Commercialization of Home Gardens in Upland Farming Systems: Evidences from Cash Crop Regimes of Rural Meghalaya, Northeast India

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Abstract
In developing countries, home garden is essential part of rural ecosystem and cater multiple functions including household food security. However, home gardens are getting commercialized in the developing world including the uplands of northeast India. Hence, we look at the impacts of commercialization on home gardens of different farming systems of Meghalaya. In this exploratory assessment, authors have employed qualitative methods including in-depth interviews to collect primary information from seven different farming systems that include two subsistence, three traditional, and two modern cash crop-based farming systems. The study has investigated the traditional practices of home gardening and its extent in different farming systems, crop and livestock diversities, levels of commercialization and the driving factors. It was found that crop diversification in the home garden is maximum in the jhum (shifting) farming system followed by tea-strawberry farming system. Similarly, the highest number of commercial crops is grown under home gardens in broom farming system and it had also made inroad to jhum (shifting) farming system to some extent. It is also found that chicken and pig rearing is common to all farming systems with some variations. Cattle have been introduced in some villages, as a direct consequence of introduction of wet paddy in the narrow valleys and partly a response to gradual cultural diffusion from the nearby plains. Besides, housing pattern of some settlement or space between dwelling units determine the existence of home garden.

Keywords
Cash crops; Home garden; Tribal communities; Space; Food security; Indigenous knowledge
Introduction

Home Garden: Generalities

A home garden\(^1\) refers to a space that is a culturally-controlled biological community around houses (Kimber, 2004), often composed of multi-species, multi-storeys and multi-purposes with solutions to the socio-economic and cultural needs of the people (Bennett-Lartey \textit{et al.}, 2004). The roles of home garden are well recognized across the globe for its significant contribution to food and nutritional security, agro-biodiversity conservation, economics, socio-cultural and aesthetics values (Gautam, Shapit and Shrestha, 2006; Gulluzz \textit{et al.}, 2010; Galhena, Freed and Maredia, 2013). The roles of home garden even become more crucial during war and emergencies (Pothukuchi and Kaufman, 1999). Home garden has proved immensely helpful for household food security irrespective of rural and urban setup during the rapid outbreak of COVID-19 pandemic and consequent lockdowns (Lal, 2020; Mukiibi, 2020; Kingsley \textit{et al.}, 2022). Recent studies found the connections of home garden with physical and mental wellbeing particularly among the elderly people (Corley \textit{et al.}, 2021). No doubt, the structure, function and contribution of home garden vary over cultural settings and agro-climatic conditions. Traditional home gardens are relatively inconspicuous and less visually impressive than crop land (Whitmore and Turner, 2001), but are intrinsic part of local food system in the developing world. Home gardens have played a significant role particularly for rural communities with subsistence economy. Home garden generally cover a small area but serves profusely. Some of the important functions include providing a stable source of fresh and safe vegetables, fruits and other edibles, preserving social capital, enhancing biodiversity, and conserving ecosystems. In addition, it enhances the nutritional need particularly for low-income rural households in the developing countries (Forum for Food Sovereignty, 2007; Galhena, Freed and Maredia, 2013; Abdoellah \textit{et al.}, 2020). In general, although home gardens are not formally managed and also small in areal extent compared to the developed world, yet they play a vital role in family nutrition, particularly for the poor households. Over recent decades, home gardens are getting commercialized in developing world in response to the market pressure (Abdoellah \textit{et al.}, 2006).

Northeast India and Home Garden

The tribes of India’s northeast connect their families with forest ecosystem and animal husbandry through the traditional home garden practices (Ramakrishnan, 1992). In the northeast, home garden as an agroforestry system optimizes the family wellbeing through integration of trees, shrubs, herbs, climbers, aromatic plants, timers, ornamental plants and domestic animals and birds. It provides the easy access to fruits, vegetables, leafy vegetables, meats, and eggs for household consumption and surplus is sold out. Numerous studies of home gardens across tribes in the region focus on the structure, function, composition, energy budget, economics, labour division and ecological aspects (Ramakrishnan, 1992; Shrivastava and Heinen, 2005; Sahoo, 2009; Tynsong and Tiwari, 2010; Singh \textit{et al.}, 2014; Tangjang and Arunachalam, 2017). In

