

Homestead plant diversity at the ship breaking areas of Bangladesh

ABSTRACT

Unplanned ship breaking at the Sitakund coast in Chittagong, Bangladesh is contaminating the surrounding vegetation mainly through the discharge of heavy metals from the discarded ship paints. Therefore, the present study was conducted with an aim to explore homestead plant diversity in ship breaking areas at Sitakunda sub-district in Bangladesh from where Salimpur and Kumira union was selected as ship breaking areas (SBA) whereas Bansbaria and Barabkunda as non-ship breaking areas (NSBA). In total 104 households were surveyed to ascertain plant diversity. Present study revealed that NSBA have more plant diversity than SBA. A total of 27 tree species including fruits, timber, fuel wood, aesthetics and medicinal were found in SBA while 30 species were found in NSBA. Shanon Winner index value was 2.5 in SBA whereas in NSBA it was 2.7. Agro-crop diversity in both areas was almost same. A total 15 agro-crop species were found in SBA and 16 species in NSBA. Average production of rice in SBA (2251.91 kg/yr/household) was quite higher compared to the NSBA (380.2 kg/yr/household). This study prioritizes the importance of soil properties analysis at the ship breaking areas and link it with the growth of plant vegetation to check if there is any significant relationship between them. Moreover, it is also very crucial to

investigate the heavy metal concentration in plant including agro-crop and forest crop growing around this area. Based on findings from the analysis of soil properties and heavy metal concentration in soil and plant, farmers can be prescribed to plant site specific species for more production and sustainable homestead forest management at the ship breaking areas of Bangladesh.

Keywords: Diversity, Index, Household, Agri-crop, Tree species

1 Introduction

From ecological and conservation point of view assessment of biodiversity of any habitat or locality has been regarded as one of the vital issue for careful preservation, promotion and management of the variety of life-forms (Alam et al. 2005). Increased human population and associated development activities in the last few decades has resulted directly and indirectly in depletion of the natural vegetation which in turn increase the pressure on the homestead forest specially in the developing countries to meet various needs of the human beings. In this circumstances correct inventory and assessment of biodiversity in different habitats is necessary for evolving a long term strategy for conserving the endangered species and improvement of the existing species.

Bangladesh is situated at the complex interface of the Himalayan and the Southeast Asian Bio-geographic regions, and historically was well endowed with very diverse complements of terrestrial and aquatic flora and fauna (Quamrul 2001). Homestead forest in

37 Bangladesh covers an area of 0.27 million ha. (Occupied by 15.4 million homesteads) while state owned forests cover 2.25 million ha
38 (Mukul et al. 2008).

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42 Homestead is an operational unit in which a number of crops including trees are grown with livestock, poultry and fish production
43 mainly for the purpose of satisfying the farmer's basic needs. It is the most prospective form of production site along with the
44 seat/shelter of the family. Homestead fulfill basic needs of the people such as food, shelter, cash etc and high species diversity of the
45 homestead help to reduce the environmental deterioration commonly associated with monoculture production system. Moreover, they
46 have been producing sustained yields for a century in a most resources efficient way.

47 Study on homestead forest was carried out in different regions of Bangladesh. But no study was so far carried out solely on the status
48 of homestead forest biodiversity in the south-eastern coastal region specially at the ship breaking areas of Sitakund sub-district under
49 Chittagong district of Bangladesh.

