Extent of adoption of recommended package of practices of crops by beneficiaries of horticulture-hubs in Meghalaya

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ABSTRACT

Establishment of Horticulture-hubs was an important intervention for horticulture development and livelihood improvement of the farmers of Meghalaya. The study was carried out in two selected Horti-Hubs *viz.* Rongram Horticulture-Hub in West Garo Hills and Upper Shillong Horticulture-Hub in East Khasi Hills, with the objective to assess the extent of adoption of the recommended package of practices of crops popularised by the Horti-Hubs by the beneficiary farmers. From each hub, 30 beneficiaries were selected as respondents. The crops cultivated by the selected beneficiaries were strawberry, anthurium, polyanthus and ranenculus. It is observed that majority (70.00 %) of the beneficiaries were middle aged, female (76.66 %) and about half of them (46.66%) were educated up to primary. Their mean annual household income was Rs. 68183/-. Most of them (88.33%) were marginal farmers. 61.67 per cent had medium level knowledge on recommended practices. Most of them (98.33%) had medium level cosmopoliteness. The mean extent of adoption was found to be highest for anthurium (68.17 %) followed by strawberry (64.85 %). However, for polyanthus (47.58 %) and ranenculus (48.33 %), the extent of adoption was comparatively lower. High extent of adoption was found in land preparation (86.67 %) and nursery management (74.17 %). The extent of adoption was low in pest management (35.80 %), irrigation management (39.17 %) and post-harvest management (42.50 %). The extent of adoption was found to be influenced significantly by gender, family type, annual household income, land holding, knowledge level and cosmopoliteness. Understanding the reasons for low adoption and interventions to improve the adoption and subsequently increase the quantity and quality of the produce is recommended.

1. Introduction

Meghalaya state possesses varied and vast genetic diversity in horticultural crops especially in fruit and plantation crops. The varied soil and climatic conditions give good scope for cultivating a large variety of fruits and vegetables. Meghalaya also has a very high potential for commercial floriculture due to many competitive advantages the state has: a favourable climate, competitive labour cost, proximity to Guwahati and Kolkata Airport, *etc.* (Syiem and Shabong, 2011). Realizing that the horticultural crops have advantage over the traditional crops in generating rural employment, enhancing rural income and high potentiality to tap national and international markets, the state government had a vision of transforming Meghalaya into a fruit and flower state of the country. To this end, several new initiatives have been

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taken to propel this vision forward. One such initiative is the creation of ''Horticulture hubs'' under Technology Mission for Horticulture Development in all the districts of the state. The setting up of Horticulture-Hubs (Horti-Hubs) was an innovative step towards development of horticulture sector with the potential to boost horticulture as one of the leading sector in the state. Substantial achievement has been made in high value low volume crops namelystrawberry and commercial floriculture crops like rose, liliums, anthuriums, carnations and birds of paradise through these hubs. High value vegetables like broccoli and capsicum are also being expanded in terms of area and per cent of farmers cultivating it in their fields (Rangad, 2011). The Directorate of Horticulture, Government of Meghalaya, Shillong identified horticulture development as a key to accelerated economic growth and viable means of sustainable livelihood for the farming community of West Garo Hills district and thus the first Horticulture Hub was established at Rongram in 2008 (Prakash *et al.*, 2015). At present, 13 Horticulture-Hubs have been successfully established in the state covering all the districts. These Horticulture-Hubs function on the hub and spokes model within an area of 10-15 km radius. The spokes represent the clusters of farmers formed based on crops. The clusters may be individual farmers, cooperatives or self-help groups. As reported by Syiem and Marak (2016), these hubs are mainly responsible for the development of spokes through formation of crop technology clusters, provision of technical and other inputs, undertaking the process of monitoring, assigning area expansion activities, developing localized centre of excellence, acting as a training centre to farmers on new crop technology and cultivation, commercialization and management of crops. The selections of crops are based on the existing market demand, strength of each Horticulture-Hub as well as the agro climatic suitability and scales of economies. In this background, the study was conducted to study the adoption of improved crop production and post-harvest practices by the beneficiaries of Horticulture-Hubs.

