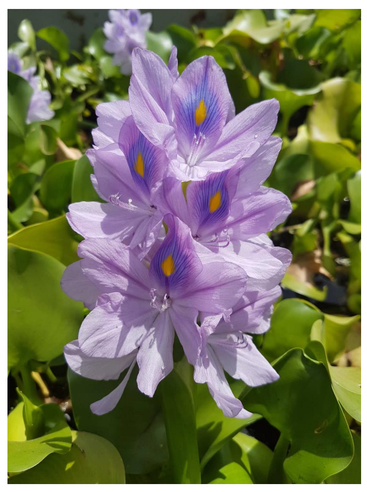
BEFWAM

Bioenergy, Fertilizer and Clean Water from Invasive Aquatic Macrophytes



BEFWAM: Bioenergy, Fertiliser and Clean Water from Invasive Aquatic Macrophytes

University of Leeds, UK; ICT-Mumbai, India; Visva Bharati University, India;
Defiant Renewables, India, CREEC, Uganda

AIMS AND OBJECTIVES

The aim of BEFWAM is to utilise the invasive aquatic biomass, water hyacinth, for the production of biogas, the cleaning of water and the recovery and production of fertilisers. The key objectives include:

1. The use of water hyacinth in combination with nutrient rich wastes to produce biogas by anaerobic digestion.
2. The development of simple upgrading strategies for upgrading biogas into high quality bio-methane.
3. The artificial cultivation of water hyacinth for cleaning water and recovering nutrients for production of fertiliser.

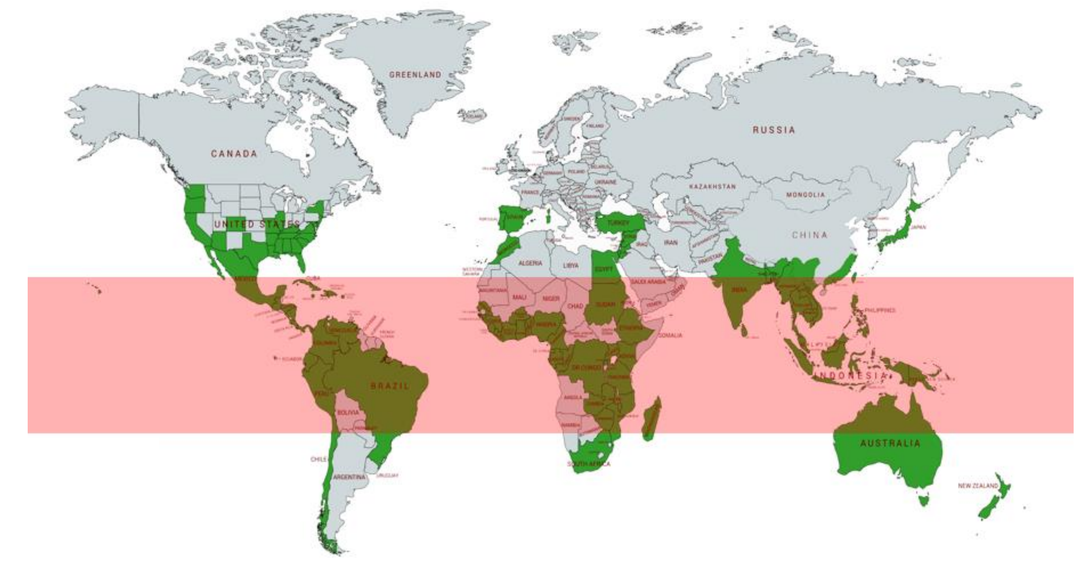
The project will demonstrate a range of integration strategies for the utilisation of water hyacinth in India and Uganda. One of the key approaches in BEFWAM includes the use of immobilised microbial systems, nutrient recovery via adsorption on to solid bio-derived media (e.g. biochar) and the development of simple biogas upgrading systems for CO2 removal and reuse (e.g. algal uptake, biomethanation via hydrogenotrophic methanogenesis).

INTRODUCTION

Water Hyacinth (*Eichhornia crassipes*) is an invasive free-floating fresh-water plant native to South America but is now prevalent across Asia and Africa.

