REVIEW ARTICLE Agricultural Reviews, Volume 41 Issue 4: 413-416 (December 2020)

Floating Seeding Production in Bangladesh: A Review

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10.18805/ag.R-147

ABSTRACT

Agriculture is the driving force of the economy of Bangladesh where two third of the arable land is inundated in monsoon due to low lying of geographical position and adverse effect of climate. A part of these monsoon wetlands are used for floating cultivation by the local farmers for their livelihood which is commonly known as "*Vasoman Chash*", a method of hydroponics. This century aged traditional agricultural method is being practiced in *haor* regions of Bangladesh. Matured water hyacinth is the most important component for making raft or bed for floating cultivation. Paddy straw, *Son ghash* (*Imperata cylindrica*), *Noll ghash* (*Hamerthria protensa*), *Topapana* (*Pista stratiotes*), ash twigs and desiccated coconut fibers are also used for making bed. The water hyacinth is collected from nearby wetlands and prepared bed and finally allowed 15 to 20 days for decomposition before cultivation. A ball */gutiltema* is prepared by soft rotten *Durali* or *Salvinia,* where seeds are inserted for germination and finally covered with rotten water hyacinth and allowed for seedlings. After 5-6 days when seedlings attained 5-6 inches long, are transferred to the floating bed. Bamboos are usually used as anchorage to keep beds fixed in a place during the monsoon and then bed is ready for growing of various kinds of vegetables. This indigenous floating bed cultivation technology can mitigate food insecurity, poverty and adverse effects of global warming.

Key words: Cultivation, *Guti*, Haor, Hydroponics, *Vasoman chash,* Water hyacinth.

The cherishing of plants in water but without soil is known as soil-less agriculture or hydroponics (a Greek word, *hydro* means water and *ponos* means labour) in which aquatic plants are used to construct floating bed where vegetables and other crops are cultivated in monsoon as well as in winter season. The practice of hydroponics on search platforms was started thousands of years ago in many parts of the world such as hanging gardens of Babylon, floating gardens of Chinese, soilless vegetable cultivation on river Nile of Egypt *etc*.

Two-third land of Bangladesh remain submerged during the monsoon for adverse effects of climate change including stagnate water in *haor* areas for long period which hampers the usual cultivation of farmers in Bangladesh (Irfanullah *et al*. 2011; Pavel *et al*. 2014). Floating cultivation are being practiced at many villages of North-eastern , north-west part of the country with the help of many NGOs and local stockholders while the local farmers of southern part of our country invented an indigenous cultivation technique to produce seedlings and vegetables in the flood water, locally known as *dhap*, a traditional age-old practice in the southern floodplains districts (Barisal, Pirojpur, Satkhira and Gopalgonj) to grow different types of seedlings and crops for at least two centuries (Haq *et al*. 2002; Irfanullah, 2009; Irfanullah *et al*. 2011; Islam and Atkins, 2007).

As seeding production on floating beds is a vital part of floating agricultural in Bangladesh. This review revealed the available information in this aspect to facilitate father steps in seedling production on floating beds.

Procedure of floating bed preparation for seedling production

It has been noted that the cultivation procedures and purposes are not exactly same in all areas of Bangladesh but there are few common steps in floating cultivation (Hossain, 2014). Raft or bed construction (Fig 1) is the first step of floating cultivation where matured water hyacinth is the single most important component but locally available Paddy straw, *topapana* (*Pista stratiotes*), *Son ghash* (*Imperata cylindrica*), *Noll ghash* (*Hamerthria protensa*), ash twigs and desiccated coconut fibers are also used (Haq *et al*. 2004; Islam and Atkins, 2007) on which vegetables are cultivated and seedlings are raised during flooding. Few steps are maintained to prepare the bed for seedling rearing (Fig 2). From May to August water hyacinth is collected from the nearby river, canals, ditches, lagoons from the wetland and pull the water hyacinths from the both sides of the bamboo poles and left them for about 15 to 20 days for decomposition before cultivation (Hossain, 2014). Because of increasing demand and rarity of aquatic plants farmers often purchase (*e.g.* Najirpur Upazila of Pirojpur district) readymade bed from nearby market. Floating beds are used for seedling and vegetable cultivation through the season, therefore, size of beds get reduced through the time.

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How to cite this article: Moniruzzaman, Md., Kabir, A. and Shahjahan, M. (2020). Floating Seeding Production in Bangladesh: A Review. Agricultural Reviews. 41(4): 413-418.