\(^1\) It is also known as garden (Crouch, 2020), home garden (Bargali, 2015), kitchen garden, dooryard gardens, house-lot gardens, homestead (Kimber, 2004; Batjargal \textit{et al.} and Zamir, 2013), edible backyard (Kortright and Wakefield, 2011) and nutrition gardens (Suri, 2020). Among the Khasi and Jaintia community of meghalaya, it is known as \textit{ka'dew kyper} (Gurdon, 1907).
the last few decades, the agricultural systems of northeast India are under the process of commercialization and globalization owing to the expanding market and rapid demographic pressure. Further, home gardens under commercialization in the northeastern states of India are scantily researched. The home gardens of rural Meghalaya, a hill state of northeast India, are in the web of commercialization of two different versions such as traditional cash crop and modern cash crop (Ramakrishnan, 1999; Behera et al., 2016). Based on the above background of home gardens, it is pertinent and essential to investigate the home gardens of commercial regimes in rural Meghalaya.

Study Area

Meghalaya is a hilly state, located in northeastern part of India. A significant proportion (86%) of the total population belongs to scheduled tribes (Census of India, 2011). Farming systems in Meghalaya are extremely diverse owing to varied agro-ecological conditions, prevailing social fabric and market linkages. For this study, all these farming practices are classified into two types of farming systems\(^2\), which can be easily identified in the plateau; the *jhum* (shifting) based, and the cash-crop based farming system (Figure 1). The first focuses on growing for subsistence and self-sufficiency, whereas the latter emphasizes on cash earning and profit maximization. The households of earlier category of farming system are more or less food self-sufficient. The system includes varieties of foods, including cereals (millet, maize, and rice), vegetables, legumes, tubers, oilseeds, leafy vegetables and even non-food items like fiber for clothes and thatch grass for house construction. According to Ramakrishnan (1993), this system was until recent times the chief source of food, livelihood, dominant land-use practice and the way of life for all tribal groups in the hills of the northeast India. The primary objective of the commercial farming system is to grow for market and export, and only a small part of it is consumed by the producer.

In the context of Meghalaya, the cash-crop based farming system can further be divided into (a) traditional, and (b) modern, based on the types of crops (Figure 1). The traditional cash crop-based farming systems are different from modern cash crop-based farming systems. The traditional crops have been grown in the plateau for a long time but only recently have been commercialized. This initial cash-crop system such as turmeric, pineapple, broom, areca nut etc. were characterized by cultivation of crops endogenous to the area aided by traditional knowledge base and evolved in response to varying agro-climatic conditions prevalent in the plateau. The modern cash crops are new for the farmers and recently introduced by governmental and non-governmental organization in the state. They include rubber, tea, strawberry, cashew nut, and coffee. Further, based on the above classification, 7 villages representing all the three types of farming systems for the field investigation were selected. Two

\(^2\) A farming system is defined as a population of individual ‘farm systems’ (a ‘farm system’ refers to individual farm with specific resource endowments, family circumstances, existing social, economic and institutional environment and are organized to produced food and to meet other household goals, through a range of activities include interdependent gathering, production, post-harvest processes, livestock keeping, fishing, agro-forestry, hunting, gathering activities and off-farm incomes) that have broadly similar resource bases, enterprise patterns, household livelihoods and constraints and for which similar development strategies and interventions would be appropriate (Dixon, Gulliver and Gibbon et al., 2001).
villages - Mawrynniaw (25°28´ 19´´ N and 91°04´ 41´´ E) and Jongchetpara Songma (25°30´ 26´´ N and 90°02´ 18´´ E) - were selected to represent the jhum (shifting) farming system, which are coded as Jhum I and Jhum II, respectively. Simultaneously, 5 villages were selected from cash crop-based farming system to represent traditional (3 villages) and modern cash crop systems (2 villages), respectively. Three villages of traditional cash crops system included Kshaid (25°12´ 34´´ N and 91°46´ 05´´ E), Nongtalang (25°12´ 32´´ N and 92°04´ 06´´ E) and Thadnongiaw village (25°44´ 19´´ N and 92°03´ 51´´ E), to represent broom, areca nut and ginger, respectively. The two villages that represented modern cash crop system were Machokgre (26°03´ 22´´ N and 91°50´ 25´´ E) and Sohliya Mawthoh (25°44´ 58´´ N and 91°59´ 33´´ E).

