive to Build the Integrated Homestead Ecosystem
11.3 Outcomes of a Healthy Baree Ecosystem
11.4 Let Us Sum Up
11.5 Further Reading
11.6 Answers to Check Your Progress
11.7 Model Questions

11.1 LEARNING OBJECTIVES

After going through this unit, we will be able to,

- understand the step-by-step process of establishing a homestead food forest.
- prepare a functional layout and zoning plan for a Baree.
- integrate agroforestry, crops, livestock, water harvesting and bio-resource units into a single system.

11.2 A PRACTICAL DIRECTIVE TO BUILD THE INTEGRATED HOMESTEAD ECOSYSTEM

The **Homestead Food Forest** is not created overnight. It is **a living system**, co-created with the land, climate, local biodiversity, and the farmer's family. This chapter lays out **a practical stepwise process**, based on the Green Commandos Forum's model, to help any smallholder household transform their **'Baree'** into a **climate-resilient, productive, and balanced ecosystem**.

Step 1: Site Mapping and Assessment

Begin with a thorough observation of the homestead space:

- **Draw a rough layout** of your Baree/homestead on paper.
- Note:
  - **Sun direction (east-west path)**
  - **Slope or water flow (if any)**
  - **Existing trees and plant types**
  - **Shaded vs open areas**

- **Location of house, shed, water source, etc.**

- *This becomes your working map for the Food Forest design.*

Step 2: Decide Zones Based on Function

Divide your homestead into **functional zones**, keeping proximity to the house and light requirements in mind:

Zone	Function	Location (Ideal)
Zone 1	Kitchen garden, herbs, livestock	Near the house
Zone 2	Multistoried cropping, bee boxes	Middle area
Zone 3	Agroforestry, fodder, bamboo	Northern/windward side
Zone 4	Pukhuri (pond), piggery, ducks	Lowest area/sloped side
Zone 5	Compost & biochar, silkworm house, weaving	Back or side yard

Step 3: Establish Agroforestry Spine (North Edge)

Plant the taller, long-term trees along the **northern end** of the Baree:

- **Mahogany, Titasopa** – Timber and microclimate creators
- **Bamboo** – For fencing, leaf tea, shoots, crafts, biochar
- **Fodder trees and grasses** – Napier, Leucaena, Sesbania

These trees:

- Serve as windbreaks
- Provide shade and fodder
- Contribute to soil enrichment
- Help create a humid microclimate

Step 4: Create Live Fence Around Homestead

Plant a **productive boundary fence** using thorny and fruit-bearing species:

- **Assam lemon, round lemon, wood apple, Poniol, oranges**
- Space plants close for an impenetrable barrier
- Prune regularly to create a dense hedge
- Harvest fruits for consumption or sale

Step 5: Implement Multi-Storeyed Cropping System

Inside the homestead, plant in **layers** to maximize vertical space and light:

1. **Upper Layer (10–15 ft+):**
    - Pomelo, Burmese plum, Garcinia, Jackfruit, Mango, Litchi
2. **Middle Layer (4–10 ft):**
    - Banana, Papaya, Moringa, Guava, Mulberry
3. **Lower Layer (1–4 ft):**
    - Ginger, Turmeric, Sweet Potato, Colocasia, Herbs

- Local chillies, Beans, Lemongrass

4. **Ground Layer/Creepers (0–1 ft):**
    - Centella, Thai coriander, Indian pennywort
    - Seasonal vegetables (greens, gourds on trellis)

Apply **mulching and intercropping** to retain moisture, suppress weeds, and improve soil.