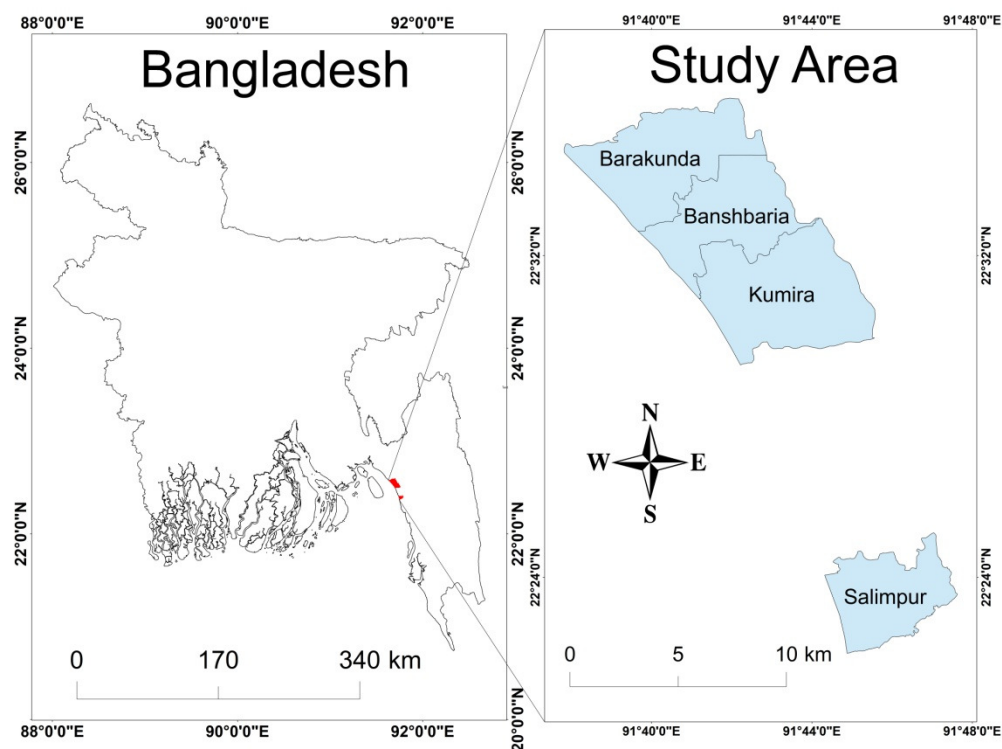
50 Ship breaking is the process of dismantling the obsolete vessel's structure for material recovery or disposal. Ship breaking is a
51 challenging process, due to the structural complexity of ships and the many environmental, safety, and health issues involved (OSHA,
52 2001). It includes a wide range of activities from removal of all gears and equipment to cutting down the ship's infrastructure.

53 Bangladesh (20°34' and 26° 38' N latitude and 88°01' and 92°41' E longitude) is a small South Asian country that borders India on the

west, north, and northeast, Myanmar on the southeast, and the Bay of Bengal to the south. Bangladesh has repeatedly been blamed by many stake holders for exerting harmful impacts on the coastal and marine environment, particularly for causing soil contamination. The waste water that are discharged from the industries, passed through directly by the drains to the sea and partially fallen nearby soil and hence soil is contaminated for their indiscriminate cutting of ship. These metals are leached out through the rain water to the ground and washed out by both heavy rainfall and tide and wave to the sea. On the other hand, while flowing through the open drains, the waste and foul waters also pollute its surrounding environments with its foul nature. These are very harmful for the people living nearby and also for the plants. Germination and initial growth of seedling are the stages of tree development that are often most sensitive to adverse environmental factors (Boland, 1993). The physiological process of plant and crop are also affected and consequently their yield and production are reduced. There is also a chance of incorporation of pollutants into the food chain through the crops. Therefore, this study site is likely to be an appropriate candidacy of conducting research with an aim to check what kind of homestead plant including tree and agro-crop species are growing at these ship breaking and non-ship breaking areas to find out further research priority areas at those homestead areas. The study will also investigate the contribution of homestead plant diversity in rural household economy. Furthermore, it will identify the management system and the problems faced by the households in the growing/cultivating plants in the homesteads of ship breaking and non-ship breaking areas.

2 Materials and Methods

2.1 Study Area



1(a)

1(b)

Figure 1(a) Bangladesh Map showing ship breaking yards (red color) and Figure 1(b) showing (blue color) the study area.

Sitakunda is an administrative unit in the Chittagong District of Bangladesh. It is a seashore area situated a few kilometers north

87 Chittagong where most of the ship breaking yards are concentrated. The Ship breaking area along the Chittagong sea shore is situated
88 on 22° N Latitude and 91 ° E Longitude and at a stretched 14 kilometer form Fouzdarhat to Kumira under Sitakunda sub-district. The
89 ship breaking industry has started its operation in Bangladesh in 60's and it was widely spread in 80's in Sitakunda, Chittagong,
90 Bangladesh. In different years the industry broke the highest numbers of ships in the world. All the ship breaking industries of
91 Bangladesh are located in this belt with more than 140 ship breaking yards in Salimpur, Kumira, Bhatiary, BarabKunda, Fouzdarhat
92 zone in Chittagong showing the Bangladesh map as Figure 1(a) locating the ship breaking area and other map showing the study areas.
93 Therefore, this study was carried out to investigate the homestead plant diversity in Sitakund sub-district specially near it's ship
94 breaking areas along the Chittagong Sea shore from Bhatiary to Kumira. Ship breaking industry covers an area of about 8 km²
95 (Hussain, 1999). The study was conducted in Salimpur, Kumira, Bansbaria, Barabkunda unions under Sitakunda upazila (Figure 1b).
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98
99 The area is subtropical with a long dry season extending from September to April and an unpredictable period of rain storm from May
100 to August. Mean annual rain fall in the study site is 3207mm and mean annual temperature is 26.24°C. Southwest monsoon air
101 provides about 94% of the total rain fall. This lead to a period of saturation and gives rise to a phase of intense plant growth.

