CEEW
THE COUNCIL

The
Food and Land Use
Coalition

FLOATING FARMING IN INDIA

This summary document provides an overview of the state of floating farming in India. And also covers a literature review of impact studies conducted on floating farming in India. **It is a part of the larger CEEW study,** *Sustainable Agriculture in India 2021: What We Know and How to Scale Up*

Sustainable Agriculture in India 2021: What We Know and How to Scale Up, is a handbook on the prevalence, practices and state of affairs of the 16 most promising sustainable agriculture practices in the country. It presents the economic, social and environmental impacts of these practices with recommendations on their potential to scale-up sustainable agriculture in India.

The study is available at: https://www.ceew.in/publications/sustainable-agriculture-india-2021

Image: Binapani Mishra, SWAD

Floating farming is a way of producing food in areas that are waterlogged for long periods. It is mainly aimed at adapting cultivation to increased or prolonged flooding. The system uses floating beds of rotting vegetation that act as compost for crop growth. The beds can float on the water's surface, thus creating agricultural land areas in a wet area.[1]

These floating gardens are made on water bodies in a floating vessel (width of 5 feet and a maximum length of 25 feet) constructed from water hyacinth, mud and bamboo. At the bottom of the bed, dried water hyacinths are intertwined to form a mesh. On this mesh, a 4-inch-thick mixture of silt and chopped water hyacinth leaves is laid. Above this is added a 5-inch layer of a mix of silt, vermicompost, and farmyard manure. The topmost layer is packed with a 3-inch mixture of dry leaves of leguminous plants, soil, and silt.[2]

Image: Binapani Mishra, SWAD

Floating farming's linkages to FAO's agroecological elements

In principle, floating farming adheres to and promotes many agroecological elements as defined by the FAO

Elements	Description of agroecological linkages
Diversity	Floating beds have high nutrient content (nitrogen, potassium, and phosphorus) and can support diverse varieties of plants and vegetables.[3]
Co-creation and sharing of knowledge	Floating farms are developed based on farmers' indigenous knowledge and evolve with experience and techniques developed over time.
Synergies	Floating beds clear areas of water hyacinth, an invasive plant species that grows at prolific rates and acts as breeding grounds for mosquitoes. They also improve open water fishing conditions. Once plants are harvested and floating beds are no longer required, they can be used in the fields to provide fertilizer or reused the following year.[4]
Efficiency	Establishing a floating garden requires minimal infrastructure, few input costs, and very little technical know-how. It is a traditional, local, self-sustaining, and minimal resource model that offers an efficient way to tackle challenges posed by floods.
Recycling	Once the floating beds decompose, the residues serve as a nutrient for enriching the soil for the next round of cultivation. Thus, the practice has a very low dependency on external resources while increasing implementers' autonomy.
Resilience	Floating gardens have arisen out of necessity due to the scarce land available in some parts of the country for farming. They are also considered an effective adaptive strategy to deal with extreme flooding events. They provide additional income and healthy diets to the implementers, often poor landless families in inundated areas, making them economically and climate-resilient.
Human and social values	Women have been at the forefront of implementing these practices, thereby improving the gender power balance in these communities as women can earn supplementary income by selling the vegetables produced. Overall, the practice protects and improves rural livelihoods for the extremely poor and landless and promotes equity and social well-being.

A brief context in India

Floating farming is an age-old practice of cultivation in the southern floodplains of Bangladesh. After observing the success story of the flood ridden farmers of Bangladesh, the practice was replicated and gained prominence to deal with areas subject to flooding in India. It is essentially confined to inundated areas/wetlands and agricultural lands that are swamped with water for extended periods, especially during the monsoon season. The most well-known floating gardens in India are the Dal Lake in Srinagar, where large lake areas are used for vegetable cultivation; the floating islands in Kuttanad-Vembanad Wetlands Ecosystem in Kerala; the floating islands of Loktak Lake in Manipur and Majuli Island in Assam; as well as the floating gardens in Odisha. Of these, the floating garden initiatives in Odisha and Assam are of particular relevance because of their economic, social, health, and environmental impacts.

