

Original Research Article

STATUS OF CULTIVATION PRACTICES AND CONSTRAINTS FACED BY THE RESPONDENTS IN TERMS OF HORTICULTURAL CROP PRODUCTION AND MANAGEMENT IN THE SELECTED DISTRICT OF MEGHALAYA

Abstract

The study was carried out to examine the status of cultivation practices and to analysed the constraints faced by the respondents in terms of horticultural crop production and management. For the present study, Ex-post facto research design was followed. Purposively the study was conducted in East Khasi Hills and Ri-Bhoi districts. Two C&RD blocks from each district were selected purposively. Further, eight villages were selected purposively where twenty respondents were randomly selected from each, village. Hence, a total sample of 160 respondents for the present study was selected. The study revealed that the majority of the respondents stated that selling and profit was the major reasons for growing the various selected crops and most sold their produce directly to the consumer. Land preparation for potato, cabbage and ginger was done in a traditional method, locally called Nur Bun method. "Nur" means an agricultural component in Khasi local language which indicate as "one raised bed". Major constraints faced by the respondents included extension constraints. Major constraints faced by the respondents can be countered and also can be solved with the intervention of the government.

Keywords: Status, constraints, Horticultural, management, Meghalaya.

Introduction:

India, constitute a significant portion of horticultural crops to the total agricultural produce. It distributes about 28 percent of Gross Domestic Product (GDP) and amount the total exports of agricultural commodities for 37 percent from India. About 58 percent of the total population in India depends on agriculture and allied activities (Agriculture in India, 2020). The second largest producer of fruits and vegetables in the world is India, after China.

India has made a good progress in production of horticultural crops like vegetables and fruits which likely touch a record of 314.67 million tonnes (mt), where the production of vegetables is estimated at 187.5 million tonnes (mt), fruits is estimated at 97.35 million tonnes (Anonymous, 2019) while spices is compute to 9 million MT. The spices comprise of turmeric, garlic, cumin, coriander and among a variety of cinnamon (Jaganmohan, 2020). Horticultural crops grown in this region range from tropical and sub-tropical fruit to temperate fruits, vegetables and flowers both native and introduced crops. Tubers and rhizomatous crops such as tapioca, sweet potato, dioscorea, colocasia, ginger and turmeric grow in abundance (Deka *et al.*, 2012) in the region while plantation crop like tea has high impact on the economy of Assam region in particular.

There is a vast possibility for horizontal and vertical prosperity for horticulture in North-east region. Horticultural crops amount about 18.60 percent of cultivated area at present. The portion is maximum in Sikkim then comes Manipur, Arunachal Pradesh, Meghalaya, Tripura, Mizoram, Assam and Nagaland (De, 2017).

Comment [DP1]: analyse

Comment [DP2]: Rectify the punctuation mistake

Comment [DP3]: indicates

Comment [DP4]: Remove the comma.

Comment [DP5]: constitutes

Comment [DP6]: Rectify this reference.

Comment [DP7]: This statement should be supported with appropriate statistical reference. This kind of statement cannot be accepted in a scientific paper without any valid reference.

Comment [DP8]: It is important to specify the region. Do you mean any particular region of India or you are trying to indicate the whole country here?

Comment [DP9]: It is important to specify the region. Do you mean any particular region of India or you are trying to indicate the whole country here?

Comment [DP10]: Do you have any reference in particular to support that? Please incorporate that.

Comment [DP11]: Revise the sentence construction.

Meghalaya is a hilly state in north-eastern India. Approximately, 3,42,885 ha is the net cropped area or the geographical area of 15.28 %. The potential unused area is approximately 5,55,104 ha or 24.75 % of the total area and the forest cover is 9,46,089 ha (Horticulture in Meghalaya, 2019). The variation of altitude, soil and climate conditions provides ample scope for growing a large variety of fruits and vegetables. The maximum area among the fruit crops is under pineapple (9.5 thousand ha) then citrus (8.2 thousand ha) and banana (6.2 thousand ha). Meghalaya has second largest acreage of potato (20.8 thousand ha) after Assam.

