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Ginger cultivation in Mizoram: Status, constraints, sustainable approaches and prospects

Chapter 5

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ABSTRACT

Ginger is an important cash crop of India including Mizoram. It plays a vital role in the livelihood security and income of Mizo farmers. The high suitability of agro-climatic conditions for ginger cultivation in Mizoram is attributed to their special characteristics like aroma, pungency, less crude fibre, distinctive taste and high gingerol content. However, there are certain constraints such as traditional Jhum farming, unavailability of quality planting materials, high production cost, lack of proper marketing channel, post-harvest losses etc., that result in lower production. Though, scientific interventions like providing need base farmers training of good agricultural practices for ginger cultivation; timely availability of high yielding quality planting material like Bold Nadia and Bhaise; soil solarization and pre-planting rhizome treatment; crop rotation and adoption of intercropping with other crops; timely pests and diseases management etc., would result in doubling the production of ginger as compared to production under conventional methods. At the same time, Mizoram received GI tag for “Mizo Ginger” has been attracting the attention and interest of buyers globally.

Therefore, there is an urgent need to focus on its production through government support with scientific backup, so that farmers can improve its production and productivity.

Keywords: Ginger, Mizoram, agro-climatic, quality and GI

Introduction

The terrain of Mizoram is bestowed with a suitable climate for growing wide varieties of vegetables and a large variety of spices such as chilli, ginger, turmeric, tejpat, cinnamon, coriander, fennel, ajwain, dill, fenugreek and garlic. Among different spices, ginger (*Zingiber officinale*), family Zingiberaceae; is the major cash crop being cultivated especially in jhum lands supporting the livelihood and income of many ginger growers of the state. The use of geographic information system (GIS) to assess land suitability for ginger cultivation identified four states in India such as Mizoram, West Bengal, Orissa and Kerala as most suitable for its cultivation (Parthasarathy *et al.*, 2008). The whole state of Mizoram has excellent suitability for ginger (Fig 1; Utpala *et al.*, 2006) and is known for growing ginger with its low fibre content. Apart from fibre, some special characteristics like aroma, pungency, high gingerol content and distinctive taste have been reported in ginger grown in Mizoram. These unique and special characteristics of indigenous gingers are attributed to the agro-climatic conditions prevailing in Mizoram. High oleoresin and higher oil recovery were obtained from ginger cultivated in higher elevation (Ngachan and Deka, 2008). The higher oil recovery (1.6-2.5 per cent versus 1.5-2.0 per cent) and oleoresin content (5.9-8.56 per cent versus 5-8 per cent) have been recorded in Mizoram ginger as compared to other parts of India (Spice Board, 2007).