Submitted: 16-04-2020 **Accepted:** 03-09-2020 **Published:** 10-11-2020

Seedling germination and management of seedlings on floating beds

There are two widely used methods for seed germination, first one is planting seeds in a ball called *Guti*, *Meda* or *Tema*. Balls are made of soft rotten *Durali (Hygroryza aristata)* or *Indurkani pana (Salvinia)* which are dried in the sun 3-4 days and make ready for ball and seeds are inserted in the ball and covered with rotten water hyacinth (Islam and Atkins, 2007) then balls are piled up in a shade for 3-4 days and balls are watered when they become dry. Sometimes saplings on the floating bed turns yellow, to overcome the problem 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 one feet away from the edge of the bed for getting the nutrient of seedlings to grow properly (Hossain, 2014). This study also revealed that after planting saplings onto the floating bed weeding becomes a regular job and bamboos are usually used as anchorage to keep beds fixed in a place during the monsoon, in addition, small boats to manage the raft. Moreover, crop products (vegetables and spices) are generally used for the expenses by the farm family, as well as farmers making extra cash in order to meet their daily household expenses as well as sell excess quantities of their agricultural products in the local market.

Seedling cultivation on floating beds

Floating farming includes raising seedlings as well as cultivating vegetables or crops on the bed. The floating bed farmers of the southern part (Barisal, Pirojpur, Gopalgonj *etc*.) of Bangladesh mainly rise seedling (IUCN, 2009) in the monsoon to sell in the market as well as some farmers grow vegetables on *kandi* (winter platform for vegetable production). Seedlings are grown on the floating beds maintaining some crop combinations (Islam and Atkins, 2007). Crops life cycle is short and it takes 15-25 days to get seedlings marketable and on average two to three crop cycles are common so crop rotation is important in this farming. IUCN (2009) implemented floating cultivation project with 31 varieties of crops in *haor* region and project beneficiaries were found to consume, cultivate, buy and sell their products. Similarly, Pavel *et al*. (2014) found 17 types of vegetables and spices cultivated in Jamalganj Upazila of the district of Sunamganj which are shown in Table 1.

Cost benefit analysis of floating seedling production

The study of Haq *et al*. (2004) stated that TK 5600 was required for preparing 10 floating beds to cultivate Ladies fingers, Ridged gourd, Amaranth, Taro and Indian spinach and lastly earned TK 21,000 including selling organic compost. Similarly, Islam and Atkins (2007) revealed that about TK 11,000 was spent for building seven floating rafts in each hectare of wetland while about TK 55,500 was returned as profit (one third of selling vegetable and two-thirds from seedlings). A similar study carried out in Nazirpur Upazila of Pirojpur district showed that average per square

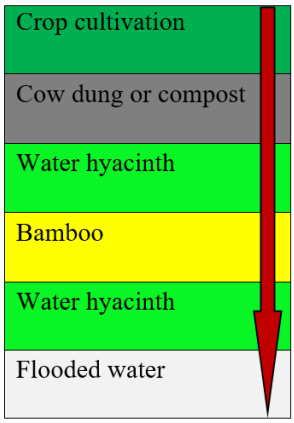


Fig 1: Schematic diagram of floating bed construction.



Fig 2: Vegetable cultivation on floating beds.

meter cost for floating seedling cultivation found BDT 281 and benefit was BDT 401 (Kabir *et al*. 2019) . Pavel *et al*. (2014) found the cultivating area of standard (15×4×3 ft) floating beds were higher than small (12×4×3 ft) which associating more benefit and suggested the benefit of floating cultivation was varied by the size of beds. About TK 24,000 gross benefit was observed from the study of Hossain (2014) in which TK 10,000 was spent for making 10 floating beds for vegetable cultivation while TK 34,000 was the total income. The findings of Irfanullah *et al*. (2011) and Pavel *et al*. (2013) also supported the above cost benefit analysis of floating cultivation in different areas of Bangladesh. Greater economic opportunities and demand of floating cultivation encourage farmers to transform this traditional floating agricultural practice leads to commercially viable agro business.

The problems and prospects of floating bed cultivation

Floating bed cultivation is the only available method of cultivation in the perennial marshlands of Bangladesh (Islam and Atkins, 2007). In the context of physical structure of floating bed, it is not suitable (Irfanullah *et al*. 2011) in all open waters, because tides or heavy rain fall may break or

Table 1: List of different types of vegetables and spices cultivated on floating bed.