102 The information and relevant literature that were required for preparing this paper were collected from different books, journals and
103 published papers of the library of Institute of Forestry and Environmental Sciences, University of Chittagong. Very recent and updated
104 information and literature were collected from Internet.

105 **2.2 Study Design**

106 From a total of 20 upazila of Chittagong district, Sitakund upazila was selected purposively as this is the only upazila of Chittagong
107 district where ship breaking yards are established. Out of 09 unions in Sitakund upazila, four unions (Salimpur, Kumira, Bansbaria
108 and Barabkunda) were firstly selected randomly. Two unions were selected from ship breaking areas and two from non ship breaking
109 areas. Then two villages from each union were randomly selected. The total number of villages was twelve (08). The selected villages
110 were Uttor Salimpur, Moddom Salimpur, Boro kumira, Alekdia, Kazipara, Nonabil, Moddhom Mahmudabad, Mandaritola
111 respectively. Thirteen (13) households from each village (total households 104) were selected for interview under this study. Total
112 number of households in each village was obtained from the District census published by the Bangladesh Bureau of Statistics (BBS,
113 2007). Before starting the actual survey, a reconnaissance survey was carried out at the study area. The objective of the survey was to
114 get familiarized with the community, to get some idea of vegetation composition from the rural people of the study area.

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117 **2.3 Data Collection**

118 **2.3.1 Formal Interview**

119 In order to collect relevant information, interview schedule was carefully designed keeping the objectives of the study in view. The
120 questionnaire contains both open ended and closed form of questions. All households were visited with the assistance of local student
121 living at the study area. Most of the information were obtained through interview with household members. The distribution of plant
122 species on the homestead was surveyed physically. Collected information was verified through discussion with the household
123 respondent. Information on agro-crop production cost, consumption, sale value per year was also collected from the household
124 member. Besides, information on particular issues like problems of home garden plantation, sources of seedlings, preferences of
125 species selection, farmer's recommendation was also collected from the household level.

126 **2.3.2 Vegetation Survey**

127 During taking interview, vegetation survey was conducted at each household compound to ascertain plant diversity. The number of plants
128 and occurrence of that plant in number of homestead counted with the help of household member and local students. The local name of the
129 plant in the homesteads was collected from the respondent. Seasonal crops like vegetables of herb category were also included in the study.

130 **2.3.3 Secondary Information Collection**

131 Secondary information and data were collected from different organizations such as IFESCU library and from various scientific
132 journals, articles etc. The identification of the species was done with the help of specialist of Institute of Forestry and Environmental
133 Sciences, University of Chittagong. Local name were collected from local people and from different books.

134 **2.4 Data Analysis**

135 Microsoft excel program was used to process all collected information and in preparing tables, charts and graphs. Moreover, Shannon
136 Index was used for finding out the species diversity using quantitative approach at the study area.

137 ***Species diversity index***

138 To ensure the abundance and diversity of different plant species. Shannon-Wiener species diversity index (H) (Nath et al. 2000) as
139 shown below was used:

140 **Shannon Index (H)** = $-\sum (P_i \ln P_i)$

141 In the Shannon index, **p** is the proportion (n/N) of individuals of one particular species found (n) divided by the total number of
142 individuals found (N), **ln** is the natural log, Σ is the sum of the calculations, and **s** is the number of species.

