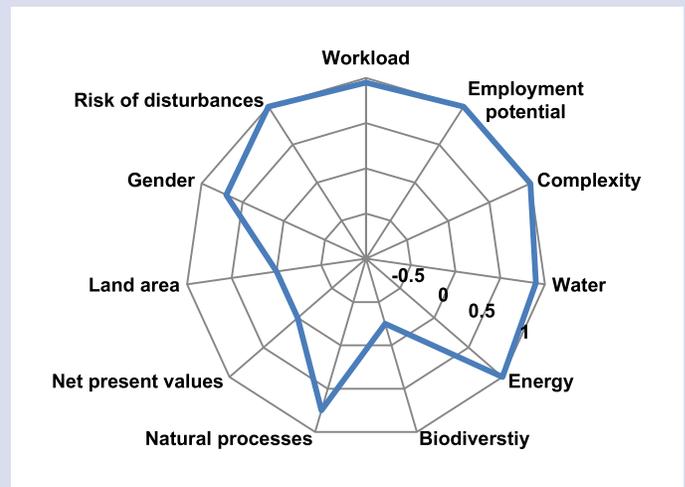


Key facts

- Low initial investment costs.
- Multipurpose perennial plant that provides a high-value, non-perishable cash crop (brooms), fuel and fodder.
- High tolerance to harsh environmental conditions such as shallow soil, drought and heavy rainfall.
- Can be grown on degraded, marginal as well as steep land that is unsuitable for food production.
- Broomgrass root system helps to control soil erosion.

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 broomgrass farming?

- Broomgrass (*Thysanolaena maxima*) is a perennial, high-value, non-perishable Non-Timber Forest Product (NTFP) that can grow on degraded, steep or marginal land.
- A multipurpose crop: only its panicle is used for making brooms. Farmers use its stem as a building material or as fuel and fodder, for mulching or staking crops or sell it to the paper pulp industry. The leaves and tender shoots are used as fodder in times of scarcity.
- Cultivation of broomgrass on marginal lands unsuitable for food production can generate additional household income.
- Broomgrass farming can be part of an agroforestry system to regenerate degraded land.

History

- Broomgrass has important ecological and economic roles for hillside dwellers.
- Broomgrass slips are traditionally harvested from forests; however, increasing population and decreasing forest area have made this practice environmentally unsustainable and illegal in preserved forest areas.
- In India and Nepal, the market for brooms is well established with a high demand.
- Its non-perishable nature makes broomgrass a suitable cash crop in areas not well connected to markets. However, farmers interested in broomgrass farming have to consider the availability of transportation to take the bulky brooms to the market.

Where it works

- Broomgrass can be grown in a wide range of agro-climatic conditions and soils (up to 2,000 m above sea level).

- It is tolerant of harsh environmental conditions such as shallow soil, drought and heavy rainfall. It grows easily on shady slopes, damp and steep river banks, degraded areas and gravelly soil on weathered rock surfaces.
- Broomgrass can grow on degraded, marginal or steep land unsuitable for food production. It can be grown as a hedge in an alley cropping system and is recommended as part of a shifting cultivation system.
- Typical successful adopters are subsistence farmers cultivating steep, fragile or degraded hillsides.
- Broomgrass is produced in a five-year cycle with the lowest yield in the first and fifth years, and highest in the second and third years.
- Although the first year of production is labour-intensive, requiring planting and weeding, the crop does not require much attention after that.

Technological aspects

- One production cycle is possible per year (in Nepal and India, broomgrass is harvested in winter between January and March).
- Production is possible indefinitely; however, broomgrass must be replanted after five years.
- In India and Nepal, planting is done at the onset of the monsoon in May/June when there is sufficient soil moisture.
- Broomgrass can be propagated artificially through seeds, slips (rhizomes: roots with culms) or by wild seedling transplant.
- Propagation with seeds takes 15 months. For this, grains are collected from wild senescing panicles in March. Grains are sown in nursery beds clean of weeds and roots, having loose soil enriched with farm-yard manure, at a density of

10 g in a 4 x 1 m bed. Germination commences one month after sowing and seedlings are ready for transplanting three months after sowing (at the onset of the monsoon in June). Seedlings are transplanted to a different nursery bed with a spacing of 10 x 10 cm. Alternatively, they can be planted in polybags in a 1:2:1 mix of soil, sand and farm-yard manure. These are transplanted to the field after a year, at the beginning of the following monsoon (15 months after sowing). For optimal growth, seedlings require regular weeding and irrigation throughout the 15 months.

- Most farmers plant broomgrass slips, which can be gathered from old plantations and forests or obtained from nurseries that rear seedlings or rhizome cuttings.
- Slips are gathered by digging the roots of wild or cultivated plants after the harvest in February or March. The culms are cut, leaving a 15-20 cm long stem with roots. Two to three culms, along with bud sprouts and rhizomes are separated from the clump and planted either in polybags (with a 1:2:1 mix of soil, sand and farm-yard manure) or directly in pre-dug field pits. Soil moisture should be maintained at a sufficient level for plant establishment.
- The planting site for broomgrass slips must be free of weeds and debris.
- One month before planting, pits of 30 cm³ are dug and left for weathering.
- On hilly land, the pits should be spaced every 1.5 x 2 m along the contour lines or on terrace bunds; 19,000 slips are needed for 1 ha.