Step 6: Construct Livestock & Animal Units Scientifically

Design and place each animal unit with **waste recycling** and **compost integration** in mind:

- **Cow shed**: Locally built, well-ventilated, with urine collection system
- **Compost pit** nearby to collect dung + biomass
- **Poultry unit**: Moveable chicken tractors or duck shelter near water
- **Pig sty**: Towards rear or downhill, with compostable bedding
- **Apiary (bee boxes)**: Place under flowering trees for shade + nectar

Ensure all shelters are:

- Easy to clean
- Connected to the compost cycle
- Away from food preparation areas

Step 7: Develop Water Harvesting Structures

- Dig a **pond (Pukhuri)** in the lowest/sloped area of the Baree
- Ensure rainwater channels naturally drain into it
- Stock with **local fishes** like Rohu, Mirika, or indigenous species
- Use pond edges for **lotus, aquatic herbs, taro, water spinach**
- Integrate ducks or floating plants for nutrient cycling

Step 8: Integrate Sericulture and Weaving

- Plant **Mulberry**, **Som**, or **Soalu trees** in one section
- Construct a **simple silkworm shelter** in a shaded area or spare room
- Rear**Eri silkworms** using local feedstock
- Set up a **traditional handloom** for household or collective weaving
- Begin value-addition with basic training (scarves, stoles, fabric pieces)

This unit creates **local livelihood**, especially for women and elder family members.

Step 9: Install Composting & Biochar Units

- Build a **composting pit**: 5 ft x 3 ft, mud-lined or brick wall or Heap Composting.
- Use kitchen waste, cow dung, dry leaves, and green biomass
- Add **biochar** from bamboo pits for enriched compost
- Install a **simple bamboo biochar kiln** or pit-style setup
- Train family in **liquid biofertilizers** like Jeevamrit or fermented herbal sprays

Step 10: Maintain and Evolve the System

- Keep a **seasonal calendar** of planting and harvesting
- Record yields, compost added, pests observed
- Involve all family members-assign roles for watering, weeding, feeding, etc.
- Conduct **monthly observation walks** to adapt the system to changing needs
- Participate in **GCF group meetings** to share insights, seeds, and innovations

W CHECK YOUR PROGRESS

Q 1: Why is site mapping and functional zoning important before establishing a Baree food forest?

Q 2: Mention any four major components of a homestead food forest.

11.3 OUTCOME: A SELF-SUSTAINED, HAPPY ECOSYSTEM

By following these steps, the Baree transforms into a:

- **climate-smart production unit**
- **healthy food source**
- **cultural heritage space**
- **microenterprise hub**
- **sanctuary of biodiversity**
- **balanced, contended lifestyle system**

2 11.4 LET US SUM UP

- The establishment of a homestead food forest is a gradual process that combines ecological planning with traditional knowledge and modern agroecological practices.
- Beginning with site assessment and functional zoning, the Baree is developed through agroforestry, live fencing, multi-storeyed cropping, livestock integration, water harvesting and bio-resource recycling.
- Additional enterprises such as beekeeping, sericulture and weaving diversify livelihoods and increase household income.
- Regular monitoring, family participation and adaptive management ensure that the Baree remains healthy, productive and resilient. Ultimately, the Baree becomes a self-sustaining ecosystem that provides nutritious food, conserves

biodiversity, enhances climate resilience and supports sustainable rural livelihoods.

O11.5 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University. https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam
2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 11.6 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q 1: Site mapping and functional zoning help utilize land, sunlight, water and available resources efficiently. They ensure proper placement of crops, trees, livestock and water bodies for maximum productivity and ecological balance.

Answer to Q 2: Four major components are:

- Agroforestry trees
- Multi-storeyed food forest
- Livestock units
- Rainwater harvesting pond (Pukhuri)

M11.7 MODEL QUESTIONS

Q 1: Explain the step-by-step process involved in establishing a homestead food forest under the Baree-Unnayan model.

Q 2: Discuss the importance of site mapping and functional zoning in designing a sustainable Baree.

Q 3: Describe the role of agroforestry, multi-storeyed cropping and live fencing in the development of a homestead food forest.

