

Ginger cultivation in bags: A productive approach for environmental and economic sustainability

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Ginger is a commercially valuable crop cultivated for its aromatic and medicinal properties. It is one of the major spices used extensively in households. The article provides details of the production technology of ginger in bags which can enhance the quality of the product, as well as its high market preference. Ginger cultivation in bags can be a highly lucrative venture with high returns on investment, providing farmers with an additional source of income. This is an efficient space-saving and eco-friendly method that can improve yield up to 2 kg/bag while reducing disease risks, water usage, and land degradation.

Keywords: Container farming, Economic analysis, Frontline demonstration, Lucrative venture, Sustainability

GINGER (*Zingiber officinale* Rosc.) is a commercially valuable crop cultivated for its aromatic rhizomes, which serve as both a spice and a medicinal ingredient. Ginger is a perennial herb notable for its extensive cultivation and significant medicinal, nutritional, and ethnomedical benefits across the globe. Ginger is full of various elements like zinc, salt, magnesium, potassium, etc. which are very necessary for our body. It has various uses as a spice in food or in drinks or in the preparation of medicines or perfumes. Among spice crops, ginger occupies a prominent position due to its consistent market demand and high economic value.

Scenario of ginger cultivation

The leading ginger-producing country in the world is India accounting for 30.48% of total output followed by China (20.97%), Nepal (12.85%) and Indonesia (12.38%). The area and production of ginger at the national level are 0.176 million ha and 1.89 million tonnes, respectively. The cultivated area of ginger in the North-eastern region of India extends to 67.82 thousand ha, with a production of 532.4 thousand tonnes and a productivity of 7.85 t/ha, which exceeds the national average productivity (2.56 t/ha). The region accounts for 22.53% of the country's total ginger production. Approximately 67.6 thousand tonnes of ginger produced in Meghalaya is from an area of 10.2 thousand ha.

Benefits of ginger cultivation

People cultivate many crops at home with care but profitable ginger cultivation is possible with very little

effort. Ginger is the most significant cash crop among spices, supporting livelihoods and enhancing the socio-economic conditions of many ginger farmers in the West Bengal region. An experiment revealed that intercrops of ginger did not affect the growth (stem girth and plant height) and yield of mango. It is observed that intercrop can successfully be grown under the mango trees without affecting their growth and yield adversely and the space can be utilised for producing additional income per unit area. Such intercropping with ginger cultivation in bag was done in mango orchard for higher space utilisation under frontline demonstration. The key benefits of ginger cultivation are as follows:

Pest management: Soil-borne diseases are significantly reduced because the growing medium is clean and contained. If one bag becomes infected or infested with insects, it can be removed without ruining the entire crop.

High yield and efficiency: Cultivation on bags or sacks can yield high returns, with some methods producing approximately 2 kg of ginger per bag. Improved soil quality and nutrient management in bags contribute to healthier plant growth.

Space optimisation: Ideal for small-scale farming, rooftops, patios, or underutilised shaded areas, allowing for intensive, vertical, or compact gardening.

Reduced labour and cost: The method requires less manual labour for weeding and soil preparation compared to traditional field farming.

Controlled environment: Farmers can easily manage moisture levels, prevent waterlogging and ensure the

soil remains light and well-draining.

Portability: Bags can be moved to adjust for sun exposure or to protect the plants from extreme weather conditions.

Economic viability: This method is becoming increasingly lucrative due to rising ginger prices, often allowing for rapid returns on investment for smallholders.

Environmental sustainability: Sustainable ginger cultivation in bags (grow bags) is an efficient, space-saving, and eco-friendly method while reducing disease risks, water usage, and land degradation. It is a resource efficient method and reduces the use of pesticides.

Institutional intervention

The demonstration was carried out in the farmers' field through frontline demonstrations by Malda Krishi Vigyan Kendra (KVK) for three years during 2021-22 to 2023-24. After preliminary survey, 40 randomly selected farmers were selected from KVK adopted villages for ginger cultivation. The area considered under each demonstration was 0.2 ha. Capacity building programmes for the beneficiaries were arranged by the KVK before implementation of the demonstration. The ginger variety *Mohini*, released from Uttar Banga Krishi Viswavidyalaya, West Bengal was distributed among the farmers as seed material for cultivation in bags. The demonstration was done in the mango orchard. Assessment of economic analysis of the demonstrated practice were compared in respect to tradition ginger cultivation practices (either in raised beds or ridges) in the area.

Cultivation practices

Soil preparation: Three baskets of soil, one basket of sand, one basket of dung manure and granular insecticide furadan @ 5 g has to be taken in a bag. Dung, sand and furadan mixed with the soil and filled in a synthetic bag. Utilising a light, well-draining mixture of cocopeat, sand and organic manure, healthy rhizome development can be promoted and prevent waterlogging. This technology eliminates the need for large-scale tilling, preserving soil structure.

Seedling preparation: Three pieces of sprouted tubers of 75 g each were buried in a tub filled with sand.



Effective utilisation of niche space

Ginger tubers were treated with fungicide (i.e. bavistin) @ 2 g/L of water) before planting. After cleaning, the tubers were dried in the shade for half an hour.

Transplanting: The plant will emerge from the sown ginger in a tub filled with sand after 20–25 days. The ginger seedlings transplanted in three places in the bag keeping mouth of the bag open. The bags were kept in a place with adequate sunlight. The ginger plant will continue to grow in a few weeks.

Fertiliser application: Two months after planting, four teaspoons of mustard seeds (Acting as a mild organic pesticide and a natural soil amendment) and half a teaspoon of urea were applied to the soil. The soil of the bags was dug and loosened a little for proper aeration which helps plant roots access necessary oxygen, promotes healthy microbial activity, and improves water drainage and nutrient uptake.