143 **4 Results**

144 **4.1 Plant diversity**

145 A total 27 different species were found in ship breaking areas (SBA) Where *Cocos nucifera* (Coconut), *Eucalyptus camaldulensis*
146 (*Eucalyptus*) and *Mangifera indica* (Mango) were found the most dominant (Table 1). On the contrary, a total 30 different plant
147 species were found in non-ship breaking areas (NSBA) where *Eucalyptus camaldulensis* (*Eucalyptus*), *Cocos nucifera* (Coconut) and
148 *Carica papaya* (Papaya) were found the most dominant (Table 1). Among the found species, 26 plant species were present at the both
149 areas where only one species *Achras sapota* (Safeda) was found only in ship breaking areas and three (3) plant species e.g. *Psidium*
150 *guajava* (Guava), *Averrhoa carambola* (Kamranga), *Bombax malabaricum* (Shimul tula) found in non-ship breaking areas. Shanon
151 Winner index for ship breaking areas show the value of 2.5 whereas in non-ship breaking areas it is 2.7 which present that there is less
152 variation in plant diversity in both the areas (Table 2).

153 **Table 1 Plant diversity in both ship breaking and non-ship breaking areas**

Species Overlapped in both areas

Local Name	Scientific Name	Local Name	Scientific Name
Acacia	<i>Acacia auriculiformis</i>	Kanthal	<i>Artocarpus heterophyllus</i>
Mango	<i>Mangifera indica</i>	Labu	<i>Citrus lemon</i>
Amra	<i>Spondia spinnata</i>	Litchi	<i>Litchi chinensis</i>
Banana	<i>Musa sapientum</i>	Mehegoni	<i>Swietenia mahagoni</i>
Bilimbi	<i>Averrhoa bilimbi</i>	Coconut	<i>Cocos nucifera</i>
Eucalyptus	<i>Eucalyptus camaldulensis</i>	Ata	<i>Annona squamosa</i>
Gab	<i>Diospyros perigrina</i>	Papaya	<i>Carica papaya</i>
Gamar	<i>Gmelina arborea</i>	Segun	<i>Tectona grandis</i>
Ganda	<i>Polygala vulgaris</i>	Silkoroi	<i>Albizia procera</i>
Jaba	<i>Hibiscus rosa-sinensis</i>	Supari	<i>Areca catechu</i>
Jam	<i>Syzygium cumini</i>	Tulsi	<i>Ocimum sanctum</i>
Jambura	<i>Citrus grandis</i>	Boroi	<i>Zyzyphus mauritiana</i>
Jhau	<i>Casuarina equisetifolia</i>	Khejur	<i>Phoenix sylvestris</i>

Species found only in non-ship breaking areas

Local Name	Scientific Name
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Guava	<i>Psidium guajava</i>
Kamranga	<i>Averrhoa carambola</i>
Shimul tula	<i>Bombax malabaricum</i>

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156 Table 2 Shanon Winner diversity index

Areas	Shanon Winner Index
Ship breaking	2.5
Non-ship breaking	2.7

157

158 4.2 Agriculture crop production status

159 Agro-crop diversity in ship breaking and non-ship breaking areas were almost same. A total of 16 agri-crop species were found in
160 non-ship breaking areas and 15 in ship breaking areas. Common species between these two areas were *Oryza sativa* (Rice), *Solanum*
161 *melongena* (Eggplant), *Abelmoschus esculentus* (Okra), *Amaranthus gangeticus* (Red Amaranth), *Basella alba* (Spinach), *Phaseolus*
162 *vulgaris* (Bean), *Solanum lycopersicum* (Tomato), *Brassica oleracea* (Cauliflower), *Lathyrus sativus* (Khesari dal), *Lens culinaris*
163 (Mosur dal). Mean annual productions of rice per family among all crops grown in farms in ship breaking areas were the highest
164 (2251.9kg/year) whereas it was (380.2 kg/year) in non-ship breaking areas. Production of rice in ship breaking areas was quite high

165 compared to the non-ship breaking areas. Unique species for non-ship breaking areas were *Ipomoea batatas* (Sweet Potato),
 166 *Momordica charantia* (Bitter gourd) and *Trichosanthes cucumerina* (Snake gourd) while
 167 *Luffa cylindrica* (Sponge gourd) and *Brassica oleracea var capitata* (Badhakopi) for the ship breaking areas shown in (Table 3 &
 168 Table 4). Various agro-crops were found in the non-ship breaking areas such as *Oryza*
 169 *sativa* (Rice), *Solanum melongena* (Eggplant), *Trichosanthes cucumerina* (Snake gourd), *Abelmoschus esculentus*(Okra) , *Momordica*
 170 *charantia* (Bitter gourd), *Cucurbita maxima* (Misti Kumra), *Amaranthus gangeticus* (Red Amaranth), *Lagenaria siceraria* (Bottle
 171 gourd), *Capsicum annuum* (Green Chili Pepper), *Basella alba* (Spinach), *Phaseolus vulgaris* (Bean), *Solanum lycopersicum* (Tomato),
 172 *Brassica oleracea* (Cauliflower), *Lathyrus sativus* (Khesari dal), and *Lens culinaris* (Moshur dal). Among them rice plays the most
 173 significant role in the rural economy of the non-ship breaking areas. Rice production in each family was 380 kg/yr where consumption
 174 was 344.2 kg/yr and production cost was 1908.6 BDT. Respondents got 835.3 BDT on an average by selling surplus rice. There were
 175 no surplus for Spinach and Cauliflower after own consumption. These crops were grown only for own consumption shown in (Table
 176 4).