Methodology

A number of households having home garden was collected through the household survey conducted by the first author in selected farming systems. A crop and livestock module was prepared based on participant observation, in-depth interviews, focus group discussions and informal conversation with villagers. Crops/livestock grown in the home garden were grouped into subsistence and commercial based on its broad use at the level of farming systems. Further, PRA (participatory rural appraisal) was conducted with household heads in each farming systems to get a generalize picture at the level of farming system.

Altogether a sample of 250 home gardens from 7 farming systems was included for the study. The information on a number of households practicing home gardens, and the composition of livestock, were collected at household level through semi-structured interview method. The crop diversity of home gardens and subsistence/commercial uses of crops were collected at the level of farming systems through PRA method. A diversity index is calculated by simply adding all the crops found including subsistence and commercial at the level of farming systems. Further, coding was used for an easy and convenient understanding. Code ‘S’ and ‘C’ were assigned to subsistence and commercial, respectively, based on the use of different crops. Accordingly, the levels of commercialization were identified based on combination of subsistence crops and cash crops. Households have been grouped into 3 broad categories, such as households growing subsistence crop only, households growing cash crops, and the households who combined both subsistence and cash crops. Similarly, the diversification of livestock were classified into 7 types, such as (1) no livestock, (2) only chicken, (3) only pig, (4) chicken and pig, (5) only cattle, (6) chicken, pig and cattle (C+P+Ca), and (7) only goats. Besides, the above primary data gathered from the field, secondary data of the total population of selected villages was used under study with two reference points of time, i.e. 1981 and 2011 (Census of India years), for calculating the growth of population in the respective sample farming systems.
Figure 1: The farming systems: (A) represents traditional jhum system where the framers’ objective is food self-sufficiency; (B) represents cash crop system where cash generation is the main objective.

**Results and Discussions**

*Home Gardens in Different Farming Systems*

The study has found that each farming system has valued its home gardens distinctly and raise accordingly. The practice of home gardening is common among the household of jhum farming systems. Both the sample villages representing Jhum farming systems have shown similar picture. In this system, all households were engaged in home gardening devoted to diverse use ranging from growing of vegetables, fruits to livestock. The other five farming systems have households with
varying extent of home gardens. On the other hand, in case of the three traditional cash crop farming systems, two of these i.e., broom grass and ginger farming villages, contain a sizeable proportion of households with home gardens. However, unlike the above said two traditional cash crop farming systems, the areca nut farming system is devoid of home gardens. Further, there are also some divergences noticed in the two villages under modern cash crop-based farming systems. Most of the households have home gardens in tea-strawberry farming system while such households are very few in case of rubber farming system (Figure 2).

Figure 2: Percentage of household with home gardens in the sample farming systems, Meghalaya

In India, home garden is an important component of all local food systems irrespective of different agro-climatic regions, or, rural or urban settings or, even in tribal or non-tribal socio-cultural structure. Home gardens strengthen the local food system by directly influencing the consumption patterns including the immediate kitchen needs that improves food security and socio-economic wellbeing of the local communities across India (Girard et al., 2012; Mazumdar and Mazumdar, 2012; Galhena, Freed and Maredia, 2013). Further, the home gardens of rural areas are functionally more attached to household food consumption pattern than in the urban setup where the functions often focus on aesthetic, environmental awareness, and urban sustainability (Cameron et al., 2012; Khairnar; Zasada, Lawrence Benninger and Weltin, 2019; Zasada et al., 2020). In the context of tribes, home gardens become more prominent as they were not traditionally used to market economy, and locationaly they are away from the urban areas, often located in the hilly, forested tracts and spatially lesser accessible areas. Thus, the current changes in the practices of home garden among the tribes of Meghalaya in cash crop regime and particularly in the modern cash crop regimes may have short- and long-term implications.
Crop Component: Diversity in the Home Gardens

The plant diversities and taxonomic classification in the home gardens of different parts of India presenting different regions are well documented in various studies (Vijayakumari et al., 2019; Shukla, Kumari and Chakravarty, 2017). Indians (including tribes) have rich heritage of practicing home gardens, as evident in different regions of Maharashtra (Khairnar, Patil and Patil, 2019), Kashmir (Islam et al., 2021), Kerala (Peyre et al., 2006; John, 2014), Tamil Nadu (Hudson, Krogman and Beckie, et al., 2016 and 2019), Odisha (Pradhan et al., 2018), Mizoram (Barbhuiya, Sahoo and Upadhyaya, 2016), Assam (Shrivastava and Heinen, 2005; Das et al., 2015), Tripura (Das et al., 2015), Nagaland (Singh et al., 2013), West Bengal (Chakraborty and Basu, 2018) and Uttarakhand (Jethi et al., 2020). However, a need for unravelling the commercialization processes in home gardens in general and with special reference to tribe is realized. Therefore, this study has attempted to understand the crop diversity of home gardens in terms of subsistence and commercial crops in different farming systems of Meghalaya.