Comment [DP12]: The reference is unavailable in the reference list. Please consider revision here.

Strawberries were cultivated in a small scale about 15 years ago in Meghalaya. Sohliya village was selected as a hub of strawberry cultivation in Meghalaya in collaboration with Horticulture department farm in Dewlieh and Umsning. Ri-Bhoi district is one of the important ginger hubs of the state. Nadia, was found to be the most prominent cultivated variety in this area as it contains low fibre (4.10%) and the demand for culinary purposes is increasing. In 1830, David Scott first introduced Potato in the Khasi Hills. In 1970s' The Central Potato Research Institute (CPRI), Upper Shillong analysed and proposed Kufri Jyoti being the most superior variety than the earlier varieties in enhancing yield also, resistance to late blight disease. However, Kufri Jyoti is inferior to Up-to-date variety in quality.

Comment [DP13]: Do you have any reference to support these data you indicate here? These data cannot be accepted in a paper blindly without any kind of valid reference.

Farmers cultivating such crops have the potential to enhance their income and production but due to some constraints such as non-availability of seeds at reasonable price, lack of infrastructure, poor transportation, poor market linkages and lack of awareness, they are not able to achieve much growth. Farmers need to increase their managerial ability to meet the demands of increasing complexity. If farmers are put up with appropriate trainings and technological know-how and also enterprises are established for marketing aspects, the horticultural crops have the potential to enhance employment and upgrade trade and commerce.

METHODOLOGY

For the present study, Ex-post facto research design was used. It's a research method in which groups with qualities that already exist are compared on some dependent variable. The present study was conducted in the state of Meghalaya. The present study was conducted purposively in East Khasi Hills and Ri-Bhoi districts as East Khasi Hills districts have the highest production in potato and cabbage whereas Ri-Bhoi districts leads in the production of ginger and strawberry. Therefore, these two districts were purposively selected for the present study.

Comment [DP14]: Do you have any reference to support your claim? A proper reference must be incorporated while making this kind of strong argument.

There are 8 Community and Rural Development (C&RD) blocks in East Khasi Hills district out of which two blocks namely Mawryngkneng and Khatarshnong were selected purposively for the present study as these blocks consists of maximum numbers of farmers with respect to the crops selected for study. Also, there are 4 C&RD blocks in Ri-Bhoi district out of which two blocks namely Umsning and Bhoirymbong C&RD block has also been selected purposively for this study as these blocks also consists of maximum numbers of farmers with respect to the crops selected for study.

From each of the selected C&RD blocks, two villages were selected randomly. Smit and Umphrup village were selected for cabbage farmers; Wahstew and Synrangsohnoh village were selected for potato farmers, Sohliya and Dewlieh village for strawberry and Itsopair and Mynri village for ginger. The following villages were selected as most of the farmers are engaged in cultivating the selected crops. Thus, a total of eight villages were randomly

selected for the present study. Out of these, twenty respondents have been drawn randomly from each village. Thus, a sample of 160 respondents was selected for the present study.

The primary data was collected by conducting personal interview with the support of a personal-pre-tested structured-schedule, construct for this purpose. The secondary data and related information were collected from concerned department, various publications, journals, magazines relevant text books, internet sources etc. The data collected from the respondents were scored, tabulated and analyzed to calculate frequency, percentage, mean, standard deviation and correlation.

RESULTS AND DISCUSSION

Status of cultivation practices followed by the respondents with respect to selected horticultural crops.

