Indigenous technology for adapting to water logging situation for sustainable livelihood security in low lying areas of Bangladesh

Md. Altaf Hossain[A]

[A]Soil Resource Development Institute, Ministry of Agriculture, Krishi Khamar Sarak, Farmgate, Dhaka-1215, Bangladesh.

Abstract
The southern, southwestern and the coastal areas of Bangladesh remain submerged for long periods every year, especially during the monsoon season. People in these areas have been coping with submerged/flooded conditions for generations. The people of these areas depend on agriculture. They have adopted a method of cultivation, locally referred to as "Vasoman Chash," meaning floating agriculture, since the time of their forefathers. This system is similar to hydroponics, which is a scientific method whereby the plants are grown in the water and they derive their nutrients from the water instead of from the soil. The production rate is high from this kind of agricultural practice. Floating agriculture is a possible local knowledge based technology which would help in attaining sustainable livelihood security in the vulnerable areas like waterlogged areas in Bangladesh.

Key Words
Waterlogging/flood coping strategy, sustainable livelihood, indigenous knowledge and practices.

Introduction

In Bangladesh about 8,000 hectares of waterlogged lands exist in Khulna and Jessore areas. If the sea level rises due to global warming more areas of Bangladesh will undergo waterlogging and more land will become unavailable for crop production (BARC, 1991). The combined effect of higher sea water levels, subsidence, siltation of estuary branches, higher riverbed levels and reduced sedimentation in flood protected areas will impede drainage and gradually increase water logging problems (Ali, 1996). This will decrease arable areas and may lead to migration of people to other parts of the country. To cope with the changed situation local knowledge based best practices may prove to be vital for sustainable livelihood security.

Floating agriculture is a farmers' innovation that is being practiced in low lying areas of middle and southern districts of Bangladesh. Floating agriculture has several advantages: (1) the fallow waterlogged area can be cultivated and the total cultivable area can be increased, (2) no additional fertilizers and manure is required unlike in the conventional agricultural system, (3) after cultivation, the biomass generated can be used as organic fertilizer in the field, (4) during the floods it can be also used as a shelter for the poultry and cattle, and (5) the fishermen can cultivate crops and fish at the same time in same area. All the activities of the practice are environment friendly and can prove to be an alternative livelihood option.

Floating agriculture by using naturally grown water hyacinth is an indigenous knowledge and technique of local farmers for growing vegetables, seedlings and flowers in waterlogged areas. In this paper we will discuss the potentiality of this practice for sustainable livelihood security in low lying areas of Bangladesh.

Farming procedure

The soil-less cultivation system was first introduced in Gopalgonj, Pirojpur and Barisal district in Bangladesh. Recently this farming system is practiced in water logged areas of Keshabpur of Jessore district. The cultivation procedures are not identical in all areas. The hydroponics farming technique of Gopalgonj is quite different from that of the Pirojpur technique. Considering the uniqueness of the technique involved only the Gopalgonj method is mentioned below.

Floating bed (*dhap*) preparation

After harvesting the Aman (cultivated in the monsoon season) paddy, water hyacinth is collected in May to July from the nearby river, canals, ditches, lagoons and from the wetland where it grows profusely. Straw and rice stubble are also used for the same purpose. The depth of the water bodies is not so significant for preparation of the bed. They can be made and managed in any depth of water. Farmers put a long bamboo on the mass of fully matured water hyacinths. Then a man stands on the bamboo and gathers immature over

mature hyacinth. He starts to pull the water hyacinths from the both sides of the bamboo and flatten them under foot. In this process he proceeds towards the end of the bamboo. This process is continued until the desired height and length of the bed is attained. Farmers again dump water hyacinths after 7-10 days later from the first dumping and then the bed is left for decomposition before sowing or planting of seedlings. The upper layer is comprised of deposits of small and quick-rotting waterworts (or small duck weed type of plant), which degrade quickly and make for good manure. It requires 15-20 days from the collection and preparation of the water hyacinth and other materials or the floating bed before cultivation can begin. Farmers carry this bed by rowing to the desired area.

Shape and size of the floating bed

The size and shape of the bed is not fixed. Farmers make the bed as their desired size and shape. Generally, the dimension of the bed is about 30 m long, 2 m width and 1 m height. The distances between beds depend on length of land. The narrow strip shaped bed is made so that it can be easily made by gathering water hyacinths and harvesting of crops is convenient.

Cultivation procedure

Sometimes farmers make a small ball called 'Tema' which is made by aquatic plant locally known as Dulali lata along with compost material. After making the ball farmers put sprouted seeds into it. They make seedbed on raised land around their homestead areas and put the Tema on seedbed.

In Tungipara Upazila, Gopalgonj farmers cultivate mixed crops on floating beds. At initial stage they cultivate Ladies finger, Cucumber and Eidged Gourd in the same bed during June to August. Usually two rows of Ladies finger and one row of Cucumber or Ridged Gourd are alternately cultivated. Crops are harvested from the month of August to October. The crops are harvested one after another till the next rainy season. Farmers use a small country boat to move around the floating beds and pick up vegetables from the beds.

Maintenance

Sometimes saplings on the floating bed turn yellow, farmers chop the decomposed parts of the bed, roots of water hyacinth and put them underneath the seedlings or put the chopped materials on the floating bed 30 cm away from the edge of the bed. Thus, the seedlings get nutrients and become healthy and start to grow. After planting saplings onto the floating bed de-weeding becomes a regular job of farmers. Bamboos are used as anchorage of floating beds to keep them fixed in a place and prevent from floating away by wind or water current. During the monsoon, farmers use small country boats to manage the floating agricultural land.