Table 1 provides details about the crop diversity index by combining crop grown for home consumption (S) and for cash generation (C). Subsistence crops directly get added to the household food consumption while the commercial crops give economic accessibility to the household food purchase. Number of commercial crops grown in home garden gives an insight into the level of commercialisation of home gardens. As is evident from the table, cultivation of subsistence crops dominates in home gardens of jhum farming system whereas cash crops-based systems are showing varied patterns. Traditional cash crop cultivated areas represented by ginger and broom farming systems have continued with the cultivation of a variety of subsistence crops in their home gardens, whereas it was found a complete absence of practicing home gardens in areca nut farming system. However, traditional cash crop-based farming system, such as areca nut farming system, has a practice of cultivating tuber and leafy vegetable within the areca nut agroforestry in suitable patches. In turn, it supplements their household’s daily requirements having a function similar to home gardens.

The broom grass growing village (Kshaid) grows three indigenous fruit crops and bay leaf as cash crops in home gardens besides the subsistence crops (Table 1). These cash crops are being transported by small cabs to nearby urban center for selling purpose (Figure 4c). It was observed that diversification of crops grown in the home garden has been maximum in the jhum farming system followed by tea-strawberry farming system. The latter represents a farming system based on modern cash crop cultivation. Number of crops produced in traditional cash crop areas is close to jhum system whereas the modern cash crop farming systems have varied experiences. For example, number of crops grown in home gardens of the households in tea-strawberry farming system is nearly identical to the jhum farming system, whereas number of crops grown in the homesteads of the households in the rubber farming system (Machokgree village) is very few.

Commercialisation of traditional fruits overtook the space of home gardens in the broom food system. Respondents from the broom farming system had experienced the recently emerged competition between cash crops and subsistence crop within the home garden. Earlier, the entire space in the home garden was allotted to growing
vegetables and leafy vegetables, but now the space is shared with the commercialized fruit crops as a monoculture. The traditional fruit crops recently commercialized in broom farming system include *Myricanagi*, *Prunus nepalensis*, *Eleagnus khasianum*, *Flemingia vestita* and *Docynia indica* (Figure 4a,b). These fruits are perishable and without any value addition were transported to nearby urban centres by small passenger cabs.

Table 1: Crops grown in home gardens in the selected farming systems, Meghalaya

<table>
<thead>
<tr>
<th>Farming system</th>
<th>Subsistence (S)</th>
<th>Commercial (C)</th>
<th>Diversity Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsistence</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jhum-I</td>
<td>Plantain, papaya, pine apple, pumpkin, jackfruit, taro, beans, pine apple, bottle gourd, ridged gourd, lemon, cucumber and chili</td>
<td>0</td>
<td>S13+C0=13</td>
</tr>
<tr>
<td>Jhum-II</td>
<td>Plantain, pineapple, papaya, pineapple, pumpkin, jackfruit, taro, chili, beans, bottle gourd, ridged gourd, cucumber, lemon, and coconut</td>
<td>Areca nut, black pepper</td>
<td>S14+C2=16</td>
</tr>
<tr>
<td>Broom</td>
<td>Pumpkin, bottle gourd, ash-guard, lemon, chills, plantain, taro, squash, cucumber</td>
<td>Bay leaf, bastard oleaster, blackberry, mulberry</td>
<td>S9+C4=13</td>
</tr>
<tr>
<td>Areca nut</td>
<td>-</td>
<td>-</td>
<td>S0+C0=0</td>
</tr>
<tr>
<td>Ginger</td>
<td>Beans, papaya, leafy vegetable, pineapple, brinjal, pumpkin, bottle gourd, ridged gourd, plantain, squash, ladies’ finger, and tree tomatoes</td>
<td>-</td>
<td>S12+C0=12</td>
</tr>
<tr>
<td>Rubber</td>
<td>Plantain, jack fruits, pineapple</td>
<td>Areca nut</td>
<td>S3+C1=4</td>
</tr>
<tr>
<td>Modern cash crop based</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber</td>
<td>Plantain, jack fruits, pineapple</td>
<td>Areca nut</td>
<td>S3+C1=4</td>
</tr>
<tr>
<td>Tea-strawberry</td>
<td>Brinjal, plantain, taro, tapioca, coconut, mango, pineapple, guava, litchi, bottle gourd, papaya, peach, pears, cucumber</td>
<td>Bay leaf</td>
<td>S14+C1=15</td>
</tr>
</tbody>
</table>