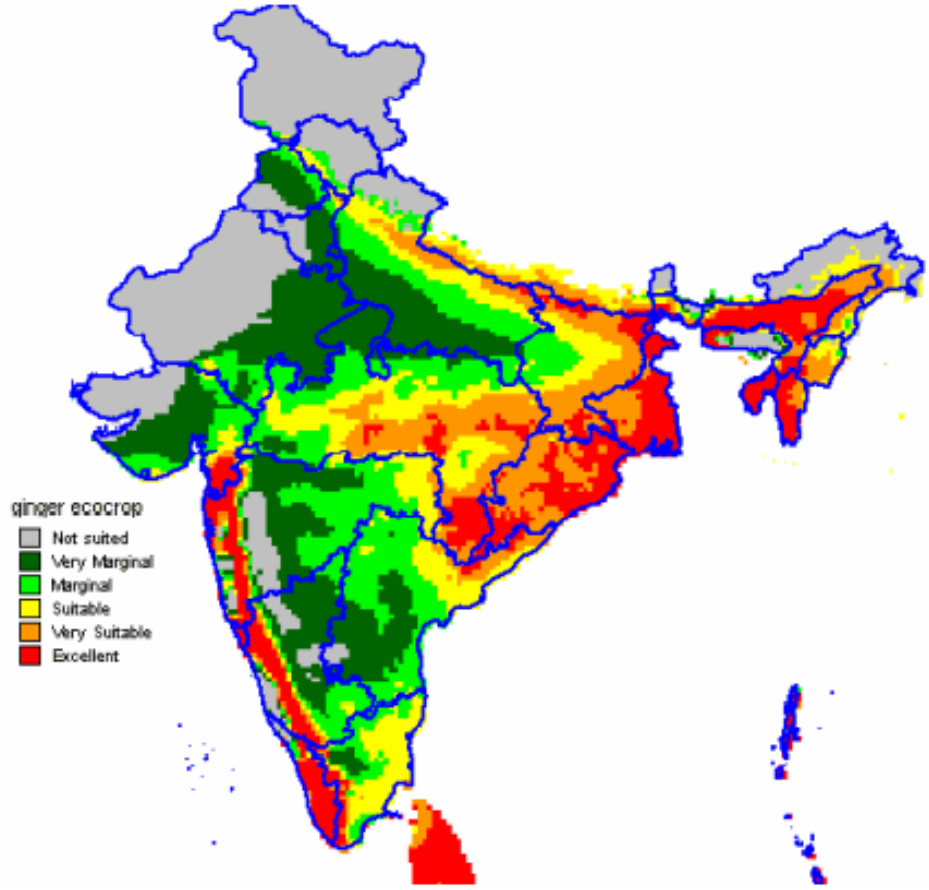


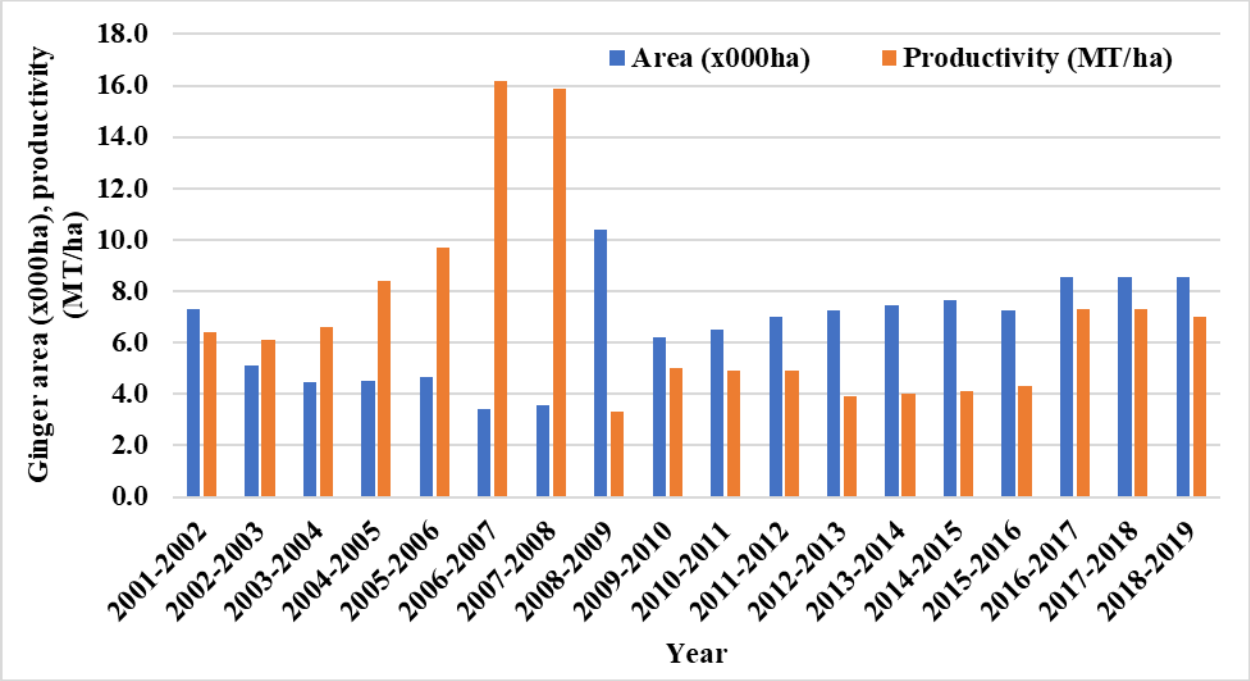
Fig. 1. Ginger site suitability map for India (Utpala *et al*, 2006)