2. Methodology

The study was conducted during 2018-19 in two of the well-established and best functioning Horticulture-Hubs *viz.* Rongram Horticulture-Hub in West Garo Hills and Upper Shillong Horticulture-Hub in East Khasi Hills. Three villages under each horticulture-hub having maximum number of farmers who adopted crops popularized by the Horticulture-Hub were selected. Random sampling with proportionate allocation method was used and 30 beneficiaries were selected from the villages under each Horticulture-Hub. This made the final size sample to be 60 farmers from the two selected Horticulture-Hubs. The selected villages were Asanang, Chibragal, Durakantragre from West Garo Hills and Mawkriah West Mawkriah East and Nongrimsadew. The extent of adoption of two most widely popularized crops by each hub *viz.* strawberry and anthurium from Rongram Horti-Hub and polyanthus and ranenculus from Upper Shilong Horti-Hub were assessed. 11 main areas ofrecommended package of practices of the selected horticultural crops were identified. For each of the identified practices, extent of adoption was measured using three-point continuum of 'full adoption', 'partial adoption' and 'no adoption' which was scored 0, 1 and 2 respectively. The sum of the adoption score of the 11 practices, gave the total adoption score of each respondent. Adoption index was calculated using the following formula

Adoption Index $=$

$$\frac{\text{Sum of the adoption score of n items}}{\text{Maximum possible adoption Score}} \times 100$$

Where, n= number of items in the adoption scale.

3. Results and Discussion

3.1 Profile of the beneficiaries

The profile description of the beneficiaries against thirteen selected variables is presented in Table 1. It is observed that 70.00 per cent of the beneficiaries were middle aged followed by young (16.66%) and old age (13.33%).
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Table 1. Profile of the selected beneficiaries (n=60)

Sl. No	Item	Category	Frequency (Percentage)	Mean	Range
1.	Age (in years)	Young (<35 years)	10 (16.66)	41.55	22-93
		Middle aged (35-50 years)	42 (70.00)		
		Old (>50 years)	8 (13.33)		
2.	Gender	Male	14 (23.33)	-	-
		Female	46 (76.66)		
3.	Education	Illiterate	10 (16.66)	-	-
		Primary	28 (46.66)		
		Secondary	12 (20.00)		
		Higher Secondary	2 (3.33)		
		Graduate	4 (6.66)		
		Post Graduate	2 (3.33)		
4.	Family Type	Nuclear	56 (93.33)	-	-
		Joint	4 (6.66)		
5.	Family size	Small (<3 persons/family)	6 (10.00)	4.5	2-8
		Medium (3-6 persons/family)	47 (78.33)		
		Large (>6 persons/family)	7 (11.66)		
6.	Annual Household Income (in Rs.)	First quintile (1000-33000)	0 (0.00)	68183.33	40000-150000
		Second quintile (33001-55000)	20 (33.33)		
		Third quintile (55001-88000)	32 (53.33)		
		Fourth quintile (>88001)	8 (13.33)		
7.	Size of land holding	Marginal (< 1.0 ha.)	53 (88.33)	0.74	0.2-1.95
		Small (1 to less than 2 ha.)	7 (11.66)		
8.	Farming experience in horticulture (in years)	Low (<8 years)	9 (15.00)	11.31	7-20
		Medium (8-15 years)	44 (75.00)		
		High (>15 years)	7 (10.00)		
9.	Knowledge level on recommended package of practices	Low (46.38)	12 (20.000)	59.17	31.82-86.36
		Medium (46.38-71.96)	37 (61.67)		
		High (>71.96)	11 (18.33)		
10.	Major Crop adopted	Strawberry	15 (25.00)	-	-
		Anthurium	15 (25.00)		
		Polyanthus	15 (25.00)		
		Ranenculus	15 (25.00)		
11.	Cosmopoliteness	Low (<12)	0 (0.00)	15	12-19
		Medium (12-18)	59 (98.33)		
		High (>18)	1 (1.66)		
12.	Trainings attended	Attended	48 (80.00)	-	-
		Not attended	12 (20.00)		
13.	Frequency of contact with stakeholders	Low (<15.56)	10 (16.66)	20.77	11.54-38.46
		Medium (15.56-25.98)	44 (73.33)		
		High (>25.98)	6 (10.00)		

Majority (76.66 %) of them were female. They illiteracy rate was 16.66 per cent and about half of them (46.66%) were educated up to primary. Almost all the respondents (93.33 %) lived in nuclear family. The family size of the respondent's ranged from 2-8. The mean annual household income of the beneficiaries was Rs. 68183.33. Most of the beneficiaries (88.33%) were marginal farmers possessing land size of less than 1.0 hectare. 75.00 per cent of the beneficiaries had medium farming experience in horticulture followed by low (15.00%) and high (10.00%). Regarding knowledge level on recommended package of practices, more than half of the beneficiaries (61.67 %) had medium level knowledge. It was observed that majority of the beneficiaries (98.33%) had medium level cosmopoliteness. Out of 60 beneficiaries 80.00 per cent had attended training on horticulture crops and 20.00 per cent of had not attend any training regarding horticulture crops.