177 **Table 3 Average production of agro-crop in ship breaking areas**

Name of the crops	Average Production (kg/yr) in each	Average Consumption (kg/yr)	Average Production cost (Tk)	Average Sale value(Tk) for surplus crop)
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Family				
Badhakopi	4.6	2.32	174.4	1325.5
Eggplant	3.13	3.9	16.2	11.6
Okra	16.69	3.1	7.8	258.2
Sponge gourd	50	1.04	139.53	979.06
Cauliflower	46.51	4.65	162.79	1046.5
Misti Kumra	11.16	0.69	26.74	156.97
Red Amaranth	3.83	0.58	8.37	65.11
Bottle gourd	66.86	8.48	377.9	715.11
Green Chili	2.39	1.46	110.9	18.6
Musur dal	3.48	0.81	23.25	76.16
Spinach	0.81	0.58	2.32	3.48
Rice	2251.9	320	4546.51	2401.39
Bean	30.81	5	124.41	610.46
Tomato	27.67	3.37	111.62	400
Khesari dal	4.18	1.27	46.51	93.02

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179 **Table 4 Average production of agro-crop in non-ship breaking areas**

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Name of the crops	Average Production (kg/yr)	Average Consumption (kg/yr)	Average Production cost(Tk)	Average Sale value for surplus crop (Tk)
Rice	380.2	344.2	1908.16	835.3
Eggplant	2.65	2.14	28.77	10.2
Snake gourd	0.918	0.71	5.1	4.1
Okra	14.69	2.65	6.83	217.34
Bitter gourd	8.16	1.02	81.63	229.59
Misti Kumra	8.46	1.12	25.51	110.2
Red Amaranth	5	0.81	21.63	76
Bottle gourd	2.04	1.02	16.53	17.85
Green Chili	3.06	0.3	76.53	469.38
Spinach	0.61	0.61	2.04	0

Bean	23.46	6.02	105.1	348.9
Tomato	14.79	3.87	112.24	165.8
Cauliflower	1.63	0.51	10.2	0
Khesari dal	1.63	0.2	30.61	42.85
Sweet potato	6.12	0.61	20.4	82.65
Mosur dal	5.1	1.22	8.16	310.2

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182 **4.3 Sources of seedlings**

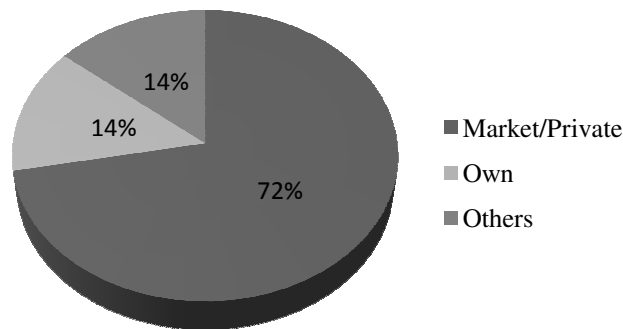
183 Three different sources of seedling were found in ship breaking areas. These are private source, own production and other sources i.e
184 bringing from relative, neighbors. Major seedling sources was private sources (72%) followed by others (14%) and own (14%)
185 respectively shown in Figure 2(a). On the contrary, three different sources of seedling were found in non-ship breaking areas. These
186 are private source, own production and other sources i.e. bringing from relative, neighbors. Major seedling sources was private
187 sources (86%) followed by others (8%) and own (6%) respectively shown in Figure 2(b).

