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Climate Smart Sericulture

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Sericulture is becoming more susceptible to the adverse effects of climate change, especially in Asia and Africa. Temperature, humidity, and precipitation variations have a direct impact on the physiology of silkworms and mulberry leaves which lowers the cocoon quality and yield. This study examines the new paradigm of climate-smart sericulture (CSS) an integrated strategy that uses ecological and technological innovations to increase the productivity, resilience, and mitigation potential of sericulture systems.

Introduction

Sericulture is an essential source of income for thousands of smallholder farmers, particularly women in tropical and subtropical areas. However, the sensitivity nature to climate change puts serious threats to both silk production and economic stability.

Climate-smart sericulture aligns with the broader Climate-Smart Agriculture (CSA) framework proposed by the FAO, which aims to:

- Increase productivity sustainably.
- Enhance resilience (adaptation).
- Reduce or remove greenhouse gas emissions.
- Promote fair outcomes.

Climate Change Impacts on Sericulture

Sericulture is particularly vulnerable to:

- **Temperature fluctuations:** Silkworms (*Bombyx mori*) are poikilothermic organisms; their development is optimal within 24–28°C. Deviations can cause larval mortality, delayed cocooning, and disease susceptibility.
- **Water stress:** Mulberry (*Morus spp.*) leaf yield and protein content are significantly reduced under drought, compromising larval nutrition.
- **Pest and disease outbreaks:** Changing climates alter the prevalence of bacterial, viral, and fungal pathogens such as flacherie, grasserie, and muscardine.

Climate-Smart Strategies in Sericulture

Adaptation Strategies

a) Climate-Resilient Mulberry Cultivation

- Introduction of drought- and heat-tolerant cultivars.
- Use of soil and water conservation techniques (e.g., contour bunding, mulching).
- Drip and sprinkler irrigation systems to improve water use efficiency.

b) Controlled Silkworm Rearing

- Adoption of low-cost, climate-modified rearing houses with temperature and humidity regulation using indigenous materials and modern sensors.
- Utilization of real-time weather forecasting tools and mobile apps to schedule larval rearing cycles.

c) Disease and Pest Management

- Emphasis on Integrated Disease Management (IDM) using probiotics, disinfectants (e.g., formalin, bleaching powder), and regular monitoring of silkworm health.

Mitigation Measures

- Mulberry plantations act as carbon sinks, sequestering ~6–8 tonnes of CO₂/ha/year.
- Reduction in GHG emissions via:
 - ✓ Organic manuring (vermicompost, green manure).
 - ✓ Utilization of silkworm litter for biogas production.
 - ✓ Minimizing chemical pesticide and fertilizer inputs through Integrated Nutrient Management (INM).

Productivity and Livelihood Enhancement

- Promotion of seri-based integrated farming systems, e.g., sericulture + apiculture + aquaculture, to diversify income and reduce risk.
- Empowering women through community-based cocoon and yarn processing units.
- Access to premium markets for organic and eco-certified silk products.

Research and Extension Needs

To scale up climate-smart sericulture, coordinated efforts are needed in the following areas:

- **Breeding and biotechnology:** Development of thermo-tolerant silkworm breeds and high-yielding mulberry varieties through molecular breeding and CRISPR.
- **Data-driven decision support systems (DSS)** for pest forecasting, irrigation scheduling, and rearing optimization.
- **Policy support** for carbon credits, green certification, and rural extension services.
- **Capacity building** through participatory training, demonstration farms, and ICT-based knowledge dissemination.

Conclusion

A practical way to turn traditional silk production into a resilient, low-carbon, and inclusive rural sector involves climate-smart sericulture. Through the integration of ecological principles, adaptive agronomic practices, and contemporary technologies, CSS can protect millions of people's livelihoods while also advancing more general environmental sustainability objectives.

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