Cost and benefit analysis of floating vegetable cultivation

Following is a brief estimate of costs incurred and benefits accrued from a typical soil-less cultivation system in floating vegetable culture consisting of 10 Dhaps, each measuring about 15 m x 2 m = 30 m^2. Estimated cost for making 10 floating beds is BDT 10,000 while estimated income from 10 such beds is BDT 34,000; the gross benefit being BDT 24,000 per season (Table 1 and 2) (1US$ = 70 BDT).

Potential for Application

The floating agriculture practice in the southern parts of the country represents a traditional/indigenous agriculture system for the water logged or the submerged area in Bangladesh. The people of the southern parts of Bangladesh adopted the practice based on their traditions and the community's culture and wisdom. This is an environment-friendly and beneficial practice. People use the floating agriculture practice as a model in the pond and other water bodies in other parts of the country. It could be a sustainable and profitable practice in Bangladesh as well as for other countries facing a similar situation.

Table 1. Estimated Cost for making 10 floating beds during rainy season.

Sl. No.	Cost Heads	Amount	Unit Cost (BDT)	Total Cost (BDT)[A]
1	Construction of hydroponics	60 man days	100	6000
2	Raw materials (water hyacinths and other aquatic weeds)	20 man days	100	2000
3	Seed and seedlings	10 beds	60	600
4	Nursing/maintenance, purchase of bamboo, insecti-cides and harvesting	10 beds	200	2000
Total Cost				10,000

[A]Note:1US $=70 BDT

Figure 1. A newly built floating bed.

Figure 2. A ready bed for planting.

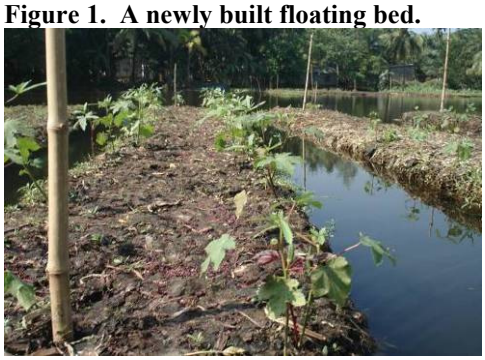

Figure 3. Red Amaranth.

Figure 4. A group of beds.

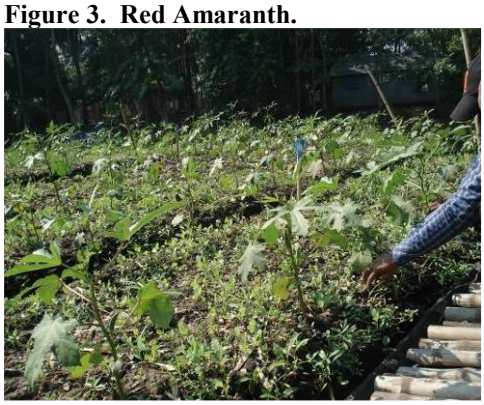

Figure 5. Intercultural operations.

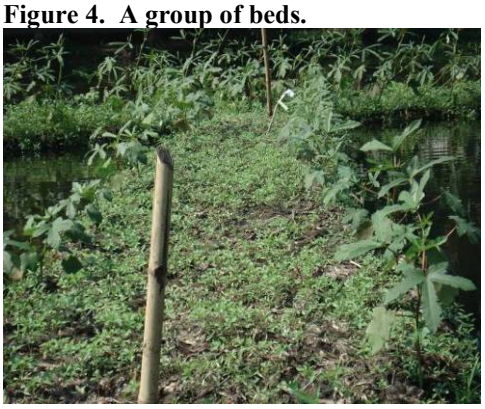

Figure 6. Coriander and Okra.

Table 2. Estimated Income from 10 floating beds.

Sl No.	Income Heads	Amount (Kg)	Unit Income (BDT)	Total Income (BDT)
1	Ladies finger	2000	6/Kg	12000
2	Ridged Gourd	400	6/ Kg	2400
3	Red Amaranth	600	8/Kg	4800
4	Taro, Indian spinach	-	60/Bed	600
5	Compost manure	30,000	0.50/ Kg	15000
Total Income				34,000

Conclusion

Food, clothing, housing, health and education are the basic needs of the people of Bangladesh. Sea level rise becomes a threat to food security by affecting basic needs and security. Bangladesh has been practicing floating agriculture for a long time (three to four hundred years). It is a useful method considering the economical, environmental and as well as social aspects. The production rate is high from this kind of agricultural practice. Floating agriculture is a possible local knowledge based technology which would help in attaining sustainable livelihood security in vulnerable waterlogged areas.

References

Ali A (1996) Vulnerability of Bangladesh to climate change and sea level rise through tropical cyclones and storm surges. *Water, Air and Soil Pollution* **94,**171-179.

Asaduzzaman M (2004) Floating Agriculture in the flood-prone or submerged areas in Bangladesh (Southern regions of Bangladesh) Asia-Pacific Environmental Innovation Strategies (APEIS), Research on

Innovative and Strategic Policy Options (RIPSO), Good Practice Inventory. www.iges.or.jp/APEIS/RISPO/inventory/db/pdf/0146.pdf
BARC (1991) 'Agro-ecological database, BARC Computer Centre'. (Bangladesh Agricultural Research Council: Dhaka).