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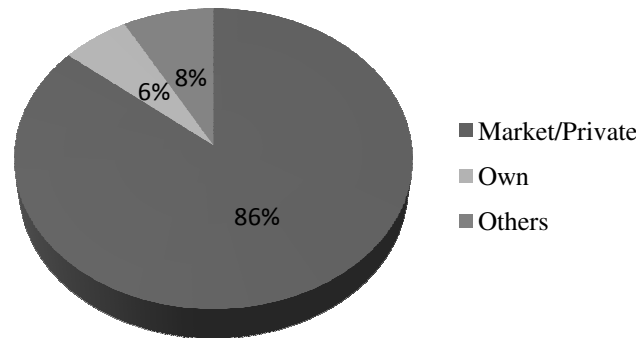
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2(a)

Figure 2(a) Seedling sources in ship breaking areas



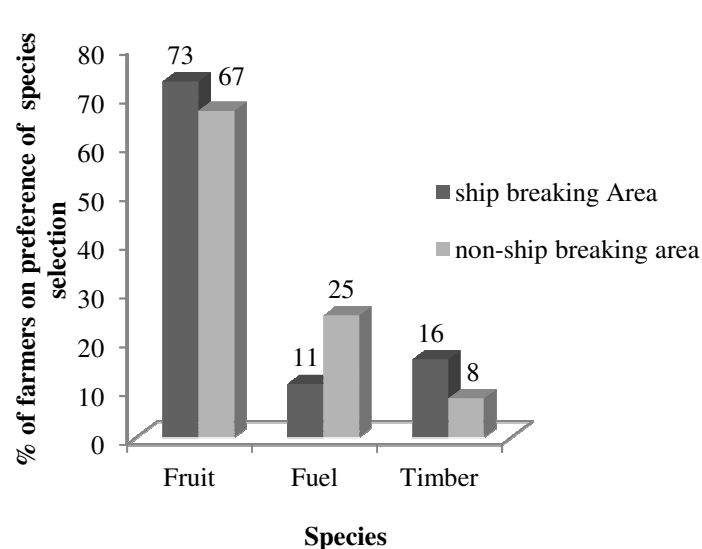
2(b)

Figure 2(b) Seedling sources in non-ship breaking areas

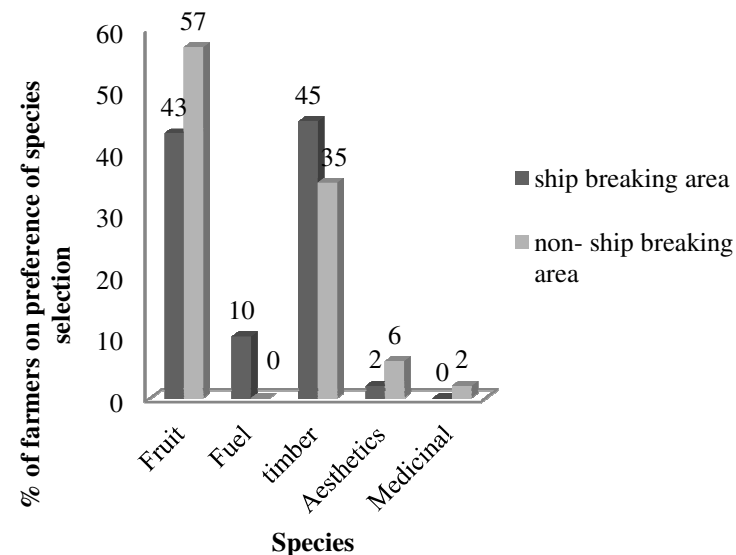
4.4 Preference of species selection

Present choice of preference of species selection is confined to fruit, fuel and timber species for both ship breaking and non-ship breaking areas. Among them preference was given to the fruit tree species for both areas. However percentage varied from each other. In non-ship breaking areas 57% people chose fruit species while 73% people chose fruit tree species in ship breaking areas. After fruit species fuel species was given preference in non-ship breaking areas while timber was given preference in ship breaking areas (Figure 3a). Past choice of species were confined to fruit, timber, aesthetics and medicinal species for non-ship breaking areas and fruit, fuel, timber and aesthetics for ship breaking areas (Figure 3b). Among them preference was given to the fruit tree species in non-ship breaking areas while timber species was given preference in ship breaking areas. In non-ship breaking areas 57% people chose fruit species while

203 43% people chose fruit tree species in ship breaking areas. In ship breaking areas 45% people chose timber species while 35% people
 204 chose timber species in non-ship breaking areas. Respondents of non-ship breaking areas were used to plant medicinal species, on the
 205 other hand respondents of ship breaking areas were used to plant fuel species (Figure 3b).