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UNIT 12: BAREE UNNAYAN AND SUSTAINABLE LIVELIHOODS – VALUE ADDITION AND MARKETING

UNIT STRUCTURE

12.1 Learning Objectives
12.2 Introduction
12.3 Baree as a Sustainable Livelihood System
12.4 Baree as Agro Educational Eco Tourism tool
12.5 Let Us Sum Up
12.6 Further Reading
12.7 Answers to Check Your Progress
12.8 Model Questions

12.1 LEARNING OBJECTIVES

After going through this unit, we will be able to,

- explain the role of Baree in promoting sustainable livelihoods.
- identify opportunities for value addition of products obtained from the Baree.
- understand different marketing strategies for Baree products.

12.2 INTRODUCTION

The **Assamese Baree (homestead garden)** has immense potential to become a strong foundation for building **Atmanirbharshil (self-reliant) rural livelihoods**. When managed through agroecological principles and diversified production, the Baree becomes more than just a food garden—it becomes a **small economic ecosystem** that supports climate-friendly and sustainable income generation. Through value addition, collective marketing, and community enterprises, the products of the Baree can be transformed into high-value goods that strengthen household income and local economies.

One of the simplest examples is the **live fence of Assam lemon and round lemon** planted around the Baree. These lemons fetch good prices in local markets. When farmers work together through community groups or cooperatives, lemons can be **clustered and processed** into value-added products such as pickles, squashes,

preserved lemon slices, and herbal drinks. Even **lemon peels** have commercial value, as they are used for natural flavour extraction in distilleries and herbal products.

12.3 BAREE AS A SUSTAINABLE LIVELIHOOD SYSTEM

Beekeeping in the Baree enhances both crop productivity and income. Bees help pollinate fruits and vegetables while producing **high-quality organic honey**, which has strong demand in local and urban markets. Honey, beeswax, and other bee products can become important sources of additional income for farm families.

Many plants grown in the Baree can be developed into **low-volume, high-value wellness products**. For example, **blue pea flowers** grown on no-tillage beds around arecanut palms and **roselle plants** grown on raised beds can be processed into herbal teas and natural food colourants. Tender leaves from **bamboo, agar trees, and mulberry trees** can also be processed into herbal beverages and wellness products, creating new market opportunities.

Agroforestry trees in the Baree also contribute to livelihood security. **Bamboo and timber trees** provide raw materials for house construction, fencing, farm tools, and handicrafts. Bamboo craft products, baskets, and utility items can be developed and sold through local markets and artisan networks, increasing the economic value of these resources.

Vegetables, herbs, and spices grown in the Baree contribute to income in two ways. First, they **save household expenses** by providing fresh and healthy food throughout the year. Second, surplus production can be sold in local markets, ensuring a steady flow of small but consistent income. These crops also support household nutrition by providing **diverse and healing foods** grown without harmful chemicals.

Livestock components of the Baree also support livelihood generation. **Country chicken** provides high-value meat and eggs that are preferred in local markets. Indigenous cows such as the **Lakhimi cow** produce **A2 milk**, which is highly valued for family consumption and niche markets. In addition, cow dung and cow urine can be processed into **organic manures, bio-inputs, and natural farming formulations**, which can be used on the farm or sold to other farmers.

Fruit trees grown in the Baree contribute to both nutrition and income. Fruits such as banana, papaya, guava, citrus, and jackfruit provide healthy food for the household, while surplus fruits can be processed into **pickles, preserves, dried fruits, juices, and traditional food products** that have a longer shelf life and higher market value.

W CHECK YOUR PROGRESS

Q 1: What is meant by value addition? Give any two examples of value-added products prepared from the Baree.

Q 2: How does beekeeping contribute to sustainable livelihoods in the Baree?

12.4 BAREE AS AGRO EDUCATIONAL ECO TOURISM TOOL

Beyond production and processing, the Baree itself can become a **destination for agro-tourism**. Visitors are increasingly interested in experiencing natural farming systems, food forests, and traditional homestead agriculture. Farmers can develop **homestays and farm visits**, allowing guests to experience rural life, traditional food, and agroecological farming practices.

The Baree can also serve as a centre for **agro-educational tourism**, where students, farmers, and visitors learn about sustainable farming, natural inputs, biodiversity, and traditional knowledge systems. Such educational activities not only spread awareness but also create additional income opportunities for farm families.