In Odisha, most of the low-lying agricultural land is submerged during floods, a phenomena which are cyclical in nature during the monsoons, though climate change has redoubled their intensity and

frequency. It takes a minimum of around three months for the water to recede, so the affected households recurrently lose their crops. To alleviate such a dire situation, the Regional Centre for Development Cooperation (RCDC) partnered with the Society for Women Action Development (SWAD) with the support of UNDP and AusAID, to implement a pilot undertaking of floating nursery and gardens in the waterlogged areas of Puri district, Odisha. With farming impossible in these water-logged landscapes, especially from July to November, between 2012 and 2014, floating gardens were set up in specific areas in individually owned, community and public spaces. In 2017, a severe flood situation in Majuli island in Assam led to a decision to create floating gardens, initiated by the South Asian Forum for Environment (SAFE) with support from the National Bank for Agriculture and Rural Development.[5] This is an area-specific practice, and most initiatives are done through NGOs, civil society groups and intergovernmental bodies.

In Odisha the practice involves entirely chemical-free farming and has benefitted the flood prone local communities. But it is relevant only during the time of floods for vulnerable families, as it needs inundated fields to sustain it. Other requirements, such as a calm water surface body with no waves, and availability of raw materials like bamboo, water hyacinth and rope for floating bed preparation, pose significant constraints for the implementers (civil society groups) and particularly for vulnerable families. Other difficulties include working in waterlogged and hyacinth-infested areas where there is a risk of encountering venomous snakes and insects. The implementers who piloted the projects faced challenges in sustaining them in the long-term due to a lack of policy support, resource crunch, etc. This prevented widespread adoption of the practice even within Odisha. Further, in regions where the practice is introduced, a certain amount of handholding is required to help the practice be adopted by families.

On the positive side, the practice is family oriented, hence, mass adoption has significant potential to generate surplus vegetables for marketing, making it an attractive proposition for the economically vulnerable (Stakeholder consultation, RCDC). In India there is no policy or scheme for floating farming. Also, we found no academic literature or peer-reviewed journals for the practice, at least in the Indian context. The sparse literature that exists is largely limited to project reports and documentation from the NGOs who promote the practice.

Floating farming: acreage, geographies, and cultivation details

How much area in India is under floating farming? Floating gardens are area-specific and practised in only a few select places in four or five districts across India (Figure 1). There are no aggregate figures on these farms at the country level.

How many farmers in India are practising floating farming? According to the stakeholders consulted (SWAD), around 145 poor landless families were involved in floating farming activities within the two blocks of Puri district of Odisha state (Satyabadi and Kanas), piloted by the SWAD from 2011 to 2019. However, there are no data on numbers of farmers involved in other parts of the country.

Where in India is floating farming prevalent? Floating gardens are present in Dal lake (Srinagar, J&K), Majuli (Assam), Alappuzha, Pathanamthitta and Kottayam (Kuttanad Region, Kerala), Loktak Lake (Bishnupur, Manipur), and Puri (Odisha) (Figure 1). In Odisha, they are piloted across five blocks; Satyabadi, Kanas, Brahmagiri, Puri Sadar, and Delanga in Puri district.[6]

In Assam, they were introduced in both upper and lower Majuli on six ponds at Pohardiya, Jamodchuk, Lahongaon, Borhula, Bhekulimari, and Sonaribari gaon.[7]

Which are the major crops cultivated under floating farming in India? Short-rooted vegetables and leafy vegetables are best-suited to floating gardens. Spinach, amaranth, coriander, brinjal, tomato, beans, ladyfinger, chilly, bitter gourd, moricha (chilli), mint, etc. are a few of the plants cultivated.[8] (stakeholders consulted at SWAD).

Figure 1. Geographical location of a few hotspots where floating farms are located

Source: Authors compilation from literature review and stakeholder consultations

Impact of floating farming

There are no peer-reviewed journals available on the economic, social, or environmental impacts of floating farming in India, given the small scale at which it functions. Hence, the few insights here are the result of a few project documents from NGOs who are implementing the practice, stakeholder consultations and available web articles.

ECONOMIC IMPACT

1. Yields

Stakeholders consulted at SWAD, who undertook the pilot activities in two of the blocks (Satyabadi, Kanas) in Odisha, suggested that one floating garden could provide a five-member family with enough

vegetables for about three months. However, they did not mention specific yields and the literature on the practice is sparse.