206 **3(a)**



207 **3(b)**

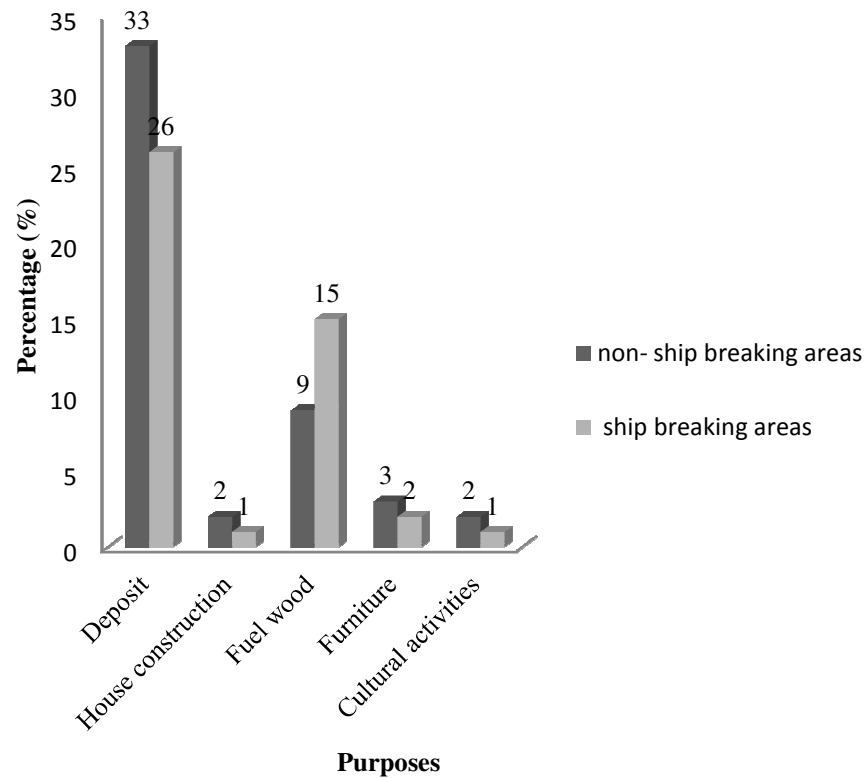
208 **Figure 3(a) & 3(b) Percentage of farmers on present and past preference of tree species selection in both the areas.**

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4.5 Purpose of planting trees in home garden

211 Major purpose of planting trees in home garden were deposit, house construction, fuel wood, furniture and cultural activities for both
212 ship breaking and non-ship breaking areas. Among them the most dominant purpose was deposit for both areas. However percentage
213 varied from each other. In ship breaking areas 26% people's purpose was deposit while 33% people's purpose was deposit in non-ship
214 breaking areas followed by fuel wood and furniture (Figure 4).



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216

217 **Figure 4 Various purposes of planting trees in home garden**

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219 **4.6 Discussions**

220 Vankatash *et al.* (2003) found that in tropical home gardens species diversity is generally believed to be very high. Home gardens
221 reached high levels of developments in terms of plant diversity, labor input and income derived from garden in region where
222 population densities are high and create a forest like multistory canopy structure. Moreover, species diversity sue, shape and plant
223 density also vary from place to place depending on cultural, ecological and socio economic factors which is consistent with the
224 findings of present study where a total of 27 tree and 16 agri-crop species including fruits, timber, fuel wood, aesthetics and medicinal
225 were found in ship breaking areas while 30 tree and 16 agri-crop species were found in non-ship breaking areas which support the study of
226 Atta-krah et al. (2004), Acharya (2006), and Ouinsavi & Sokpon (2008) where our traditional agro-forestry practices support
227 biodiversity through in situ conservation of tree species on farm level and there are many factors behind the selection of integrated tree
228 species in the farming system existed. This study has similar findings with Pandey et al. (2006) that documented more diverse crops in
229 the home gardens in the South Andamans.

230 In this project, major seedling sources were found from private, own production and other sources e.g. relative, neighbors at both ship
231 breaking and non-ship breaking areas. It is similar to the maximum findings (Roy 2013) of homestead plantation seedling sources in
232 Bangladesh. Surprisingly, relative and neighbors play an important role as seedling source, sometimes as seed or seedling.