Extent of adoption of recommended package of practices
a) *Strawberry*: Compared to other practices high adoption extent was observed in land preparation (96.67%) followed by harvesting (90.00%), transplanting (80.00%) and post-harvest management (80.00%). For cultivation of strawberry crop, the care should be given in the initial stages like, preparation of raised beds for planting, maintaining moisture content by sprinkling of water twice a day, planting the strawberry stolen in appropriate time (March- April or September-October) and immediate irrigation after plantingMajority of the beneficiaries highly adopted those practices and following the recommended practices to increase the crop growth and to reduce drying of plants. Bacchal *et al*., 2018 also found high adoption of transplanting and intercultural operations in strawberry crop. For transport to distance markets, the fruits should be harvested when still firm and before colour has fully developed and packed in perforated cardboard with cushioning materials. This way of harvesting and post-harvesting practices reduces the fruit damage. So the beneficiaries used to follow the recommended practices which are recommended by the Horti-Hubs. Lowest extent of adoption was observed in disease management (30.00%) and nutrient management (36.67%) practices. The hub used to provide fertilizers, pest and disease control agents during

during the initial period. After three years, Horti-Hub stopped the free distribution of inputs. In absence of the free supply, the beneficiaries stopped applying those inputs to the crop. The reason behind this was the beneficiaries do not want to spent their money on those inputs and they had less knowledge on manures and fertilizers, pest and disease management practices. Low level of adoption in manure and fertilizer management, pest management and disease management were also reported by Yadav *et al*., 2013.

b) *Anthurium:* In case of anthurium, higher extent of adoption was witnessed inland preparation (90.00%), transplanting (90.00%) and harvesting (90.00%). For planting anthurium, the polybags or raised beds should be prepared with manure mixture of farm yard manure, sand and red soil. This manure mixture will maintain soil moisture content. Foliar application of NPK fertilizers at 0.2% should be given for the crop in weekly intervals and 200 ppm of GA3 should be applied in a two months interval to improve the growth and quality of flower. Root rot and leaf spot are the major diseases which affects anthurium. Captan and Dithane foliar spay should be given for root rot and leaf spot respectively to reduce the disease infestation. Harvesting should be done when the spadix is completely developed and the flower should be harvested during early morning. Most beneficiaries had fully adopted these recommended practices which help to maintain the quality of the flower. Low adoption was seen in pest management (40.00%). It was due to the lack of knowledge regarding plant protection chemicals, high price of inputs. Low adoption of pest management in grapes and jasmine was reported by Ramesh *et al*., 2015 and Janani *et al*., 2016 respectively.

c) *Polyanthus:* Among the different recommended polyanthus practices, land preparation and nursery management practices were highly adopted by the beneficiaries. For seasonal flowers, crop establishment stage is the critical stage. So the most beneficiaries adopted these initial practices very carefully. Low adoption was observed in irrigation management (16.66%), harvesting (30.00%) and post-harvest management (30.00%). It was due to they used to grow polyanthus in pots and polybags and low

knowledge on improved package of practices. In case of irrigation management, the hub recommends sprinkling of water twice a day based on moisture content. But many of the polyanthus growers following their own method of irrigation of once in a day based on the moisture content. Due to the improper irrigation, seedling drying was observed.

d) *Ranenculus:* Land preparation was the only practice which was highly adopted by the ranenculus growers. It was due to the seed of the ranenculus is small in nature so, fine ploughing should be done in the field. The field with clods restricts the germination of the crop. It is also interesting to note that not a single beneficiary adopted post-harvesting management practices. They used to sell the pot or flower by wrapping with the newspaper. It may due to low knowledge on post-harvest practices and weak linkage with

the input suppliers. Low adoption in pest management (26.67 %) was observed which was due to lack of knowledge. Pawar *et al.,* 2011 found negligible adoption of pest management practices in medicinal and aromatic plants.