Intercultural practices: Apply organic compost or balanced fertilisers every 4–6 weeks during the 8–10 month growth cycle. While ginger requires consistent moisture (1,500–2,000 mm annually), bag cultivation reduces water wastage compared to open fields. Drip or targeted irrigation is recommended to prevent waterlogging, which can cause rot.

Harvesting: Ginger was planted in the month of June-July, therefore, it was ready for harvesting in the month of December-January. Average yield of about 1.5 kg was achieved from three plants in one bag when necessary management was done.

Precautions

- Use fresh, high-quality potting mix for each cycle to prevent soil-borne diseases.
- Avoid planting in the same spot for multiple consecutive years to reduce pathogen buildup.
- Employ recycled or durable, breathable grow bags. Some sustainable options include paper woven bags with liners, which offer better durability and biodegradability than plastic alternatives.
- Place bags in partial shade with temperatures between 18–35°C. Plant rhizomes 5–7 cm deep and use mulch (straw or leaves) to retain moisture and suppress weeds. It maximises yield per square meter, making it ideal for limited spaces and minimised contact with soil reduces reliance on pesticides.

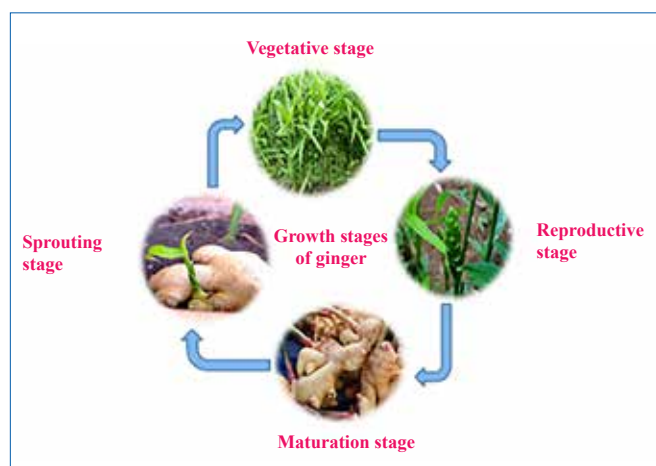


Table 1. Economic analysis of ginger cultivation in bag under mango orchard

Crop	Thematic area	Variety	No. of farmers	Area (ha)	Yield (q/ha)		% change in yield	Economics of demonstration (₹/ha)				Economics of check (₹/ha)			
					Demonstration	Check		Gross cost	Gross return	Net return	*BCR	Gross cost	Gross return	Net return	*BCR
Ginger	Proper utilisation of vacant space in orchard	Improved cultivar Mohini	40	0.2	20.78	15.54	33.72	23,580	62,340	38,560	2.64	26,025	46,620	20,595	1.79

*BCR (Benefit-cost ratio)= Gross return / Gross cost.



Frontline demonstration of ginger cultivation in bags



Ginger nursery

Environmental and management challenges

Ginger is an important and the oldest spice crop in the North-east region, with potential for further boosting production and increasing ginger exports. Since it is a vegetative propagated crop, a lack of consciousness in the selection of high-yielding varieties and several characters must have occurred in the past. There had also been an interchange of materials, but despite this, there has not been a tangible increase in production. Ginger rhizomes are highly susceptible to rotting in waterlogged conditions. In bags, ensuring consistent moisture without saturation requires careful attention, as excess water has nowhere to go unless the drainage is perfect. Ginger is sensitive to temperature extremes. Temperatures below 13°C induce dormancy, while those above 32°C can cause leaf scorching and heat stress. Bags in direct sun can heat up quickly, while bags in cold areas may not stay warm enough, requiring placement in shaded conditions or a controlled microclimate. While ginger can grow in bags, it needs ample space for rhizome development; a bag should be at least 12 inches deep and wide. Inadequate space can stunt growth and reduce yields. Soil in bags has a limited nutrient reservoir that depletes faster than open-field soil. Consistent fertilisation is necessary. Using too much nitrogen can lead to excessive foliage rather than good rhizome yield. Rhizome rot (Soft rot) is the most significant disease problem, caused by fungal species such as *Pythium* which thrive in moist soil. Once established, it is difficult to control and can destroy the entire crop. Bacterial wilt is another serious soil and seed-borne disease that can cause wilting and yellowing of leaves. Common pests include shoot borers, nematodes, and white grubs, which can be difficult to manage within a container system without proper soil treatment and vigilance.

Transfer of technology

Successful implementation has inspired neighboring farmers due to the newness of the technology in Malda district. Ginger cultivation in bags has been demonstrated to be a more productive agricultural method in mango orchards. Utilising the best farming techniques and technologies to get maximum yields from ginger. Ginger cultivation in bags offers a highly productive, space-saving method that reduces disease risks, minimises labour, and enables the use of unproductive shaded land. The farmers found this technology of ginger cultivation more applicable in the mango orchard enhancing the unit area of their orchard. More than 60 farmers have adopted this technology for their additional income.

SUMMARY

Ginger cultivation in bag has a prospective potential for higher income generation. It enables using unused land, offers better nutrient control, and is increasingly adopted by rural youth for income generation. Management of ginger cultivation in bag is simple and comparatively less labourious and moreover it is environmental sustainable. Economic analysis has already shown the profitability of ginger cultivation in bags through frontline demonstration programme. The simplicity and low labour requirements of the method make it accessible to individual farmers with limited land, including women farmers, thereby promoting inclusivity in ginger cultivation in bags. Therefore, farmers having interest in ginger cultivation in bags with profitable attitude are continuously motivated by KVK to start this technology in their fields.

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