Cabbage cultivation

For land preparation i.e., preparation of Nur-Bun was prepared in the month of April. Farmers perceived that cultivation of crops along the slope (Nur-Bun) on raised beds prevents washing off the whole crop at the time of heavily storm and rains. The channel (drainage) along the beds helps in washing away the excessiveness rain-water having no effects on the crop raised in beds. During this preparation, cost incurred for labor reaches up to Rs 8000-100000 for 1 acre of land. For planting materials, farmers purchased seed from the local market @ 200 per packet. The District Horticulture Officer East Khasi Hills, Shillong sometimes supplied inputs like plant protection equipment & chemicals, organic manure and seeds etc. Raising of nursery begins from April 1st week to June last week for production flow and supply flow in the market. Cost incurred during time of planting reaches up to Rs 2000-3000. A spacing of 1x1ft (RxR) and (PxP) were commonly followed by the farmers because it was practiced by their ancestors since ages. For manuring, common material used was fresh cow dung which was incorporated during land preparation and usually depends on rain for irrigation. The farmers mentioned that Black rot (*Xanthomonas campestris*) and Leaf webber (*Crociodolomia binotalis*) were the common diseases and pests infecting cabbage. Hot water treatment at 50^o C for 30 minutes were incorporated by some farmers to minimize Black rot whereas some of them spray Endosulfan @2l/ha to minimize leaf webber. Harvesting was done in the month of August and markets their produce right after harvesting. Some of the farmers stored at home for days. On an average 20-30q of cabbage were obtained from 1 acre of land which is more than the average national productivity of cabbage which stands at 15-20 q/acre.

Ginger Cultivation

Preparation of Nur-Bun was prepared in the month of March. During this preparation, cost incurred for labour reaches up to Rs 20000 for 1 acre of land because more man power is required for ploughing. Planting material like Nadia, Vareda were commonly used by the farmers because it has a high yield potential and can bear the heat and they purchased from the local market @ 3500 for 40 kg. Ginger was planted in mid-April. A spacing of 1/2x1/2ft RxRPxP were commonly followed by the farmers because it was practiced by them since ages and most depend on rain for irrigation. Symptoms like yellowing of leaves, softening; milky, pulpy of rhizomes and plants easily collapse on pressing was observed frequently by the famers. Some treat rhizome with Dithane @2g/l of water while some simply disposed the

Comment [DP15]: The constraints faced by the producers were assigned the ranks based on the weighted mean score. It should be clearly mentioned here in "Methodology" section how these scores have been calculated.

Comment [DP16]: Please put the details of the scoring technique you used for this particular study.

Comment [DP17]: It is not clear how you analyzed your data and applied these descriptive as well as inferential statistical tools to draw a meaningful conclusion. Did you use any particular statistical software like NVivo or MS excel etc.?

Comment [DP18]: I have not found any particular instances here in this paper where the author(s) used standard deviation and correlation. Please consider revision.

Comment [DP19]: Please mention the sowing and weed control practices here as a part of cultivation practices. Besides, please indicate the commonly grown varieties of cabbage in this region as you were informed by the farmers.

Comment [DP20]: Is it the cost of cultivation or cost of production?

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Comment [DP22]: As this is not your research finding, you need to put a reference to support this particular claim you made here.

rhizome. Harvesting was done in the month of December and markets their produce between January and February. The market price of ginger was Rs 100/kg. After harvesting, Ginger was stored in a pit in the field itself. About 10000 kg of ginger can be obtained from 1 acre of land which is less than the average national productivity of ginger which stands at 18000 q/acre.

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Strawberry Cultivation

A strawberry bed was prepared in the month of September. Cost incurred during bed preparation reaches to Rs 5000-6000 for 0.5 acre of land. Before, seedlings were provided by the Department of horticulture, Dewlieh for free but as of now they had to purchase @ 20-25/seedlings from the supplier. Varieties like Camarosa, Festival and Sweet Charlie were commonly cultivated by the farmers but they observed that Festival is the sweetest among other varieties. Propagation was done by means of runners after blooming. They also mentioned that plants having a good root system were utilized for new plantation. For mulching, black polythene was commonly used by the farmers because it conserves soil moisture by preventing it from evaporating. Some farmers used raw cow dung as organic manure and purchased @ 6000/truck. Drip irrigation method was commonly followed by the farmers and released every morning. If there is no rain, irrigation was given twice a week during September and October, and minimized in November weekly intervals. In December, harvesting was done after which sorting and grading was followed. After sorting and grading, the fruits were packed in a container for marketing to the nearest or distant market. The market price of strawberry per container was Rs 120. From 1 acre of land, they can produce about 25-30 q which is less than the average national productivity of strawberry which stands at 35-40q/acre.