Comparison across different farming system reveals that the highest number of commercial crops is grown under home gardens in broom farming system followed by the second jhum village (jhum-II). Areca nut plantation has occupied the space of home gardens in rubber farming system. Bay leaf is the most important cash crop produced in the home gardens of tea-strawberry farming system. Although the bay leaf as a cash crop is newly introduced in the northern side of the plateau i.e., in Ri-Bhoi area, yet it is a traditional practice in the southern precipitous slope of the plateau i.e., Ri-War areas. The introduction of bay leaf in the home gardens of Ri-Bhoi area
has happened because of permanent migration of people from the Ri-War areas as one of the prominent reasons.

![Figure 3: Crops grown in home gardens in the selected farming systems, Meghalaya](image)

Diversities of the home gardens are well explained in the existing literature. Plant diversity in the home gardens of Palayamkottai urban space, Tamil Nadu (Vijayakumari et al., 2019). Similarly, plant diversity in home garden was also studied (Shukla, Kumari and Chakravarty, 2017). Several such studies are also found in northeast India on plant diversity (Barbhuiya, Sahoo and Upadhyaya, 2016). Besides plant diversity, studies have also focused on diversity of vegetable crop (Chatterjee et al., 2016), socio-economic and bio-physical character of plant diversity in home gardens (Das and Das, 2005; Sahoo, 2009), inventory of flora in North Bengal (Subba et al., 2016) and plant characteristics with soil character (Singh et al., 2013). Further, Das et al., (2015) have argued that mushroom can be commercialised from the home garden. As the diversity is high in this farming system, home gardens, therefore, play a vital role in the food security (Jana and Roy, 2021).

**Livestock Component: An Intrinsic Practice**

Livestock has remained as a significant component of home gardens particularly in the subsistence economy (Kenneth-Obosi, 2019). In the context India, the livestock composition of home gardens is different from one region to another across the country. The difference is guided by cultural factors significantly including religious beliefs and practices besides the physical factors of the regions. The folk culture of Indian tribes has also reflected in home gardens in different regions of the country in terms of livestock composition. Further, the livestock composition in home gardens in the northeast India is different compared to rest of the tribal regions of India. Therefore, the need to explore the recent commercialization in different farming system of these regions in relation to livestock composition is realized in this study.
Livestock rearing is another vital component of home garden in Meghalaya. It is a common phenomenon that has been noticed across farming systems regardless of any crop cultivated whether on a subsistence or commercial basis. However, there is difference between jhum farming system and cash crop regime, as per the extent and quality of livestock rearing is concerned. Further, the difference within a farming system is minimal. As far as livestock rearing is concerned, as much as 23 per cent households in the village under rubber plantation do not rear any kind of livestock followed by the villages cultivating broom grass or ginger on a commercial basis (16-17%). Around 13 per cent households in tea and strawberry growing village do not own livestock. Interestingly, none of the households owned any livestock in areca nut growing village. This is in sharp contrast to the jhum villages where each of the household continues to own some livestock. As the livestock composition in a household is concerned, chicken and pigs rearing are common in all farming systems despite some variations. The highest proportion of this composition found in jhum farming system and the lowest is found in traditional cash crop-based farming system of areca nut. In broom grass cultivation village, fewer households had this combination as a majority went for chicken rearing only. It shows the continuity in the livestock rearing practices in spite of changes in the farming systems. Limited livestock diversification is found in modern cash crop systems. It was a coincidence to find cattle and wet paddy cultivation together in the tea-strawberry and ginger farming system. However, small-scale diversification has begun recently by a few households and mostly confined to cattle and farm chicken. For example, a household in the village with rubber plantation has recently started rearing cattle not for agricultural purpose but for selling milk in nearby urban center and another household has also started growing farm chicken in tea-strawberry farming system for the similar purpose. Goats and cows are recently added as livestock by a few households under cash crop regime only. Cattles, however, are found in far fewer households belonging to both subsistence and cash crop regimes.