Figure 1. Rhizomes in polybags (left) and ready for transplant (right)



- Each pit is planted with a seedling or slip with 4 to 5 buds in a mix of soil and farm-yard manure.
- During the first year, the crop should be weeded 3 to 4 times. For a higher yield in the first year, farm-yard manure can be applied as a top-dressing during the second weeding.
- The plot should be weeded annually in subsequent years.
- A fence will protect the crop from browsing and grazing.
- From January to March, the mature panicles are carefully harvested: these are tough and have changed in colour to light green or red.
- The timing of the harvest is extremely important for ensuring maximum return. If the panicles are harvested prematurely (5 to 7 days in advance), their production declines dramatically. If the harvesting is delayed, the plant begins to wilt.
- Panicles can be harvested by cutting above the soil, separating stem and panicle or pulled out by hand.
- Young sprouts must not be damaged during harvest. Panicles should never be harvested when unripe, or by uprooting the entire plant¹.
- 30 to 35 dried panicles are bundled together to make one broom. Farmers bundle the brooms themselves.
- After five years, the plot should be burned after harvest to improve germination of seeds and foster rapid growth in the next season.

Figure 2. Finished brooms and stem cuttings for house construction



¹ Standa-Gunda, W., T. Mutimukuru, R. Nyirenda *et al.* (2003). Participatory modelling to enhance social learning, collective action and mobilization among users of the Mafungautsi Forest, Zimbabwe. *Small-scale Forestry*, vol. 2, pp. 313-326, p. 321. Available from: http://epubs.scu.edu.au/esm_pubs/492/.

Figure 3. Broomgrass on land sloping 41° to 45°



Economic aspects²

- Initial investment cost is that of the broomgrass slips. Farmers can source slips from earlier plantations.
- Variable cost is that of labour. On steep land, in the first year, 135 person-days at NPR 200 (\$2.27) each person-day are needed, for a total variable cost of NPR 27,000 (\$306.32). In subsequent years, 95 person-days at NPR 19,000 (\$215.56) are needed for maintenance, harvest and bundling the brooms.
- Cultivation of 1 ha of broomgrass produces 450 brooms in the first year and 3,619 brooms in the fourth year, in one season, which sell for NPR 42 (\$ 0.48) each.
- Gross agricultural margin averaged over a period of four years is NPR 25,500 (\$289.30) per ha.
- Rate of return per day worked is NPR 189 (\$2.14).

Environmental aspects

- No additional irrigation necessary. No wastewater produced.
- No external inputs needed.
- On-farm recycling of all waste.
- No energy needed other than human labour.
- The deep, fibrous broomgrass root system anchors and structures the soil, preventing erosion of steep hillsides.
- Broomgrass farming is recommended as part of a shifting cultivation system on marginal hillsides³.
- Growing on degraded and steep land, broomgrass can be used to rehabilitate degraded areas. It does not compete for land with cereal crops⁴.

² Economic figures are based on the experience of the Nepalese NGO Manahari Development Institute (MDI) which has been promoting broomgrass farming in the hills of Nepal since 2010.

³ Kafle, G., and M.K. Balla (2008). Effectiveness of root system of grasses used in soil conservation in Paundi Khola sub watershed of Lamjung district, Nepal. The Initiation: SUFFREC (Journal of the Student Forum for Forestry Research and Environmental Conservation), vol. 2, No. 1, pp. 121-129. Available from : <http://nepjol.info/index.php/INIT/article/view/2533>.

⁴ MDI-Nepal Annual Report 2013, p. 26. Available from: mdinepal.org/MDI%20Annual%20Report%202013.pdf.

Social aspects

- Sale of brooms increases household incomes.
- Additional benefit from the multipurpose crop as its grass can be used as animal fodder, the stem used or sold and the roots have medicinal value (can be decocted for use as a mouthwash during fever)⁵.
- Broomgrass is especially important during the lean fodder season from November to March when its leaves remain green after other green feed is exhausted.
- Females provide 70 per cent of the labour for broomgrass cultivation and manufacturing of brooms.
- Ten per cent of labour is from outside the household, creating some rural employment opportunity.

Issues for replication

- Sourcing broomgrass may be an issue. However, this can be remedied in a short time with new broomgrass plantations to harvest slips.
- Broomgrass growing areas must be protected against human and animal encroachment, especially during the seed germination period.
- When harvesting panicles, plants must not be uprooted as this kills the whole plant.
- Farmers in Nepal and India sell brooms through middlemen who keep 65 per cent of the retail price. Farmers can benefit from a cooperative marketing system.

Contacts

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Useful links

- Newar, N. (2013). Broom brings boom. How one Nepali village has found the road to harmony and prosperity. *Nepali Times* No. 656, 17-23 May 2013. Available from: <http://nepalitimes.com/article/nation/Broom,410>
- World Wildlife Fund Nepal (2013). *Broom Grass – a Boon for Communities and Ecosystems*. Available from: <http://www.wwfnepal.org/?212732/Broom-grass--a-boon-for-communities-and-ecosystems>
- World Wildlife Fund Nepal (2012). *Rehabilitating Land Degraded by Shifting Cultivation*. Available from: <http://wwfnepal.org/?206908/Rehabilitating-land--degraded-by-shifting--cultivation>
- Youtube video: broomgrass rhizome collection

⁵ Shankar, U., S.D. Lama, and K.S. Bawa (2001). Ecology and economics of domestication of non-timber forest products: an illustration of broomgrass in Darjeeling Himalaya. *Journal of Tropical Forest Science*, vol. 13, No. 1, pp. 171-191, p. 174.