In this way, the **Baree Unnayan model** becomes a pathway toward **sustainable livelihoods, ecological resilience, and rural prosperity**. By combining production, value addition, and marketing, the Baree transforms into a **self-reliant economic unit** that supports both the well-being of the family and the health of the environment.

2 12.5 LET US SUM UP

- The Baree is much more than a homestead garden; it is a diversified livelihood system that integrates food production, ecological conservation and income generation.
- Through value addition, products such as fruits, vegetables, herbs, honey, bamboo and livestock products can be transformed into high-value commodities with better market potential.
- Collective marketing through cooperatives, farmer groups and digital platforms further enhances profitability.
- Additional activities such as agro-tourism, agro-educational tourism, cottage industries and handicrafts create employment opportunities, particularly for women and rural youth.

- Thus, the Baree-Unnayan model promotes self-reliance, strengthens rural livelihoods, conserves biodiversity and supports climate-resilient, sustainable development.

O12.6 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University. https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam
2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 12.7 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q 1: Value addition is the process of increasing the economic value of agricultural products through processing, packaging or branding. Examples include lemon pickles, herbal teas, honey, fruit squashes, dried fruits and bamboo handicrafts.

Answer to Q 2: Beekeeping improves crop pollination, increases fruit and vegetable yields and produces honey, beeswax and other bee products, which provide additional income to farm families.

M12.8 MODEL QUESTIONS

Q 1: Explain the concept of sustainable livelihoods. Discuss how the Baree-Unnayan model promotes self-reliant rural development.

Q 2: Discuss the importance of value addition in increasing the income of Baree households with suitable examples.

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UNIT 13: NUTRITION AND HOUSEHOLD ECONOMICS WITH BAREE UNNAYAN

UNIT STRUCTURE

13.1 Learning Objectives
13.2 Introduction
13.3 Nutrition Security through Diversity
13.4 Baree and Household Economics
13.5 Low-Cost Farming through Local Resources
13.6 Baree for Self-Reliance and Sustainable Livelihoods
13.7 Vitamin and Mineral Balance for Women and Children through the Baree
13.8 Let Us Sum Up
13.9 Further Reading
13.10 Answers to Check Your Progress
13.11 Model Questions

13.1 LEARNING OBJECTIVES

After going through this unit, we will be able to,

- explain the role of Baree in ensuring household nutrition and food security.
- identify nutrient-rich crops, fruits, livestock and traditional plants grown in the Baree.
- describe the importance of the Baree in improving the nutrition of women and children.
- explain how Baree Unnayan reduces household expenditure and enhances family income.

13.2 INTRODUCTION

The **Baree Unnayan (homestead development)** approach plays a crucial role in improving both **household nutrition and family economics**. Traditionally, the Assamese Baree has been a living food basket where diverse crops, fruits, herbs, and livestock together provide balanced nutrition for the family throughout the year. When properly planned and managed, the Baree becomes a **source of healthy food, savings, and sustainable income**.

13.3 NUTRITION SECURITY THROUGH DIVERSITY

A well-developed Baree produces a wide variety of foods such as **leafy vegetables, roots, tubers, fruits, pulses, spices, herbs, eggs, milk, fish, and honey**. This diversity ensures that the household receives a balanced diet containing essential nutrients such as vitamins, minerals, proteins, and healthy carbohydrates. Fresh vegetables like mustard greens, coriander, gourds, beans, and tomatoes provide vitamins and minerals, while pulses and peas contribute plant proteins.

Fruit trees such as banana, papaya, guava, citrus, and jackfruit provide natural sources of vitamins and antioxidants. The integration of livestock further strengthens nutrition. **Country chicken provides eggs and high-quality protein**, while indigenous cows provide milk for the family. If the Baree includes a pond with local fish species, it adds another important source of protein and micronutrients.

The presence of medicinal herbs and traditional plants in the Baree also supports **preventive healthcare**, as many of these herbs are used in traditional diets and home remedies.

