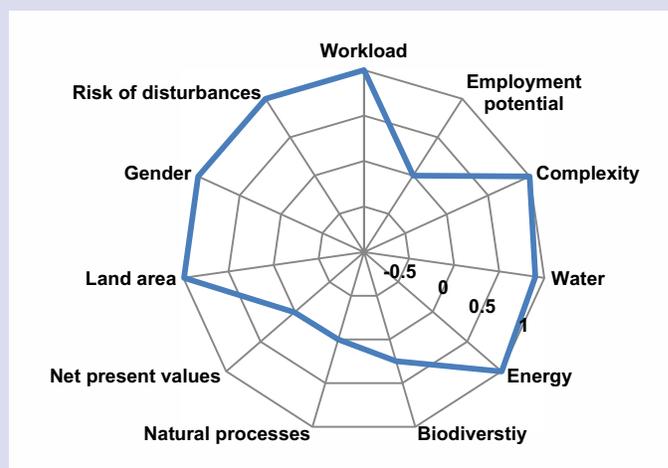


## Key facts

- Yam tubers provide food from otherwise unused small land areas when cultivated close to the homestead; require very little management and can be harvested in times of food insecurity.
- Zero initial investment cost and very low variable cost.

This graph summarizes the results of a sustainability assessment conducted for this technology. The closer the line is to the outer edge of the diagram, the better the technology performs in terms of the particular criterion.



## What is domestic yam production?

- Potato yams or yams (*Dioscorea spp.*)<sup>1</sup>, are herbaceous or woody climbing plants cultivated for their starchy tubers. Tubers can be harvested from creepers, the so-called bulbils, an aerial storage organ (see Figure 2) and underground (see root-borne yams harvest, Figure 3). Yams are perennial plants with a strong annual growth cycle including a dormancy period (Mignouna *et al.*, 2008; Balogun, 2009).
- Yams can be cultivated in small domestic spaces using non-fruit bearing trees<sup>2</sup>, trellis or thatch as a support for the vines to climb on.
- The crop is highly adaptable and requires little management (Sangakkara and Frossard, 2014).
- Yams are grown in many tropical regions throughout the world having high rainfall (FAO, 1997).
- It is consumed as a vegetable, normally in combination with meat, fish, green vegetables, coconut and spices, depending on taste and the resources of the consumer (Islam *et al.*, 2011).
- Potato yams are cultivated as food, particularly in times of scarcity and to maximize domestic land use.

## History

- Some 7,000 years ago, yams were domesticated independently on three continents with *D. alata* cultivated in South-East Asia and the South Pacific (Bradshaw, 2010).

- Using non-fruit trees, trellis or thatch to grow yams close to the home is an indigenous technology, practised for many years in Bangladesh and India.
- Currently, the technology is being scaled up in Bangladesh as part of the sustainable technology transfer to enhance productivity for ultrapoor (STEP UP) project<sup>3</sup>.
- Yam is no longer cultivated throughout Bangladesh as a vegetable since the introduction of Irish potato (Islam *et al.*, 2011).

## Where it works

- Yams can be produced in tropical and subtropical climates (optimal temperature 25° C to 30° C), on fertile, loose and well-drained soils and need minimal care once growth starts (FAO, 1997). Ample moisture is required during the entire growth period (Visayas State University, 1987).
- Rainfall-optimal yields have been obtained in areas in Bangladesh with 1,750 mm of rain distributed throughout the year. Bradbury and Holloway (1988, cited in Lebot, 2009) report optimal rainfall of between 1,200-1,500 mm/year.
- Guinea yams (*D. rundata* and *D. cayenensis*) originated in West Africa and the so-called water or greater yam (*D. alata*) was most likely domesticated in South-East Asia and Oceania (Malapa *et al.*, 2005).
- Typical successful adopters in Bangladesh are land-poor and landless farmers because yam cultivation requires little

<sup>1</sup> In parts of the United States of America the term yam is commonly used for sweet potato (*Ipomoea batatas* L. Poir.) and in other places is used for edible tubers of adoids. However, this fact sheet is about plants from the genus *Dioscorea*.

<sup>2</sup> Such as trees used for timber, fuel, or furniture-making.

<sup>3</sup> The NGO NETZ: Partnership for Development and Justice is an implementing partner in Bangladesh.

land. Landless farmers can grow yams on fallow land owned by the Government or others after being granted access.

- Cultivation of six to eight yam plants by a household allows weekly harvests between May/June and November/December. One plant produces about 0.8 kg of yam per month.