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Potato Cultivation

Preparation of Nur-Bun for potato was prepared in January during summer season and august during autumn. A furrow at 50 cm apart was prepared. Planting material was obtained from horticulture department or registered growers and cost @ Rs 14kg⁻¹. Farmers mostly cultivate Kufrijyoti and Kufrimegha because it has a high yield potential, high demand especially for those requiring for instant flakes and chips. Tubers were planted in mid-February. Farmers also state that they incorporate both manure and fertilizers for potato crop and further mentioned that the cost of fertilizers was costly i.e. @ 8000 bag⁻¹. Leaf roll virus, cut worms (*Agrotis ipsilon*) and potato tuber moth (*Phthorimaea operculella*) were the common diseases and pests infecting the crop. It was observed that few farmers sprayed Indofil M-45 @ 500 g acre⁻¹ in 300lt of water to minimized fungal pathogen like Early-blight (*Alternaria solani*) and Monocrotophos 40 EC of 1.5 lt in 1000lt of water. Harvesting was done in mid-July – mid August. Harvested potatoes were stored at home for few days so that sorting can be done after which they were packed in a sack weighing 80-90kgsack⁻¹ for marketing. The farmers estimated that a yield of 40q can be obtained from 1 acre of land which is more than the average national productivity of cabbage which stands at 20 q acre⁻¹.

Comment [DP25]: As this is not your research finding, you need to put a reference to support this particular claim you made here.

Comment [DP26]: Water management and weed management are 2 vital aspects of the cultivation practices of potato. Please incorporate these here based on your research findings.

Comment [DP27]: August

Comment [DP28]: per kg (Don't write kg⁻³)

Comment [DP29]: per sack

Comment [DP30]: Is it cabbage or potato? Please consider revision.

Comment [DP31]: As this is not your research finding, you need to put a reference to support this particular claim you made here.

Indigenous Technical knowledge of land preparation

Nur-Bun method

The state of Meghalaya primarily consists of mountainous terrain and different crops including potato, cabbage and ginger were cultivated predominantly on the slopes. Land

preparation for potato, cabbage and ginger was done in a traditional method, locally called Nur Bun method. "Nur" means an agricultural component in Khasi local language which indicate as "one raised bed", measures about 1-1.25 m wide and 2-7 m long. "Bun" means the technique of preparing these raised beds. This is an alteration of jhum or shifting cultivation, commonly indicate as slash and burn technique which is an old-age technique bun system. In this technique, farmers vacate the identified forest-area over-all vegetation inclusively trees and utilized the area for some years for cultivation before shifting to other land for cultivation. This technique is initially a kind of ridge-furrow system, being identified to ensemble the strenuous mountainous-hilly-terrain and excessive rainfall during growing season. The nur method of land preparation is followed whenever a new forest or fallow area is to be brought under cultivation. In this method, rows of raised beds measure 1-1.25 m wide, 20-25 cm in height, and 2-7 m long (depending on the availability of land) are constructing beside the slope. About 50-70 cm, distance between the two beds was made which imply as a drainage channel to drained excessiveness of rain-water.

Farmers perceived that cultivation of crops along the slope (Nur-Bun) on raised beds prevents washing off the whole crop at the time of heavily storm and rains. The channels (drainage) along the beds help in washing away the excessiveness rain-water having no effects on the crop raised in beds. Also, it plays a vital role in enhancing the condition of the soil physically that enables the cultivable soil hard and compact. The incidences of disease are also perceived to be low. Thus, resulting in better production.

The findings in Table 1 revealed that the majority (100.00%) of the respondents stated that selling and profit was the major reasons for growing the various selected crops. This was followed by home consumption (88.75%), cultivate because ancestors also practiced and subsidy provided by the government (1.25%) respectively.

Table 1: Distribution of respondents based on reasons/ motives for growing selected horticultural crops

Reasons	Percentage	Rank
Selling and profit	100	I
Home consumption	88.75	II
As Ancestors practiced	66.25	III
Highest producer	15.00	IV
Subsidy	1.25	V

It was also evident from Table 2 that majority (100.00%) of the respondents sold their produce directly to the consumer which is more common for cabbage and potato, 90.63% sold to the retailer and 45.63% sold to the wholesaler.