Ginger requires a warm, humid climate with heavy rainfall of 1500-3000 mm per year or plenty of irrigation for its cultivation. It may be cultivated at altitudes ranging up to 1500 metres from above sea level. It grows well in clay loam or sandy loam soil with adequate humus content and good drainage. Partially shaded fields are ideal for ginger. It is an excellent crop for intercropping. The planting season in Mizoram starts after the celebration of 'Chapchar Kut' festival during April-May month that coincides with onset of monsoon. The best time for planting ginger is the first fortnight of April. The stored seed rhizomes for planting should be sorted with large, shiny; disease-free, spots, marks, bud or eye injury should be selected for planting. The seed rhizomes can be planted as a whole or cut the rhizome into pieces bearing 2-4 sprouts per cutting. Harvesting of rhizomes is done from the 6^{th} month onwards after sowing for green ginger and 8^{th} – 9^{th} month for dry ginger when the leaves turn yellow and gradually dry up. The rhizomes harvested can be eaten as raw or in processed form. It can be used as spice and medicine for over many years. It exhibits some promising health benefits and medicinal properties. It has been used to treat various problems like vomiting, cold symptoms, pain, etc. It has been shown to have anti-inflammatory, anti-

tumor, anti-apoptotic, anti-pyretic, anti-tumourigenic, anti-platelet, anti-hyperglycaemic, anti-diabetic, anti-clotting, antioxidant, cardiotonic, cytotoxic and analgesic properties (Shahrajabian *et al.*, 2019).

Status of ginger in India and Mizoram

Ginger occupies an area of 0.17 million hectares in India with a production of 1.84 million tonnes having productivity of 10.72 t/ha (FAOSTAT, 2020). The state of Assam is leading in ginger production followed by Maharashtra and West Bengal while Mizoram stood 7th position in ginger production (NHB, 2017-2018). The productivity of ginger in Mizoram (2018-19) is 7.03 MT/ha which is one of the highest in India (Economic Survey, 2019-2020). The trend in production of ginger in Mizoram for eighteen years is shown in Fig 2. The indigenous ginger cultivars such as Thinglaidum, Thingpuidum, Thingaria, Thingpui and Jugijan were reported to dominate the ginger cultivars of the state (Rahman *et al.*, 2008). 'Thinglaidum' dominates in area having small in size, extremely pungent, less fibre with blackish ring and mainly used in the processing of dried ginger which has varied industrial uses. 'Thingpui' cultivar occupied second in an area having bold, light-yellow rhizome with less pungency that is used for table and domestic purposes. Mizoram got the geographical indication (GI) tag for these two ginger cultivars, collectively called "Mizo Ginger" (Fig 3). The interest among farmers for ginger cultivation grows as climate, soil and other ecological factors favour quality production of ginger. In Mizoram, there is a good scope to improve the yield per unit area and hence the overall production of ginger. Farmers produce black ginger, a variety of ginger with bluish-black rhizomes, for both commercial and self-consumption, and it receives a premium price in the market for its therapeutic and medicinal properties.



Source: Economic Survey (2019-2020)

Fig. 2. The trend in area and productivity of ginger in Mizoram (2001-2019)

Thingpui Thinglaidum

Fig. 3. Thingpui and Thinglaidum ginger cultivars collectively called “Mizo Ginger”

Constraints in ginger cultivation

Traditional Jhum Farming: Despite the fact that ginger output in Mizoram has improved, there is always room for increasing productivity. The practice of growing ginger on steep slopes under jhum cultivation in rainfed conditions without following proper agronomic package for its cultivation leads to reduction in yield. In the first and second years of cultivation, virgin soils under the jhum method provide greater yields, however, after a gap of 3-5 years, low ginger yield (5-8 t/ha) was obtained (Jha and Deka, 2012). Earlier, due to low population pressure, jhum lands got sufficient time (10-15 years) for regeneration of forests, however, the cycle of cultivation has shortened (3-5 years) due to population pressure (Yadav *et al.*, 2004). The regeneration of biomass in jhum land takes time and is insufficient for good cropping thus reducing yield of the crop.

Land tenure system: In Mizoram, the land is owned by the community and not individuals. The village council president leases a particular hill to a family for cultivation for 3-5 years. As a result, farmers could not undertake adequate management practices resulting in lower production.