Table 2: Percentage of households owning livestock to total the household

<table>
<thead>
<tr>
<th>Farming system</th>
<th>Livestock composition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No livestock</td>
</tr>
<tr>
<td><strong>Subsistence</strong></td>
<td></td>
</tr>
<tr>
<td>Jhum I</td>
<td>0</td>
</tr>
<tr>
<td>Jhum II</td>
<td>0</td>
</tr>
<tr>
<td><strong>Traditional cash crop</strong></td>
<td></td>
</tr>
<tr>
<td>Broom</td>
<td>17</td>
</tr>
<tr>
<td>Areca nut</td>
<td>100</td>
</tr>
<tr>
<td>Ginger</td>
<td>16</td>
</tr>
<tr>
<td><strong>Modern cash crop</strong></td>
<td></td>
</tr>
<tr>
<td>Rubber</td>
<td>23</td>
</tr>
<tr>
<td>Tea-Strawberry</td>
<td>13</td>
</tr>
</tbody>
</table>

Note: C- Chicken, P- Pig, Ca- Cattle
Beyond the Cattle Culture

Traditionally, livestock is part of rural agro-food system in Meghalaya. However, it was limited to pig and chicken. Dairy farming was never part of livestock among the Khasi, Garo and Jaintia, particularly in the hilly areas. Swan rearing is an important component of the village ecosystem functioning across the tribes in northeast India (Ramakrishna, 1992). This is largely due to the fact that the traditional agricultural practices in the hill regions are not associated with cattle unlike the rest of India. Besides, the dairy products were not part of traditional food preference among the tribes. A century back, Gurdon (1907) had also observed that the tribes of Meghalaya as a rule to do not consume any dairy products. Accordingly, the consumption pattern had direct impact on the variety of livestock rearing in the home garden. Likewise, goat rearing was also not associated with traditional livestock rearing in Meghalaya. The findings of the present study do match with the overall livestock scenarios of the state. Combination of chicken and pig is a dominant pattern in five out of seven villages covered in this study. The remaining two villages are broom grass and areca nut growing villages. Basketry as a handicraft is a dominant subsidiary economic activity in broom grass areas, which is substituting livestock rearing. According to villagers, basketry is easier than pig rearing mainly because of scarcity of fodder for livestock. The case of areca nut plantation village is an exception where piggery is banned inside the village due to lack of space. However, a few households have established piggery away from the village. To keep the village clean and not to disturb the inhabitants is the key purpose behind the ban. However, there are also some other changes in different farming systems with regard to livestock. For instance, cattle have been introduced in some villages, as a direct consequence of introduction of wet paddy in the narrow valleys and partly a response to gradual cultural diffusion from the nearby plains.

Space: A Driving Factors of Home Gardens

The settlement pattern, particularly distribution of housing units relative to one another appears important, as it either permits space between housing units or it does not. In areas where houses are dispersed, it permits adequate space for maintaining home gardens. The dispersed dwelling units providing enough space around a home is one of the important driving factors. The denser housing structure under cash-crop regimes lead to the replacement of traditional practices of home gardens including the domestic livestock (pigs and chicken), which are integral part of this traditional agroforestry system, a unique characteristic of the subsistence farming system in northeast India. Home gardens are big enough in settlements with dispersed housing pattern as is the case in jhum areas with small size of population and fewer households as well as experiencing relatively small increase in number of households. This traditional practice of home garden around the housing unit, however, is getting altered on the face of rapid increase in the number of households, which is leading to more compact settlement (Table 3). These settlements are relatively large in size. For example, the Nongtalang village has turned into a compact settlement due to

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3 Tribes of rural Meghalaya do not prefer dairy products. This was evident from the experience of a rural young man who assisted during the field work conducted in the village. The young man was offered rice in Shillong which had a tinge of ghee (clarified butter). He consumed the rice but felt uncomfortable as he had never tasted any milk or milk products ever.
significant increase in the number of households from 158 in 1981 to 391 in 2011. At present hardly any space is left between housing units that can be used for home garden in the village growing areca nut, currently. In addition, the settlement is located on a small table top plateau where it is not possible for further expansion. Besides, the village council does not permit pig rearing inside the village. In other cases where the housing units are scattered as found in the case of the jhum as well as ginger farming system, enough space is available for home gardens. Here, the space between houses was adequate and used widely for home gardens (Behera et al., 2016).

