Tittle: Sustainable Agro-Technologies in Sri Lanka: In Vitro Plant Propagation, Rice Water Management & the Cascade System

Introduction

Environmental Conditions of the Dry Zone in Hambantota, Sri Lanka

Hambantota, located in the dry zone of Sri Lanka, experiences an arid to semi-arid climate with high temperatures throughout the year, averaging between 27°C and 32°C max 34 °C. The region receives an annual rainfall of approximately 1,000–1,250 mm, primarily during the northeast monsoon (October to January), while the rest of the year remains dry with prolonged drought periods. Strong winds are common, particularly during the southwest monsoon. The dominant soil types in Hambantota include Reddish-Brown Earth and Sandy Regosols, which are typically low in organic matter and nutrients. The soil has moderate to poor water retention capacity, making irrigation essential for agriculture. Saline and alkaline soils are also found in coastal and lagoon-adjacent areas, affecting crop productivity.

Social Background

The region's economy is largely based on agriculture, fisheries, and emerging industries. Major crops include paddy, maize, pulses, and drought-tolerant cash crops like coconut and cashew. Livestock farming, particularly cattle and goat rearing, is also significant. The population comprises rural farming communities, with recent developments in infrastructure, such as the Hambantota Port and Mattala Airport, influencing economic diversification and urbanization. However, challenges such as water scarcity and limited employment opportunities persist, shaping the socio-economic landscape of the region.

Introduction to the Student Mobility Program at UCIARS

The student mobility program at the University of Colombo Institute for Agro-technology and Rural Sciences (UCIARS) is designed to provide students from Southwest University, China, with hands-on experience and theoretical insights into tropical agriculture under Sri Lanka's dry zone conditions. This program offers a comprehensive understanding of sustainable agricultural practices, integrating both conventional and modern approaches to crop cultivation, livestock management, and advanced plant propagation techniques.

The curriculum is structured into two key modules. The first module focuses on the cultivation and management of tropical crops adapted to dry zone ecosystems, efficient livestock rearing techniques for meat and egg production, and infrastructure planning for farm operations. Additionally, it emphasizes irrigation and water resource management strategies essential for optimizing agricultural productivity in arid environments.

The second module introduces students to in-vitro propagation technologies, with a particular emphasis on tissue culture techniques for large-scale plant production. Practical sessions will include the application of cost-effective tissue culture methods for the mass propagation of banana and other commercially important crops, ensuring high-quality and disease-free planting material.

Throughout the program, students will be encouraged to apply resource optimization techniques to enhance productivity while considering agronomic, socio-economic, and regulatory factors. By participating in this program, students will gain valuable knowledge and practical skills that will equip them for future challenges in sustainable agriculture and agri-biotechnology.

Course schedule

Module: Plant In-vitro Propagation

Objectives

- Explore various in-vitro propagation technologies used for plant multiplication and conservation.
- Develop skills in cost-effective tissue culture techniques for large-scale plant production at the domestic level.
- Apply in-vitro tissue culture methods for the mass propagation of banana, ensuring high-quality and disease-free planting material.

Through Expert Seminars; Teaching Sessions

Low-cost options for domestic tissue culture, Media formulation, Plant regeneration systems, Micro-propagation of banana. Artificial seed production. Principals and protocols for plant chemical extraction via micro propagation technology.

Student Centered Field Work

Designing a tissue culture laboratory for in-vitro clonal propagation, Salts and hormone stock solution preparation, Murashige&Skoog medium preparations & formulations, Micro-tuber / micro-rhizome induction, Embryo culturing, Acclimatization methods for in-vitro propagated plants.

Duration: Theory 10 hours: Practical 30 hours

Location: UCIARS lecture halls and UCIARS tissue coculture laboratory

Research studies and other activities

1. Assessing Daily Crop Water Requirement of Paddy Under Irrigated Conditions in Dry Zone Sri Lanka

Project Objectives

This project aims to determine the daily crop water requirement of paddy using a barrel-type lysimeter, quantify evapotranspiration and percolation losses for optimized irrigation, analyze the impact of environmental factors on water consumption, and generate scientific data to support sustainable water resource management and policy development.

Significance of the project

Understanding the daily water requirements of paddy cultivation is essential for optimizing irrigation practices, improving water-use efficiency, and ensuring sustainable agricultural practices. This project aims to install a barrel-type lysimeter to measure evapotranspiration and percolation losses in paddy fields under controlled irrigation conditions.

By generating precise daily water balance data, this study will:

- Provide critical insights into the crop water requirement of paddy, aiding in efficient irrigation scheduling.
- Contribute to national water resource management strategies, especially in the context of climate variability and water scarcity.
- Enhance sustainable rice production through scientific data-driven decision-making.
- Serve as a foundation for future research collaborations and policy recommendations in precision irrigation for paddy cultivation.

This research is ongoing with the collaboration of Department of Agrarian Development, Sri Lanka.

Methodology

Barrel Type Lysimeter is installed at UCIARS Paddy field and students required to take daily measurements and relevant management practices.

Location UCIARS Farm

2. Other: Student Visit to Explore the Sri Lankan Cascade System

Objective

This project aims to facilitate a visit by students from Southwest University, China, to Sri Lanka to explore the ancient **Sri Lankan Cascade System (Ellangawa)** - a unique, sustainable water management system. The visit will provide firsthand experience in traditional and modern irrigation techniques, enhancing their understanding of sustainable agriculture and water conservation.

Activities

- Field visits to key cascade systems in Sri Lanka's dry zone.
- Discussions with local experts on ancient and modern irrigation practices.
- Collaborative workshops with Sri Lankan students and researchers.
- Cultural exchange programs to strengthen academic ties between institutions.

Expected Outcomes

- Improved knowledge of sustainable water management systems.
- Strengthened academic collaboration between Southwest University and UCIARS.
- Insights for applying traditional techniques in modern agricultural practices.

<u>Methodology</u>

- I. **Pre-Visit Orientation:**
 - Conduct an introductory session to familiarize students with the Sri Lankan Cascade System, its historical significance, and its role in sustainable water management.
 - Assign background reading materials and short research topics related to traditional irrigation and climate adaptation.

II. Field Exploration & Data Collection:

- Visit selected cascade systems in Sri Lanka's dry zone, guided by local experts and researchers.
- Observe and document key components such as reservoirs, feeder canals, spillways, and groundwater recharge areas.

• Engage in interactive discussions with local farmers and irrigation officers to understand practical applications and challenges.

III. Hands-on Learning & Collaboration:

50 km

- Participate in field-based demonstrations of water flow measurement, soil moisture analysis, and biodiversity assessments within the cascade ecosystem.
- Work in student teams (Sri Lankan and Chinese) conduct short surveys or interviews with stakeholders on the impact of climate change on the system.
- Location: Small Tank Cascade Systems in Walawe River Basin, Agrarian service center, Sri Lanka, Farm organizations

Number of days 02 days

Transportation