It can form impenetrable mats, boost mosquito numbers, and deplete the water of dissolved oxygen—effectively suffocating fish.

Water bodies filled with sewage and fertilizer via eutrophication, create an ideal water hyacinth habitat

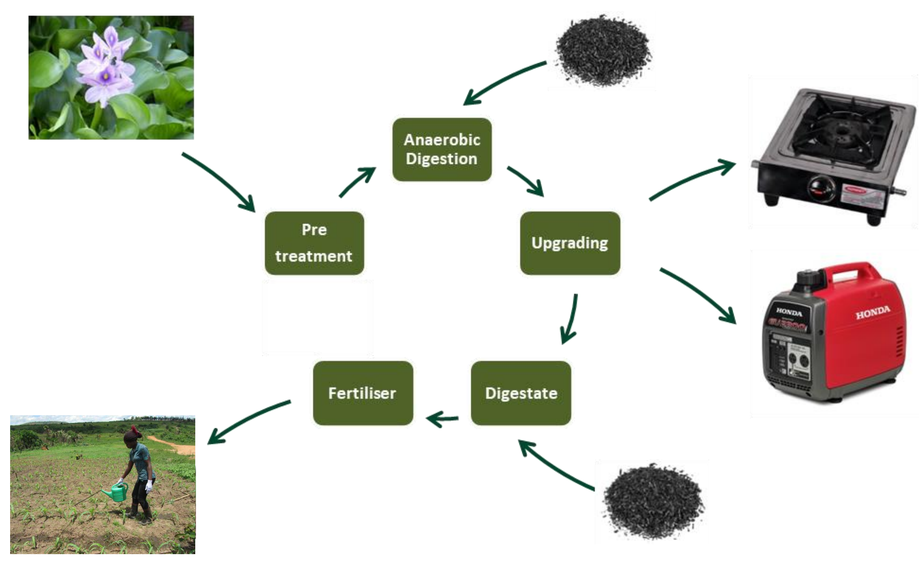


Regions known to have problems with Invasive Water Hyacinth

WORK PACKAGE STRUCTURE

The project is structured into 5 technical work Packages:

WP 1 Anaerobic conversion of invasive macrophytes;
WP 2 Routes to enhance methane yields and biogas quality;
WP 3 Development of immobilized bioreactors systems;
WP 4 Integrated approaches using invasive aquatic macrophytes;
WP 5 Environmental and social considerations.



The project will consider the utilisation of invasive biomass removed from lakes and rivers and artificial cultivation of water hyacinth in tanks.

A principle aim of the project is to develop small scale, low cost solutions, for anaerobic digestion of water hyacinth, biomass pre-treatment, biogas upgrading and utilisation of digestate as a fertiliser.

APPLICATION OF WATER HYACINTH

Bioenergy production
- Anaerobic digestion
- Fermentation to bioethanol
- Briquettes and Charcoal

Non-conventional source of protein
- Fish food
- Animal feed

Nutrient recovery
- Mulch and ideal for composting

Waste water treatment
- Phytoremediation (scavenging toxic elements and heavy metals)

Cooking with wood
- Health implications
- Supply chain/sustainability issues
- Simple and Accepted

Cooking with Biogas
- Cleaner but more complex
- Alternative feedstocks
- Improved operation/integration

One of key objectives of the project is to produce biogas for cooking to replace the use of fuel wood.

A number of integration approaches will be investigated including the harvesting of the invasive biomass and the artificial cultivation of water hyacinth.

INNOVATION AND IMPACT

AD Facility Visva Bharati University

One of the key aims of the project is promoting capacity building and facilitating knowledge transfer, transforming laboratory scale innovation into full scale application providing direct benefits to local communities.

The innovation will be transferred from laboraory to pilot scale by engaging with technology providers and operators of biogas test facilities in India and Africa..

The project will develop a number of small scale AD demonstration units utilising water hyacinth to clean water, provide fertiliser and bio-energy in rural areas in Africa and India.

In the Bendarwadi region, near Pune, India, the biogas will be used to generate power to pump water from their reservoir up to the village.

In Uganda, the biogas will be used as a fuel for cooking in Schools and Orphanages.

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