Quality planting material: Non-availability of quality planting material concurrence with serious seed-borne diseases has attributed to low productivity. Some serious seed-borne diseases are soft rot (*Pythium sp., Rhizoctonia sp. and Sclerotium rolfsii*), bacterial wilt (*Ralstonia solanacearum*) and dry rot (*Fusarium oxysporum*). Rhizome rot incited by *Pythium aphanidermatum* is highly destructive in all the ginger-growing areas of Mizoram (Singh *et al*, 2018). Ginger stem borer (*Dichochrosis punctiferalis*) and shoot borer weevil (*Prodiotes halmaticus*) cause crop damage between 30-40 percent during July-September (Jha and Deka, 2012).

Fertilizer availability: The use of chemical fertilizers is very less among the farmers as they are unable to purchase the fertilizer either due to unavailability in village markets, limited availability in cities, and its high costs. The total consumption of fertilizer in terms of nutrients (NPK) is 31.97 kg/ha in Mizoram which is far below the national average of 133.44 kg/ha (Anonymous, 2020).

Resource-poor farmer: Most of the farmers are small and marginal with smaller landholdings that make them unable to grow ginger on a commercial scale. Moreover, lack of storage facilities on-farm results in loss of harvested produce. Non-existence of a proper marketing channel force the hardworking farmers to sell their produce at throw-away prices. Besides, lack of awareness on post-harvest technologies among farmers and skilled trainers leads to lower-income. The absence of an adequate number of post-harvest processing units to absorb marketable surplus (which is nearly 70 per cent) forces the cultivators to sell the

produce as fresh only (Jha and Deka, 2012). During handling and transport, the post-harvest loss of ginger in the North-eastern region is estimated to be around 10.5 per cent (Deka *et. al*., 2004).

Financial support: The lack of financial aid for the cultivation of ginger from the government to purchase quality seeds and other inputs is also a concern for farmers. As cultivation of ginger requires lots of planting material (1.5-2.0 t/ha) with a large capital requirement, many poor farmers do not afford it. At the same time, they are afraid to take risks to invest in the crop due to an unorganized market.

Sustainable approaches for ginger cultivation in Mizoram

- The right to land ownership should be given to farmers to stop jhum cultivation and judicious management of land. This will help in the transformation of Jhum land to a settled form of cultivation in the form of terraces (Fig 4).

Jhum land Permanent terrace land

Fig. 4. Transforming Jhum land to permanent terrace land

- The availability of high-yielding quality planting material, free from diseases and pests will contribute to enhancing the productivity of ginger. In Mizoram, apart from local cultivars, research at ICAR Kolasib found that Bold Nadia is performing best with a yield of 12-15 t/ha. Apart from this, some other varieties are Bhaise, PGS 121, PGS 95, PGS 102 and Gurubathani are suitable varieties for this region.
- There is a need for the establishment of seed agencies to supply certified seed rhizome in Mizoram.
- Soil solarization is very effective for the control of rhizome rot under organic cultivation. This was done by using a transparent polythene sheet of 100-micron thickness to cover the irrigated soil immediately by burying the edges of the polythene in the soil. Solarization should be conducted for six weeks (April to May)

when the temperature increases by approximately 4-10ºC which is enough to kill the soil pathogens, insects and weed seeds (Fig 5).

Fig. 5. Soil solarization under terrace farming to control soil-borne ginger diseases

- Crop rotation is an important practice to break reproduction cycles of pathogens and insects. It also improves the physical condition of the soil that ultimately helps in the growth and development of the crop. In the North-eastern region, ginger is mainly rotated with french bean or soybeans, which also give additional income to the farmers. The cycle of rotation varied for 2-4 years and crops such as mustard, potato and paddy are also used in rotation. Apart from crop rotation, cultivation of ginger under intercropping system results in a synergistic effect leading to increased productivity, higher yield per unit area per unit time as compared to sole cultivation. The finding shows that ginger performed better under an intercropping system with taro, legumes crops, sweet corn, papaya, banana etc. (Fig 6).