Local name	English name	Scientific name	Summer	Winter
Dherosh	Ladies finger	*Abelmoschus esculentus*	+	
Daata shak	Amaranth	*Amaranthus tricolor*	+	+
Lal shak	Red Amaranth	*Amaranthus tricolor*	+	+
Kanthhal bichi	Jackfruit (seed)	*Artocarpus heterophyllus*	+	
Pui shak	Ceylon spinach	*Basella alba*	+	+
Chaal kumra	Wax gourd	*Benincasa hispida*	+	
Phulkopi	Cauliflower	*Brassica capitata var. botrytis*	+	
Bandhakopi	Cabbage	*Brassica capitata var. oleracea*		+
Pepe	Papaya	*Carica papaya*	+	+
Kochu	Arum	*Colocasia esculenta*	+	
Mukhi kochu	Arum	*Colocasia esculenta*	+	
Paat shak	Jute (young leaves)	*Corchorus capsularis*	+	
Shasha	Cucumber	*Cucumis sativus*	+	
Mishti kumra	Pumpkin	*Cucurbita maxima*	+	
Gajor	Carrot	*Daucus carota*		+
Kolmi shak	Aquatic spinach	*Ipomoea aquatica*	+	
Mishti aloo	Sweet potato	*Ipomoea batatas*	+	
Shim	Hyacinth bean	*Lablab purpurea*		+
Lau, Kodu	Bottle gourd	*Lageneria siceraria*		+
Jhinga	Ridged luffa	*Luffa acutangula*	+	
Dhundal	Sponge/ smooth	*Luffa cylindrical*	+	
Tometo	Tomato	*Lycopersicon esculentum*		+
Korola	Bitter gourd	*Momordica charantea*	+	
Kakrol	Teasle gourd	*Momordica dioica*	+	
Mula	Radish	*Raphanus sativus*		+
Morich	Chilli	*Solanum frutescens*	+	
Begoon	Eggplant, Brinjal	*Solanum melongena*		+
Aloo	Potato	*Solanum tuberosum*		+
Chichinga	Snake gourd	*Trichosanthes cucumerinavar. nguina*	+	
Potol	Pointed gourd	*Trichosanthes dioica*	+	+
Barboti	Cowpea	*Vigna sinensis*		+
Ada	Ginger	*Zingiber officinale*	+	
Dhan	Rice	*Oryza sativa*	+	+
Dhaniya	Coriandar	*Coriandrum sativum*		+
Holud	Turmeric	*Curcuma longa*	+	
Olkopi	Kohlrabi	*Brassica oleracea var. gongylodes*		+
Shalgom	Beet	*Brassica campestris*		+

Source: Pavel *et al*. (2014); IUCN (2009).

wash away rafts, using bamboo cage make the platforms stronger, but such measure is expensive for the extreme poor. In recent local elites and politically powerful people have begun to encroaching the floating gardens in the *khas* or common property (Islam and Atkins, 2007) areas which cause social tensions. According to Fazal and Amin (2013), excessive floating gardening hampers natural balance of the ecosystems which was observed in Dal Lake (Kashmir).

Despite these challenges and limitations, there are some potentialities of floating bed cultivation. Vegetable farming techniques in the floating system are currently a sustainable agricultural technology for the people of low or flooded areas of Bangladesh. Floating gardening has been much discussed as a climate change adaptation (Irfanullah, 2013a) option, which can adapt with climate change in an economically viable way (Pavel *et al*., 2013). Haq *et al*. (2004) explored that it is a great opportunity to create employment opportunities for men as well as women empowerment because most of the work is done by the young men and women, which gives them a sense of economic satisfaction. Pavel *et al*. (2014) proved that floating garden is very suitable for the *haor* areas of Bangladesh and floating garden farming system can produce vegetables for self-consumption and for sale. Although there is couple of monsoon months per year, the floating garden can reduce the daily expenditure of vegetables and at the same time,

earns a good amount of cash income (Pavel *et al*. 2014). Some local and international NGOs have been working to promote this traditional technology in wetland areas of Bangladesh providing technologies (Irfanullah, 2013b) by which farmers can grow food on flooded land as a means of improving the nutritional and livelihood status of the extreme poor wetland dwellers (Irfanullah, 2009). This system is fully organic and the products from the beds get special attention from the local buyers and consumers (Haq *et al*. 2004), in addition, the decomposed floating beds are used as organic fertilizer into the soil (Islam and Atkins, 2007). Along with food production, it increases the capacity (Irfanullah *et al*. 2011) of arable land for planting crops and seeds (Pavel *et al*. 2014), especially in the flood prone areas during the rainy season when the cultivation land is scarce. Thus, this floating system uses the natural resources like water hyacinths and other aquatic plants efficiently which is environment friendly and helpful for conserving biodiversity (Haq *et al*. 2004). Nyong *et al*. (2007) and Ayers and Dodman (2010) found that the folk community can cope with the impacts of the climate in the local areas by practicing the floating garden farming system. Kates (2000) indicated community-based adaptation as a kind of economic and social development. Study of Pavel *et al*. (2014) showed the floating gardening method is completely beneficial and farmers can use this indigenous knowledge at very low cost.

CONCLUSION

"*Vasoman Chash*" can play a significant role for economic security of the marginal people of long term flood affecting regions. We are extreme porn to the consequences of global warming. So, it is the high time for adoption of "*Vasoman Chash*" in all of the *haor* regions. It is important to increase the technical skill of farmer for making bed and overall management of farm through training and motivation. It is also needed the extensive research and adoption of new technology for minimizing initial cost, increasing productivity, development of stress tolerance variety of vegetables.

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