13.4 BAREE AND HOUSEHOLD ECONOMICS

Reducing Household Food Expenses

One of the most important economic benefits of Baree Unnayan is the **reduction in daily food expenditure**. Families that grow their own vegetables, fruits, eggs, milk, and fish spend much less money on purchasing food from markets. Even small homestead gardens can supply a significant portion of the household's food needs.

The savings generated through home production can be used for other essential expenses such as education, healthcare, or farm development. In this way, the Baree directly contributes to **household economic stability**.

Income from Surplus Production

When the Baree produces more than the household requires, the surplus can be sold in local markets. Fresh vegetables, fruits, herbs, honey, eggs, and traditional food products often fetch **good prices because they are locally grown and chemical-free**. Farmers can also process surplus produce into **value-added products** such as pickles, dried herbs, herbal teas, fruit preserves, and traditional snacks. These products have a longer shelf life and higher value, helping families increase their income.

13.5 LOW-COST FARMING THROUGH LOCAL RESOURCES

Baree Unnayan promotes the use of **locally available bio-resources** such as compost, bamboo biochar, animal manure, herbal extracts, and natural farming inputs. This reduces dependence on costly chemical fertilizers and pesticides.

Since most inputs are prepared within the homestead using farm waste and livestock resources, the **cost of cultivation becomes very low**, allowing farmers to maintain production with minimal external expenses.

W CHECK YOUR PROGRESS

Q 1: How does a diversified Baree contribute to household nutrition?

Q 2: Why are traditional leafy vegetables and wild edible plants important for women and children?

13.6 BUILDING SELF-RELIANT HOUSEHOLDS

The combination of **diverse food production, reduced expenses, and income from surplus products** makes the Baree an important tool for strengthening rural livelihoods. Families become less dependent on external markets for food and inputs, which increases resilience during economic or climate-related uncertainties.

Through Baree Unnayan, the homestead becomes a **centre of nutrition, health, and economic security**. It ensures that families eat healthy, chemical-free food while also improving their financial well-being. In this way, the Baree supports both **human health and sustainable rural development**

13.7 VITAMIN AND MINERAL BALANCE FOR WOMEN AND CHILDREN THROUGH THE BAREE

Women and children require a **balanced diet rich in vitamins and minerals** for healthy growth, immunity, and overall well-being. In many rural households, nutritional deficiencies such as **iron deficiency (leading to anemia), calcium deficiency, and lack of essential vitamins** are common, especially among women and young children. A well-managed Baree can play a vital role in addressing these deficiencies by providing **fresh, diverse, and nutrient-rich foods** throughout the year.

Traditional Barees are rich in **wild greens, ferns, herbs, and leafy vegetables** that are naturally high in micronutrients. Many of these plants grow easily in homestead

gardens and forest edges and have been part of traditional Assamese diets for generations.

For example, **edible ferns** commonly found in moist areas of the Baree are rich in **iron, calcium, and antioxidants**. These nutrients are especially important for women, as iron helps prevent anemia and supports healthy blood formation. Including fern vegetables in regular meals strengthens the body and improves immunity.

Leafy vegetables such as **amaranth (maatixaak or lalxaak)** are excellent sources of **iron, calcium, vitamin A, and vitamin C**. These nutrients are essential for the growth of children, improving eyesight, strengthening bones, and supporting immune health. Amaranth grows easily in the Baree and can be harvested repeatedly, making it an important component of daily nutrition.

Another valuable traditional herb is **masandari**, which is commonly used as a leafy vegetable in many households. It contains **important micronutrients, dietary fiber, and natural antioxidants**, which support digestion and help maintain overall health. Such herbs are easy to grow in no-tillage beds or along the edges of raised beds in the Baree.

Other leafy greens like **mustard leaves, coriander, and local herbs** also contribute important nutrients such as folate, potassium, and vitamins that support healthy growth in children and help women maintain energy and reproductive health.

By maintaining a **diversified Baree with seasonal leafy greens, herbs, and wild edible plants**, families can ensure a continuous supply of natural sources of vitamins and minerals. These foods are fresh, chemical-free, and culturally familiar, making them easy to incorporate into daily meals.