Table 2: Distribution of respondents based on preference of marketing channels

Comment [DP32]: The sentence construction is incorrect. Please consider revision.

Comment [DP33]: Descriptive statistical distribution must demonstrate the frequency here. You should mention the frequency details alongside the percentage both in the table 1 as well as in the above paragraph..

Comment [DP34]: Descriptive statistical distribution must demonstrate the frequency here. You should mention the frequency details alongside the percentage both in the table 2 as well as in the above paragraph..

Reasons	Percentage	Rank
Producer - consumer	100.00	I
Producer - retailer - consumer	90.63	II
Producer- wholesaler - retailer - consumer	45.63	III

Comment [DP35]: Marketing channels

Constraints faced by the respondents in terms of horticultural crop production and management.

Also, Table 3 revealed that the major constraints faced by the respondents were extension constraints with the overall mean score of 1.51 which ranked first. Therefore, to overcome this problem, extension personnel should make a regular visit to the villages to gather information related to the problems faced by the farmers and to provide trainings according to their needs. For making the farmers more aware of the new technologies, they can set up different teaching methods like method demonstration, result demonstration, farm and home visit, etc., followed by the constraints related to not getting support from the government, with overall mean score of 1.38 which ranked second. Therefore, the government should take initiatives to provide incentives or subsidies, setting up storage facilities and encouraging the farmers to go for large scale cultivation. The Government should also procure the produce from the farmers so as to provide a sense of guarantee from minimum crop loss.

The third constraint was logistic constraints with overall mean score of 0.93. Therefore, the government should focus on improving the logistical flow in the agricultural product supply chain like product flow. This measures to improve the flows of products like physical handling, storage, and transportation of products. The Government should also take initiatives to construct proper storage houses at one common point for the villagers so that the government or any middleman can procure directly from the storage house in order to minimized transportation cost, distance from home to the field and lack of transportation. Marketing constraints with overall mean score of 0.87 ranked fourth. Therefore, to overcome this problem, price fluctuation should be minimized; provision of cold storage facilities at the village level for the smooth movement of the produce from the point of production to consumption centers and educating the farmers about proper marketing channels should be undertaken.

Technical knowledge/skills related constraints with the overall mean score of 0.55 ranked fifth. Therefore, the trainers should adopt appropriate procedures for effective training of farmers using identified knowledge and skills. The facilities meant to organize intensive training for rural farmers should be provided by government and other relevant bodies. Financial constraints with the overall mean score of 0.32 ranked sixth. Therefore, this problem can be avoided by creating awareness of availing both short term and long-term loans from sources like KCC, NABARD as well as co-operative banks. Production constraints ranked seventh with overall mean score of 0.2. Therefore, to overcome this problem, government should create awareness programs, campaign and exhibition and also should setup a system which provides on farm services to the farmer.

Table 3: Distribution of constraints faced by the respondents in terms of horticultural crop production and management

Nature of constraints	Weighted mean score	Rank
Extension constraints	1.51	I
Policy level constraints	1.38	II
Logistics constraints	0.93	III
Marketing constraints	0.87	IV
Technical knowledge/skills constraints	0.55	V
Financial constraints	0.32	VI
Production constraints	0.2	VII

CONCLUSION

The study revealed that majority of the respondents stated that selling and profit was the major reasons for growing the various selected crops and most sold their produce directly to the consumer. Land preparation for potato, cabbage and ginger was done in a traditional method, locally called Nur Bun method. "Nur" means an agricultural component in Khasi local language which indicates as "one raised bed". Major constraints faced by the respondents can be countered and also can be solved with the intervention of the government.

Comment [DP36]: As this is a research study using ex-post facto research design, it is quite important to incorporate few references here which support or contradict the findings of the researcher. The conclusion should be much more illustrative comprising the summary of the entire findings of the researcher along with some valid suggestions/recommendations. The summary of the recommendations addressing various constraints as described in the "Results" portion might be used here briefly in "Conclusion".

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

Reference

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