Ginger + Taro

Ginger + Sweetcorn

Ginger + Banana


Ginger + Papaya


Ginger + Arecanut


Ginger + Frenchbean

Fig. 6. Compatible ginger base intercropping system

- Integrated disease management of rhizome rot using hot water treatment, bio-fungicide and chemical has been found effective. Hot water treatment at 47 °C for 30 min, soil application of bio-fungicide (*Trichoderma harzianum* at 2.5 kg/50 kg FYM/ha) followed by three time drenching of copper oxychloride (0.3 per cent) in combination was found most effective in limiting the incidence of soft rot (19.29 per cent) on ginger besides having their significant response in improving the growth and yield (41.90 q/ha) (Singh *et al*, 2018). Bio-organic/botanical extracts proved to be effective for control of rhizome rot of ginger. *Trichoderma harzianum, T. viride, Metarhizium anisopliae, Azadirachta indica* and *Agave Americana* were found to be promising in reducing mycelial growth of *Pythium aphanidermatum*, the main causal organism of ginger rhizome rot (Sharma, 1998; Hossain *et al.*, 2021). Soaking of ginger rhizomes in *Boerhaavia diffusa* root extract (10 per cent) overnight and 3 foliar sprays of the same at weekly intervals starting just after apparent symptom was found quite effective in the management of the disease (Pandey *et al.*, 2010). Extracts of *Polyalthia longifolia*, *Parmotrema tinctorum*, *Flavoparmelia caperata*, *Jacaranda mimosifolia, Moringa olifera,* and *Terminalia arjuna* were also found to be effective in controlling the disease (Dileep *et al.,* 2013; Praveen and Sharma, 2014; Shivanna and Garampalli, 2015). Cow urine extract of *Elaegnus kologa* caused high inhibition of *Pythium aphanidermatum* (Rakesh *et al.*, 2013).
- For effective control of shoot borer in ginger, application of chlorantraniliprole + spinosad @ 0.5 ml/L (alternatively) at fortnightly intervals was found very effective that resulted in good ginger growth, higher yield attributes and ultimately higher fresh rhizome yield (18.0 t/ha).
- Farmers / Farmers Association / NGOs / Field labourers should be trained to develop technical skills in farm management and agronomic practices of ginger cultivation. Training in processed products and marketing is also important for strengthening the

income of farmers and reducing wastage. Marketing of Ginger produced in the state is taken up in collaboration with Mizoram Agriculture Marketing Solution (MAMSoL) and Mizoram Farmers' Society (MIFAS). Ginger produced by farmers are purchased and sold through these Agencies with interest free loan provided from Ginger Marketing Scheme.

- The establishment of processing units in the region is needed to absorb the market surplus and produce value-added products that have longer shelf life.
- The harvest of mother rhizome in off-season fetch higher price in market thus providing supplemental income to farmers. The traditional practice of mother rhizome removal called '*mau* extraction'. In this practice, higher seed rate (2-2.5 t/ha) against normal rate (1.5 t/ha) is required and planted in the month of March-April. By the end of May or June, *i.e.* when ginger crop gives 3-4 leaves or attains 60 days age, the mother rhizomes are removed, leaving the sprouted piece of rhizome in the soil and well-decomposed farmyard manure is applied after 15 days of *mau* extraction (Rahman *et al*, 2009).
- Quality ginger production following GAP (Good Agricultural Practices) should be followed to boost sale of ginger inside and outside of Mizoram. Organic ginger fetches high prices in market and international trade. More focus on organic production of ginger and proper marketing channel can boost the economy of the state.

Prospects of ginger cultivation

The northeastern region is the ginger hub of India as the climate and the land composition for the cultivation of ginger are most favourable in this region. Quality ginger produced in Mizoram can be processed to get quality products such as dry ginger, ginger oil, oleoresin, ginger powder etc. Adoption of scientific methods of cultivation like use high yielding varieties like Bold Nadia, Bhaise etc. with proper soil solarization, pest and disease management and adoption of proper crop rotation can improve crop yield and ultimately farmers' income. Other technologies for value-addition like encapsulated ginger, preserved ginger, crystallized ginger, salted ginger, etc. can be adopted to improve income and avoid post-harvest losses. The establishment of processing industries and adequate training for skill enhancement are also very necessary for the grower to make them efficient, and to compete with the global market. The role of government is also very necessary in terms of financial support to expand the production and market. The storage facility is another vital component

for the preservation of fresh ginger. Low cost of production technologies through the use of farm mechanization, use of bioagents and biofertilizers along with *in situ* compost, vermicompost and manure production unit is crucial to achieving cheaper production cost of ginger. The rich diversity of ginger germplasms that are available in the state needs to be conserved and register to get GI for better marketing and export while preventing unauthorized use of registered GI.

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