233 For the majority of respondents surveyed, the selection criteria of tree species in the system were dependent on cash income as output
234 followed by house construction, fuel wood, furniture and cultural activities for both the ship breaking and non-ship breaking areas.
235 This study was found similar to the study conducted by Salam et al. (2000) where they mentioned that farmers' decisions of whether
236 or not to plant trees have been based primarily on economic rather than ecological concerns. Many of the farmers presently preferred
237 fruit trees to plant in both the ship breaking (43%) and non-ship breaking (57%) as a source of income as well as their own
238 consumption which is supported by findings of several researchers (Masum et al. 2005, Mustafa 1997, Siddiqi & Khan 1999) across
239 the country. Roy 2013 also found similar findings where farmers were very interested to grow timber and fruit trees for their economic
240 return and family needs.

241 Homestead forestry can generate additional income to alleviate the poverty of rural people by increasing overall household income.
242 Moreover, Shannon–Wiener index of this study was 2.5 in ship breaking and 2.7 in non-ship breaking areas, which is consistent with
243 findings of a similar study Muhammed et al. (2011) reported this index as 2.62–3.33, for different-sized home gardens of Bangladesh.
244 Homestead forest is acting a great role for biodiversity conservation but it is evident from the study that farmers have lack of
245 knowledge on homestead forest species conservation through scientific way as they are planting following traditional management
246 systems. Even farmers are not conscious whether ship breaking activities are affecting their homestead plant production or not.
247 Several studies (Vardar et al. 2002, Rubaiyat et al. 2013, Siddiquee et al. 2009) were carried out at the ship breaking areas to check the soil
248 properties and heavy metal concentration in soil and they explored that heavy metal pollution in the sediments of ship breaking areas is at
249 alarming stage. Moreover, Abdullah et al.,(2010) reported the drastic expansion of ship yard from 3.45 km in 1989 to 12.78 km in 2010 which

250 indicated an elongated pollution release zone which directly influencing the vegetation at the surrounding areas. Therefore, it is very much
251 important to investigate the land use changing pattern due to ship breaking activities over time and its impact on soil properties and
252 plant growth including agro-crop and forest crop growing around the ship breaking areas of Bangladesh. Moreover, it is also very
253 urgent to investigate the heavy metal concentration in plant including agro-crop and forest crop growing around this area. Based on
254 findings from the analysis of soil properties and heavy metal concentration in soil and plant, farmers can be prescribed to plant site
255 specific species for more production and sustainable homestead forest management at the ship breaking areas of Bangladesh.

256

257 **5 Problems and Recommendations**

258 Household members mentioned oil leakage from ship breaking yards to the agri-land may cause soil infertility. Moreover, they also
259 mentioned crops damaged animals, storm, children, lack of technical knowledge, unavailability of space as major problems for
260 cultivation of agri-crops and planting trees at the homestead level in both ship breaking and non-ship breaking areas. Household
261 members suggested some measures against those problems which are mentioned below:

- 262 • Ship breaking industry should follow certain guidelines provided by Govt. so that it cannot effect negatively on cultivation
263 and production of agri-crops and plantation of trees.
- 264 • Use of multipurpose trees should be encouraged considering the increasing demand of forest resources.
- 265 • To ensure safe and reliable source of planting materials i.e. establishment of Govt. nursery.

- Indigenous techniques practiced by the farmers should be modernized.
- Use of species that can withstand stormy weather for protection and can survive in ship breaking areas should be planted.
- Proper training and technical support should be made available by appropriate authority about home garden management to make home garden more productive.

6 Conclusions

Home garden is one of the most elaborate system of indigenous forestry, found most often in tropical and sub-tropical areas. It was found from the study that homestead people prefer fruit, fuel wood and timber species to plant which are a direct source of cash income as well as play role to fulfill their own demand. This preference of species selection should be considered while planning the homestead plantation program at the local level. Farmers should be provided incentives to plant their preferred tree species as well as endangered tree species for biodiversity conservation point of view. Moreover, agro-crop diversity was quite similar in both the ship breaking and non-ship breaking areas, even though there should be a depth research whether there is any impact of soil properties including heavy metals contamination on growth of agro-crop and tree species in ship breaking areas perhaps soil contamination due to ship cutting in the yard is happening there. In addition, farmers should be made conscious if there are any changes of production of agro-crop at the ship breaking areas and they should search the causes behind the changes. Moreover, strong co-ordination and linkage among different stakeholders from agriculture, forestry, land-use practitioners and finally the local people should be developed for sustainable homestead forest management.

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