Nonetheless, one of the case studies piloted in Majuli, Assam, found that 22 floating gardens gave 375 kgs of vegetables in a month, an average of 17 kgs/floating raft.[9]

2. Income

Floating gardens are constructed using low-cost, ecologically sustainable raw materials such as bamboo and rope. Apart from seeds and labour they require few inputs. The lack of technical know-how required makes the practice appealing, especially for vulnerable landless and marginalised families. The vegetables cultivated in these gardens can feed the household, and the surplus can be sold. A case study from Puri village mentions that initial support of INR 2,000 (USD 27) was provided by RCDC to a family to build floating farms and cultivate vegetables. The vegetables cultivated from the farms were consumed by one family for two months.[10]

By comparison, in Majuli, a family looking after ten floating rafts can earn around INR 5,000 per month (USD 70) by selling the cultivated produce (USD 70).[11]

SOCIAL IMPACT

1. Health

The vulnerability of marginalised people in terms of food security and nutrition is a big challenge in flood and disaster situations. For these groups, floating gardens are a viable low-cost solution for providing entirely organic, nutritious food despite the challenging conditions.

2. Gender

The practice has relevance for the family as a whole, but especially so for women. A few pilot studies show that with proper training women have found the practice beneficial for supplementing income. It has also improved their status in their communities by making them more confident and self-reliant, as providers for the family.[12]

ENVIRONMENTAL IMPACTS

1. Soil and nutrients

The practice increases the nutrient value of the soil as the floating bed ingredients (a mixture of dry leaves of leguminous plants, soil, a mixture of silt, vermicompost, compost/farmyard manure, chopped water hyacinth leaves, dried cow-dung) are used as compost after harvesting the vegetables on land for agriculture. These materials can also be used as fertiliser during the dry season.[13] These floating gardens help in increasing soil nutrients as nitrogen, potassium, and phosphorus are abundant in the beds. Therefore, there is almost no need for fertiliser input.[14]

2. Water

Water is the core medium for the practice, without which it would not be possible. A hidden benefit is the clearing of invasive water hyacinth when placing the floating beds.[15]

3. Energy and emissions

No external energy other than physical labour is required for the practice. While this was validated by stakeholders consulted, there is a lack of research studies on this front.

No evidence was found on the impact of the practice on GHG emissions of carbon sequestration.

4. Biodiversity

The practice helps to clear water hyacinth, which is an invasive plant, thereby helping to preserve the aquatic life of the region.[16] However, there have been no systematic studies on this impact.

Impact evidence

State of available research discussing impact of floating farming on various outcomes

Evidence Type	Yield	Income	Health	Gender	Soil and nutrients	Water	Energy	GHG emissions	Bio-diversity
Journals	0	0	0	0	0	0	0	0	0
Reports	1	2	0	0	1	1	0	0	0
Articles/ case-studies	0	0	0	1	0	0	0	0	0
Others **	0	0	0	0	1	2	0	0	0
Total	**1**	**2**	**0**	**1**	**2**	**3**	**0**	**0**	**1**

*** Thesis, guidelines, conference papers, etc*

Source: Authors' compilation based on the scant publications provided by stakeholders

Note – The evidence is from the first 75 results examined in Google Scholar Advanced search and the first 30 results from Google Advanced Search. Only those papers which clearly established the evidence for different indicators were selected.

Stakeholder mapping

The following institutions are involved in research and promotion of floating gardens; a few were consulted for this research:

NGOs/Civil Society organisations
Regional Centre for Development Cooperation (RCDC)
Society for Women Action Development (SWAD)
United National Development Programme (UNDP)
South Asian Forum for Environment (SAFE)