Thus, the Baree becomes not only a place of food production but also a **living nutrition garden**, supporting the health of women and children while preserving traditional food knowledge and dietary diversity.

2 13.8 LET US SUM UP

- Baree Unnayan plays a vital role in strengthening household nutrition and economic well-being.
- A diversified Baree supplies vegetables, fruits, pulses, herbs, eggs, milk, fish and medicinal plants that provide a balanced and nutritious diet throughout the year.

- Traditional leafy vegetables and wild edible plants are particularly valuable for meeting the nutritional needs of women and children by supplying essential vitamins, minerals and antioxidants.
- The Baree also reduces household food expenditure, generates income from surplus production and value-added products, and lowers cultivation costs through the use of locally available bio-resources.
- Thus, Baree Unnayan serves as an effective model for achieving nutrition security, household economic stability, self-reliance and sustainable rural development.

O13.9 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University. https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam
2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 13.10 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q 1: A diversified Baree provides vegetables, fruits, pulses, herbs, milk, eggs, fish and honey, ensuring a balanced diet rich in carbohydrates, proteins, vitamins and minerals throughout the year.

Answer to Q 1: Traditional leafy vegetables and wild edible plants are rich in iron, calcium, vitamins and antioxidants. They help prevent nutritional deficiencies, improve immunity and support the healthy growth of women and children.

M13.11 MODEL QUESTIONS

Q 1: Explain the role of Baree Unnayan in improving household nutrition and food security.

Q 2: Discuss the importance of traditional leafy vegetables, fruits and livestock products in meeting the nutritional needs of women and children.

Q 3: Explain how Baree Unnayan contributes to household economics by reducing expenditure and generating income.

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UNIT 14: EXTENSION SKILLS, TRAINING AND DEMONSTRATION

UNIT STRUCTURE

14.1 Learning Objectives
14.2 Introduction
14.3 Becoming a Living Model
14.4 Training through Demonstration
14.5 Leading with Action
14.6 Characteristics of a Good Extension Worker
14.7 Building Community Enterprises
14.8 From Individual Practice to Community Transformation
14.9 Let Us Sum Up
14.10 Further Reading
14.11 Answers to Check Your Progress
14.12 Model Questions

14.1 LEARNING OBJECTIVES

After going through this unit, we will be able to,

- explain the role of extension education in promoting Baree Unnayan.
- understand the importance of demonstration-based learning in agroecological farming.
- identify the qualities and responsibilities of an effective extension worker.
- describe how community participation and farmer-to-farmer learning strengthen Baree.

14.2 INTRODUCTION

"**Be the change that you wish to see in the world.**" — Mahatma Gandhi

The spirit of this message is deeply relevant for trainers and extension workers engaged in **Baree Unnayan and agroecological transformation**. A trainer or extension worker should not only speak about sustainable practices but must **practice them personally**. The most powerful way to inspire people is through **demonstration and action**. When farmers see real results in a living Baree model, they gain confidence and motivation to adopt similar practices.

14.3 BECOMING A LIVING MODEL

As a certified trainer in Baree Unnayan, the first responsibility is to **develop your own living model Baree**. This Baree should demonstrate all the important components of the agroecological homestead system—diversified cropping, composting, bamboo biochar preparation, no-tillage beds, bio-intensive raised beds, live fencing, livestock integration, bee boxes, pond-based systems, and organic input preparation.

When farmers visit and observe these practices working successfully, learning becomes **practical and experiential** rather than theoretical. Your Baree becomes a **living classroom**, where community members can see, touch, and understand the processes of natural farming.

14.4 TRAINING THROUGH DEMONSTRATION

Extension work in agroecology should always focus on **hands-on learning**. Instead of relying only on classroom lectures, trainers should explain the scientific and ecological principles of farming **while working in the field**. Demonstrations such as compost making, seed treatment, raised bed preparation, or biochar production allow farmers to learn by doing.

