

Vertical agriculture: Suspended horticulture in towers



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ABOUT VERTICAL AGRICULTURE AND TOWERS

Suspending horticulture activities above the ground can result in high production of vegetables when the challenges of unfertile or saline soil, flooding, waterlogging, and land and water constraints are encountered.

A vertical tower is a cylindrical structure made from bamboo, live wood, soil, coconut coir, brick chips, compost and cow manure for growing vegetables. The size and shape of the tower depends on the geographical location, land space, availability of resources, and intensity and height of waterlogging, flooding or salinity. The vertical tower allows for yearlong vegetable production in the homestead, where vegetables can grow on top of or within other structures, such as the roof of a house, nets or trees.



Farmers with their harvested vegetables at Gabgachia village.

BENEFITS OF VERTICAL AGRICULTURE

The farmers of Bangladesh face many challenges associated with climate change and increases in population. Rising salinity, waterlogging, flooding and storm surges, coupled with a growing population that is expected to reach 250 million people by the year 2050, have resulted in a decrease in cultivable land for vegetable production. Vertical agriculture can address the loss of cultivable land by maximizing the space around households and suspending horticulture production along trees, houses and bamboo structures. Vertical agriculture results in higher production rates and the use of less land and water. It also allows women to better manage their own food security, nutrition and consumption.

Vertical towers deliver the following benefits:

- increased surface area (up to five times) compared to soil beds, depending on the tower shape and size
- reduced time loss between cropping seasons
- reduced rates of salinity through irrigation
- increased protection from flooding
- decreased water evaporation during drought.



Photo Credit: Sumin Siddiqi/POCCAFS

Debnath in her vertical garden.

CONSTRUCTION OF VERTICAL TOWERS

Selecting a location

Choose a suitable location in an area that has the least potential for waterlogging or salinity. There must be adequate sun or shade, depending on the vegetables that will be planted, as well as nearby vertical frames such as rooftops, walls or trees to provide growing vines with support.

Constructing the tower

At the base of the tower, create a pile of soil and bricks to raise the tower 0.15 meters (m) above ground level. The base can also be covered with a polythene sheet to prevent salinity intrusion and waterlogging from damaging the soil.

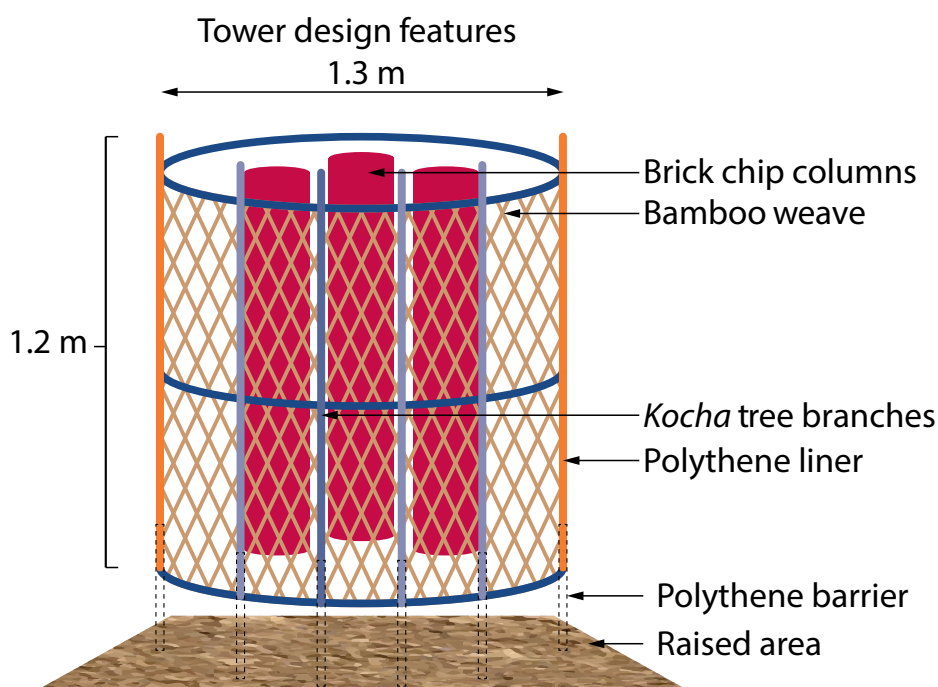
Build the main frame of the tower by firmly burying the ends of *kocha* or *jiga* tree limbs in the ground in a circle.

Place three rings made of bamboo strips inside the *kocha* tree frame. The first ring is placed near the bottom, the second in the middle and the third at the top of the *kocha* tree frame. Place a crisscross woven frame made of thin bamboo strips on the inner side of the main *kocha* frame to provide a container.

To prevent moisture loss and salinity intrusion, install a polythene cover on the inner side of the bamboo frame. The polythene can be transparent or white.

Fill the container within the frame and polythene sheet to a depth of 15 centimeters (cm) with a plant-growing medium such as a combination of dried water hyacinth (40%), coconut husks (30%), compost (10%) and a mixture of soils (20%).

After filling to about 15 cm in depth, place three PVC pipes (15 cm in diameter) in the tower and place brick chips within the pipes. Raise the pipes up gradually as you fill around them with the plant medium, so that when the container is full, the pipes can be completely removed, leaving only columns of brick chips. This design allows for better irrigation.



GROWING VEGETABLES ON A VERTICAL TOWER

Prepare small rectangular holes in the sides of the polythene sheet. By cutting only three sides of the rectangle and keeping one side (the top) attached, you can fold the polythene flap upward and inward and sow seed or plant seedlings underneath the polythene. The polythene barrier at the top of the hole directs the growth of the plant outward rather than upward.

The plant spacing used depends on the type of vegetable species, but 20–30 cm (line to line) and 25–30 cm (plant to plant) is acceptable. If the plants are planted too densely, production could be reduced.

On the top of the tower, grow vegetables such as bottle gourd, sweet gourd, ridge gourd, bitter melon, ash gourd, *dhondol*, tomato, *brinjal* and beans. Grow plants that are short rooted on the side of the tower. These include chili, Indian spinach, *kholkhol*, beet and sweet potato.

To maintain healthy plants, 10–20 liters of water should be applied to the top of the tower every evening. The top of the tower should also be mulched using straw or water hyacinth.



A vertical tower at Dumuria village (high-saline zone).

PRODUCTIVITY AND PROFIT FROM VERTICAL TOWERS

The total investment required to build and plant a tower is about BDT 900–1000 (USD 11.50–12.80) or around BDT 300–350 (USD 3.80–4.50) per cycle. More than 100 kilograms of vegetables, valued at BDT 2500–3000 (USD 32–38.50), can be harvested from a tower per cropping cycle. The net profit per tower averages BDT 2200 (USD 28) per cropping cycle. (Three cycles can be planted in a year: summer, inter and winter.)



A comparative study of vertical towers at Chandipur village.



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