Figure 1. Yams growing on non-fruit trees



Photo: Maamun, NETZ Bangladesh

## Technological aspects

- For maximum yield, yams should be grown in shaded soil as a shorter period of daylight tends to favour tuber formation while a longer period favours vine growth (Visayas State University, 1987). Water-logged soils must be avoided.
- Yam plants with no possibility of climbing for a better exposure of their leaves to sunlight, have lower yields (Visayas State University, 1987). Therefore, the use of non-fruit trees, trellis or thatch to provide climbing support to the vines, is recommended.
- In Bangladesh, yams are sown after winter (February-March). In Sri Lanka, most gardeners plant yam setts at the start of the inter-monsoonal rains in March but for all gardeners interviewed, the planting time ranged from late November to early April (Sangakkara and Frossard, 2014).
- Pits of 1 x 1 x 1 m are dug close to the support (a non-fruit tree, trellis or thatch). Pits should be spaced 1 m apart.
- The planting material is known as setts, which are whole small yam tubers or bigger tubers cut into not more than three pieces of between 60 and 250 g each. Setts should be selected from healthy tubers of healthy plants. "As a rule, the bigger the sett used, the higher is the expected yield although the increase in yield for every unit increase in sett weight decreases" (Visayas State University, 1987). The sides of the cut pieces are treated with ash and air-dried to prevent fungal infection. Dried setts can be planted directly or pre-sprouted before planting. For pre-sprouting of setts, see Visayas State University (1987).

- Setts are planted in the pits, which are refilled with 1 kg of compost mixed with soil. In Sri Lanka, gardeners add approximately 1 kg of wood ash into the planting pit (Sangakkara and Frossard, 2014).
- The crop needs minimal care once planted but occasional weeding, mulching or application of compost is recommended. Yam can remove about 128 kg N, 17 kg P and 162 kg K from the soil per hectare of land and the nutrients should be added again to the soil (Visayas State University, 1987).
- When the creeper is long enough, a bamboo twig is used to support it.
- To facilitate the growth of creepers, the tree canopy should be pruned.
- The soil around the tuber can be piled up into mounds, two to three months after planting. Uncovered tubers should be covered with soil to prevent greening.
- One production cycle is possible per year with weekly harvests of creeper-borne yams between May/June and November/December. Creeper-borne yams can be harvested, starting 90 days after planting. Four to eight kg of creeper-borne yams can be harvested within 6 months.

Figure 2. Creeper-borne yams



Photo: Maamun, NETZ Bangladesh

11/12/2012

- In Bangladesh, root-borne yams are harvested once a year in December/January or about 200 days after planting. In Sri Lanka, underground yam is harvested nine months after planting (Sangakkara and Frossard, 2014). On average, 6.4 kg of root-borne yams can be harvested per plant per year in Bangladesh.
- Yams are hardy plants and so far have contracted only a few diseases. However, nematode infestations have been observed.
- In the Bandarban area of the Chittagong hills in Bangladesh, yam is locally known as 'Mo-o-Pome' (Miah *et al.*, 2004). For a list of the 18 species of *Dioscorea* in Bangladesh, including their local names, see Islam *et al.*, 2011, page 606; and Rahman *et al.*, 2001, cited in Islam *et al.*, 2011.

Figure 3. Root-borne yams after harvest



Figure 4. Potato yams maximize use of domestic space



## Economic aspects

- One plant produces an average of 11.2 kg of yams per year. One plant may produce between 6 and 20 kg yams per year, depending on soil conditions and the weather.
- In Sri Lanka, yields range between 1 and 15 kg per vine with the highest yields of 12-15 kg for *D. alata* found in the intermediate and wet zones of the country, in combination with manure and fertilizer application (Sangakkara and Frossard, 2014).
- Experimental underground tuber yields ranged from 0.5 to 16.5 kg/ plant in Bangladesh with a mean yield of 4.5 kg/ plant (Islam *et al.*, 2011)<sup>4</sup>.
- There is no initial investment or fixed costs.
- Variable costs include the cost of the seed yams (Tk 9; \$0.12), compost, and the farmer's labour (7 hours per season).

- On average, the market value of yams produced by one plant in one year is Tk 280-336 (\$3.53-\$4.23).
- The farm gate price in Sri Lanka is \$0.45/kg (Sangakkara and Frossard, 2014).
- Seed yams may be sourced locally from neighbours' or the farmer's own harvest.
- Yam cultivation requires little labour: about two hours to dig the pit and five hours to harvest, per season.

## Environmental aspects

- No additional irrigation needed. No wastewater produced.
- Compost and seed yams are obtained locally and external inputs are not needed.
- There is no generation of waste.
- The only energy need is human labour.
- The use value of non-fruit bearing trees is maximized.

## Social aspects

- The key benefit for adopters is a steady supply of yams for household consumption, especially in times of food insecurity as well as for sharing with neighbouring households.
- Farm households can consume yams once the yams are matured.
- Yams can be stored for five to six months after harvest.
- Yams can also be sold in local markets to increase household income.

## Issues for replication

- In Bangladesh, yams are regarded as the "poor man's food".
- Availability of planting material of high quality may be an issue. For a review on germplasm conservation and propagation, see Balogun (2009).
- Yam production is characterized by high perishability and losses during storage (up to 50 per cent). Yam production systems are not suited for large-scale mechanized production and have mainly evolved in subsistence economies (FAO, 1997).

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<sup>4</sup> Islam *et al.* (2011) examined 59 *D. alata* and one *D. bulbifera* accessions.

## Related topic

'Mukibat' Grafting System in Cassava Production fact sheet.

## Useful link

<http://dioscoreaceae.e-monocot.org/>

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