Such practical learning builds **confidence, skill, and ownership** among community members. When farmers participate directly in these activities, they are more likely to replicate the practices in their own Barees.

14.5 LEADING WITH ACTION

A true leader in agroecological transformation **leads through action rather than words**. Farmers trust what they see working in real life. By maintaining a healthy and productive Baree, the trainer becomes a **credible example** for the community.

The success of a trainer is not measured by applause after a training session but by the **number of farmers who replicate the living model** in their own homesteads. Replication is the true indicator that knowledge has been understood and adopted.

14.6 CHARACTERISTICS OF A GOOD EXTENSION WORKER

An effective extension worker or trainer should develop certain qualities that help build trust and inspire communities:

- **Lead by example** through a living demonstration model
- **Commitment to agroecological values and sustainability**

- **Patience and willingness to listen to farmers' experiences**
- **Ability to explain complex ideas in simple language**
- **Respect for local knowledge and traditional practices**
- **Encouragement of participatory learning and group work**
- **Consistency in field visits and follow-up support**
- **Honesty, humility, and dedication to community welfare**

These qualities help create strong relationships between trainers and farmers, which are essential for long-term transformation.

14.7 BUILDING COMMUNITY ENTERPRISES

After completing the certificate course, trainees should take the initiative to **motivate their community members** to adopt the Baree Unnayan approach. Each certified trainer should aim to **enroll at least five people from the community** in the training programme. Together, these trained members can establish multiple model Barees within the village.

When several households adopt these practices collectively, it becomes possible to **develop a community-based enterprise** around Baree Unnayan. Farmers can jointly produce organic inputs, process value-added products, market surplus produce, and promote agro-tourism activities.

W CHECK YOUR PROGRESS

Q 1: Why is a demonstration Baree considered an effective extension tool?

Q 2: Mention any four characteristics of a good extension worker.

14.8 FROM INDIVIDUAL PRACTICE TO COMMUNITY TRANSFORMATION

The goal of the training programme is not only to improve one Baree but to **transform the entire community's approach to food production, nutrition, and livelihoods**. When trainers demonstrate success through their own Barees and guide others with practical knowledge, the movement grows naturally.

Through **demonstration, training, and community collaboration**, Baree Unnayan can evolve into a powerful grassroots movement for **agroecological farming, nutrition security, and sustainable livelihoods**.

In this way, the extension worker truly becomes the change they wish to see—creating living examples that inspire others to follow.

2 14.9 LET US SUM UP

- Extension education plays a vital role in the successful implementation of Baree Unnayan. Demonstration-based learning enables farmers to understand and adopt agroecological practices through observation and participation.
- An effective extension worker leads by example, respects local knowledge and promotes participatory learning. By developing model Barees, organizing practical training and encouraging community participation, trainers help build self-reliant villages and strengthen sustainable livelihoods.
- Thus, extension workers become catalysts for transforming individual homesteads into community-wide movements for nutrition security, ecological conservation and rural prosperity.

O14.10 FURTHER READING

1) Barua, J. P., Ahmed, A. A., Gogoi, S., Pathak, S., & Hatibarua, P. (2019). *Baree: The home garden of Assam*. Assam Agricultural University. https://www.scribd.com/document/740979427/Baree-The-Home-Garden-of-Assam

2) Sarma, J. K. (2015.). *The benefits of a 'bari'*. NEZINE.

K 14.11 ANSWERS TO CHECK YOUR PROGRESS

Answer to Q 1: A demonstration Baree allows farmers to observe sustainable farming practices in real-life conditions. It promotes experiential learning, builds confidence and encourages farmers to adopt agroecological practices in their own homesteads.

Answer to Q 1: Any four characteristics are:

- Leads by example.
- Communicates effectively in simple language.
- Respects local knowledge and traditions.
- Is patient, honest and committed to community development.

M14.12 MODEL QUESTIONS

Q 1: Explain the importance of extension education and demonstration methods in promoting Baree Unnayan.

Q 2: Discuss the role and responsibilities of an extension worker in the dissemination of agroecological farming practices.

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