Welthungerhilfe
AusAID India

Source: Authors compilation

Note – The stakeholders list is indicative and not exhaustive

Endnotes

[1] UNEP-DHI. 2018. "Floating agricultural systems". Climate Change Adaptation Technologies for Water. UNEP-DHI. https://www.ctc-n.org/sites/www.ctc-n.org/files/resources/floating_agricultural_systems.pdf
[2] Chatterjee Jagannath. 2016. "Floating gardens for the landless". Webpage, India Water Portal. https://www.indiawaterportal.org/articles/floating-gardens-landless. Accessed 8 Oct 2020.
[3] Food and Agriculture Organization of the United Nations. 2020b. *Floating Garden Agricultural Practices, Bangladesh.* FAO, Rome. http://www.fao.org/giahs/giahsaroundtheworld/designated-sites/asia-and-the-pacific/floating-garden-agricultural-practices/detailed-information/en/. Accessed 11 Oct 2020
[4] UNEP-DHI. 2018. "Floating agricultural systems". Climate Change Adaptation Technologies for Water. UNEP-DHI. https://www.ctc-n.org/sites/www.ctc-n.org/files/resources/floating_agricultural_systems.pdf
[5] South Asian Forum for Environment. 2018. *Floating technology grows hope for a better future.* South Asian Forum for Environment, Guwahati.
[6] RCDC, SWAD, and UNDP. 2012. *Project Completion Report - Water resource management for climate change adaptation and disaster risk reduction.* Regional Centre for Development Cooperation (RCDC), Bhubaneswar.
[7] South Asian Forum for Environment. 2018. *Floating technology grows hope for a better future.* South Asian Forum for Environment, Guwahati.
[8] Ibid
[9] Ibid
[10] RCDC, SWAD, and UNDP. 2012. *Project Completion Report - Water resource management for climate change adaptation and disaster risk reduction.* Regional Centre for Development Cooperation (RCDC), Bhubaneswar.
[11] South Asian Forum for Environment. 2018. *Floating technology grows hope for a better future.* South Asian Forum for Environment, Guwahati.
[12] Chatterjee Jagannath. 2016. "Floating gardens for the landless". Webpage, India Water Portal. https://www.indiawaterportal.org/articles/floating-gardens-landless. Accessed 8 Oct 2020.
[13] RCDC, SWAD, and UNDP. 2012. *Project Completion Report - Water resource management for climate change adaptation and disaster risk reduction.* Regional Centre for Development Cooperation (RCDC), Bhubaneswar.
[14] Food and Agriculture Organization of the United Nations. 2020b. *Floating Garden Agricultural Practices, Bangladesh.* FAO, Rome. http://www.fao.org/giahs/giahsaroundtheworld/designated-sites/asia-and-the-pacific/floating-garden-agricultural-practices/detailed-information/en/. Accessed 11 Oct 2020
[15] RCDC, SWAD, and UNDP. 2012. *Project Completion Report - Water resource management for climate change adaptation and disaster risk reduction.* Regional Centre for Development Cooperation (RCDC), Bhubaneswar.
[16] Ibid

Suggested citation: Gupta, Niti, Shanal Pradhan, Abhishek Jain, and Nayha Patel. 2021. *Sustainable Agriculture in India 2021: What We Know and How to Scale Up*. New Delhi: Council on Energy, Environment and Water

The **Council on Energy, Environment and Water (CEEW)** is one of Asia's leading not-for-profit policy research institutions. The Council uses data, integrated analysis, and strategic outreach to explain – and change – the use, reuse, and misuse of resources. It prides itself on the independence of its high-quality research, develops partnerships with public and private institutions, and engages with wider public. In 2021, CEEW once again featured extensively across ten categories in the *2020 Global Go To Think Tank Index Report*. The Council has also been consistently ranked among the world's top climate change think tanks. Follow us on Twitter @CEEWIndia for the latest updates.

FOLU Coalition: Established in 2017, the Food and Land Use Coalition (FOLU) is a community of organisations and individuals committed to the urgent need to transform the way food is produced and consumed and use the land for people, nature, and climate. It supports science-based solutions and helps build a shared understanding of the challenges and opportunities to unlock collective, ambitious action. The Coalition builds on the work of the Food, Agriculture, Biodiversity, Land Use and Energy (FABLE) Consortium teams which operate in more than 20 countries. In India, the work of FOLU is being spearheaded by a core group of five organisations: Council on Energy, Environment and Water (CEEW), the Indian Institute of Management, Ahmedabad (IIMA), The Energy and Resources Institute (TERI), Revitalising Rainfed Agriculture Network (RRAN) and WRI India.

Contact shanal.pradhan@ceew.in/ abhishek.jain@ceew.in for queries

CEEW
THE COUNCIL