Table 3: Growth rate in number of households in selected farming system, Meghalaya

<table>
<thead>
<tr>
<th>Farming system</th>
<th>Number of HH</th>
<th>Growth (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1981</td>
<td>2011</td>
</tr>
<tr>
<td>Subsistence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jhum I</td>
<td>28</td>
<td>32</td>
</tr>
<tr>
<td>Jhum II</td>
<td>36</td>
<td>59</td>
</tr>
<tr>
<td>Traditional cash crop based</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broom</td>
<td>36</td>
<td>59</td>
</tr>
<tr>
<td>Areca nut</td>
<td>158</td>
<td>391</td>
</tr>
<tr>
<td>Ginger</td>
<td>41</td>
<td>102</td>
</tr>
<tr>
<td>Modern cash crop based</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber</td>
<td>14*</td>
<td>40</td>
</tr>
<tr>
<td>Tea-strawberry</td>
<td>30</td>
<td>62</td>
</tr>
</tbody>
</table>

Source: Census of India, 1981, 2011
Note: There was no separate census enumeration for the village in 1981; the information provided is based on data supplied by the concerned headman (Rangbah Shnong) of the village.
Figure 4: Home gardens: (a, b) Plantation of indigenous fruits (as cash crops) in the home garden in broom farming system of Kshaid village, (c) transport of fruits grown in home gardens as cash crops to Shillong by passenger vehicles, and (d) shrinking size of home garden in Kshaid; (e) cultivation of tuber crops in a home garden of tea-strawberry farming system, (f) intensive home gardening in ginger area; (g) bay leaf plantation in tea-strawberry farming system Sohliya Mawthoh village; (h) areca nut has occupied the space of home garden in rubber farming system, Machokgre village, Meghalaya (Photos by first author).

Conclusion

Impacts of commercialisation on home gardens are reflected in the previous sections extending its relevance though the effects are different in each farming systems. It can, however, be generalized that the traditional farming systems continue to have higher dependence on home gardens and traditional cash crop-based systems having mixed experiences as these are yet to be fully commercialized. Besides, crop diversification and change in livestock rearing in home garden of different farming system, the housing pattern of a settlement also sturdily determines the existence and practice of home garden.

Though the cash crop system is invading to the traditional subsistence farming systems, the intricacies of home gardens with a sizable proportion of household in the traditional system reveal the contributions to produce food and nutritional secure villages. Most importantly, home gardens are the intrinsic part of the local food system, which is again relevant due to the hilly and difficult terrains that the people live with. Despite having several important functions such as providing a stable source
of fresh and safe vegetables, fruits and other edibles, preserving social capital, enhancing biodiversity, and conserving ecosystems particularly for low-income rural household, home gardens are getting commercialized in response to the market pressure for profit maximizations. Therefore, it intends that a large section of tribal societies in Meghalaya are becoming food and nutritionally insecure, increasing chance of loss of agro-biodiversity and loss of indigenous knowledge system of the communities. In Meghalaya, the share of landless household is highest amongst all the states of northeast India. The current tenure practices, land ownership systems and tribal customary laws do have enough implications for commercialisation of home garden. As a huge number of households belong to landless category and majority are small and marginal farmers, they probably might have started commercializing home gardens as a coping strategy, which attracts further detail investigation.

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**Authors’ Declarations and Essential Ethical Compliances**

**Authors’ Contributions (in accordance with ICMJE criteria for authorship)**

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<th>Contribution</th>
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<td>Conceived and designed the research or analysis</td>
<td>Yes</td>
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<td>Collected the data</td>
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<td>Contributed to data analysis &amp; interpretation</td>
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1.4 Did/will Aboriginal identity or membership in an Indigenous community used or be used as a variable for the purposes of analysis?

   No
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2.1 If you answered “Yes” to questions 1.1, 1.2, 1.3 or 1.4, have you initiated or do you intend to initiate an engagement process with the Indigenous collective, community or communities for this study?

Yes

2.2 If you answered “Yes” to question 2.1, describe the process that you have followed or will follow with respect to community engagement. Include any documentation of consultations (i.e., formal research agreement, letter of approval, PIC, email communications, etc.) and the role or position of those consulted, including their names if appropriate:

Verbal consents were taken from all the heads of the village councils prior to collect the data from the villagers (respondents). Further, all the respondents were clearly informed by the first author that the information collected would be used for research and academic purpose only. Therefore, no such data/information were collected that may violate any ethical aspects of the concerned communities.

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Sd.
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