Overall extent of adoption: When read practice wise, it was observed that highest extent of adoption was found in land preparation (86.67 %) followed by nursery management (74.17 %). The extent of adoption was recorded low in pest management (35.80 %), irrigation management (39.17 %) and post-harvest management (42.50 %). If seen crop wise, the mean extent of adoption was found to be highest in the case of anthurium (68.17 %) followed by strawberry (64.85 %). However, in case of polyanthus (47.58 %) and ranenculus (48.33 %), the extent of adoption was comparatively lower.

Table 2. Extent of Adoption of recommended package of practices of selected crops

Recommended package of practices	Adoption Index				
	Strawberry (n=15)	Anthurium (n=15)	Polyanthus (n=15)	Ranenculus (n=15)	Overall (n=60)
1. Land preparation	96.67	90.00	83.33	76.67	86.67
2. Nursery management	76.67	73.33	80.00	66.67	74.17
3. Transplanting	80.00	90.00	40.00	36.67	61.67
4. Intercultural practices	70.00	63.33	33.33	46.67	53.33
5. Soil and Nutrient Management	36.67	66.66	53.33	56.67	53.33
6. Weed management	60.00	56.66	46.67	30.00	48.33
7. Irrigation management	53.33	53.33	16.67	33.33	39.17
8. Pest management	40.00	40.00	36.67	26.67	35.80
9. Disease management	30.00	53.33	73.33	40.00	49.17
10. Harvesting	90.00	90.00	30.00	30.00	60.00
11. Post-harvest management	80.00	60.00	30.00	0.00	42.50
Overall Extent of Adoption	64.85	68.17	47.58	48.33	57.23

Relationship of independent variables with extent of adoption

In order to understand the relationship of the extent of adoption with the independent, appropriate statistical tools were used *viz.* Pearson's correlation (r), Spearman's rank correlation (ρ) and Chi-square test of association (χ2).

Personal variables gender and family type was found to be significantly associated with extent of adoption at 1% level of significance. Mamathalakshmi and Naghabhushanam, 2011 & Hadole *et al.,* 2017 also reported that family type was a determinant of extent of adoption. According to

Mignouna *et al.,* 2011, farmer's education, age, gender, and household size were the major factors which affects the technology adoption.

Socio-economic variables annual household income and size of land holding was calculated to have positive and significant association with the extent of adoption. Annual household income had significant effect on extent of adoption. It indicates that as income increases the respondent have sufficient finance to meet the consequences of adoption of new innovation. Mamathalakshmi and Naghabhushanam, 2011 and George *et al.,* 2012 also

Table 3. Relationship of independent variables with extent of adoption (n=60)

Sl. No.	Variables	Statistical tool used	Value
1.	Age	R	.147
2.	Gender	χ2	.023**
3.	Education	ρ	-.213
4.	Family type	χ2	.340**
5.	Family size	R	-.150
6.	Annual Household Income	R	.283*
7.	Size of land holding	R	.339**
8.	Farming experience in horticulture	R	-.294*
9.	Knowledge level on recommended package of practices	R	.469**
10.	Major Crop adopted	χ2	.002*
11.	Cosmopoliteness	R	.388**
12.	Trainings attended	R	.149
13.	Frequency of contact with stakeholders	R	-.149

*Significant at 5% level of probability; **Significant at 1% level of probability

mentioned that annual income positive effect on adoption of flower crops and IPM in vegetable crops respectively. Size of land holding was positively influencing the adoption due to large size land holders have sufficient area to cultivate new crops and follow the improved package of practices. Adoption was also positively and significantly influenced by the knowledge on package of practices at 1 % level of significance, however, contradicting this was the finding that farming experience in horticulture was negatively and significantly correlated with adoption. Among the communication variables, only cosmopoliteness had positive and significant correlation with extent of adoption. Raghuprasad *et al.*, 2018 also mentioned the significance of cosmopoliteness in adoption of pomegranate recommended practices. It was also observed that the extent of adoption also significantly varied across the major crops cultivated. Differences in the level of adoption of different flowers were also reported by Manjhi *et al.,* 2016.

4. Conclusion

The establishment of the horticulture-hubs in Meghalaya is one very big step in enhancing the livelihood of the farmers. One of the important detriments of the success of the programme is the adoption of the popularised crops according to the recommended package of practices. It was found that extent of adoption of the selected crops ranged from 68.17 to 47.58 percent with the overall adoption index being 57.23 per cent.

This indicates a high scope for improving the extent of adoption. The practices were adoption were low are pest management, irrigation management and post-harvest management. Understanding the reasons for low adoption and interventions for targeting these practices, so as to improve the adoption and subsequently increase the quantity and quality of the produce is recommended.

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