

The stock and socio-economic uses of *Borassus Aethiopum* in Abrimasu Forest Reserve of Mampong Forest District

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Abstract

This present paper provides the stock level and socio-economic uses of *Borassus aethiopum* in Abrimasu forest reserve of Mampong forest District. Survey was conducted in Abrimasu Forest Reserve and five selected fringe communities of the forest Reserve. Information on stocking, source, usage, as well as sale of *Borassus aethiopum* were obtained through semi-structured interview, key informants interviews, personal communication and desk study were used together with focal group discussion. The inventory of *Borassus aethiopum* was taken from both the on- and –off reserve areas. Three compartments and farms were randomly selected and demarcated for the study. The mean stocking of *Borassus aethiopum* (33-61 trees per hectare) in the Abrimasu Forest Reserve was significantly higher than stocking in the off-reserve (18 and 61 trees per hectare). From the results, 29% of the respondents use *Borassus aethiopum* as food and 33% of the respondents use *Borassus aethiopum* as shelter. 15% and 23% of the respondents generate income for using *Borassus aethiopum* for Aphrodisiac and medicinal purposes. It was concluded that more *Borassus aethiopum* trees are exploited from the off-reserve than the forest reserve. It is envisaged that as the population increases in the study area, there will be over-exploitation on the species in terms of urban development, consumption and agricultural practices. Authors strongly recommend that measures are in place to save the species from extinction.

Keywords

Abrimasu Forest Reserve—*Borassus aethiopum*—economic—environment—socio-cultural

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1. INTRODUCTION

Borassus aethiopum (Mart) is a dioeciously palm tree of African origin, which belongs to the family of Palmae or Areaceae. It is known in Nigeria, among the Yoruba, Igbo, Hausa and Ga people as Agbon-eye, Ubiri, Giginya and Kengera, respectively and in Ghana among the Akans, Ewe and Gas as Omankube, Agoti and Wiedzo respectively. Although it was described first in India in 1753 and only much later in Africa, botanists believed that it originates in Africa [1][2]. Its dispersal is motivated by elephants, which are so fond of the fruit. In fact the migration of elephants as well the slave traders introduced the current existing grooves of *Borassus aethiopum* in most of the West African states [3]. In terms of ecological requirements, it grows very well in the transitional and savanna areas of the semi-arid and sub-humid tropics in West Africa [2][3][4]. *Borassus aethiopum* is a multi-purpose palm, providing multi-functional uses in the areas of: shelter, food supply, improvement of economic

status (Income & employment) of rural people and the protection of the environment from degradation and biodiversity depletion. Every part of the tree can serve any of the socio-cultural, economic and environmental needs of human kind. The tree is an attractive palm and has been planted for amenity purposes. The roots, shoots and fruits are also utilized for medicinal purposes. The Roots' powder mixed with sheep butter is used to treat sore throat and bronchitis; palm wine is considered an aphrodisiac and stimulant [3].

In Ghana the potential benefits of *Borassus aethiopum* both social and economical have not been fully recognized since there is little documentation and primary data in terms of stocking, utilization, growth, processing and marketing. The aim of the study is to find out the stocking and uses of *Borassus aethiopum* in Mampong Forest District. With the growing concern among environmentalists and the general public about the steady decline of timber and non-timber products, the need to manage the forests on sustainable basis has become necessary each passing day; hence it is high time that there should be a paradigm shift study of the characteristics and efficient utilization of lesser known species like *Borassus aethiopum*. In order to shift the attention to the lesser used species; there is the need to assess their occurrence in Ghana and plan for sustainable use and management.

The research is designed to address the objectives of; estimating the stock level of *Borassus aethiopum* in the on and off-reserve areas of Abrimasu Forest Reserve in Mampong Forest District, Ashanti Region and also to find out the socio-economic importance of *Borassus aethiopum* in five fringe communities of the Abrimasu Forest Reserve.

2. MATERIALS AND METHODS

2.1 Study Area

Abrimasu Forest Reserve is named after an old hunter's camp inside the reserve and lies in the transitional zone of Ghana, in the Ashanti Region and falls under the administration of the Mampong Forest District. The reserve is located in the Ashanti Region of Ghana. It is located in the Dry Semi deciduous Forest type and fire zone type Dry Semi Deciduous Forest Zone (DSFZ) of [6], specifically between longitudes $1^{\circ} 42' W$ and $1^{\circ} 31' W$ and latitude $7^{\circ} N$ and $7^{\circ} 19' N$. The reserve covers an area of 26.21sq km and has total perimeter of 34.94km. It is rectangular in shape and a total of 19 compartments. The Abrimasu Forest Reserve is owned by Kumasi, Mampong, Agona and Ejisu stool lands. There is only one river that flows through the Abrimau Forest Reserve. The Afram River flows from right through the Abrimasu Forest Reserve in a South West-North East direction. The land in Abrimasu rises gently from 550ft in the east to 900ft in the West. The rest of the land is gently undulating. The reserve lies within the tropical humid cli-

matic zone, characterized by uniform high temperature and two peak rainfall seasons in June and October and dry season from December to March. Average annual rainfall of the area is 1,352.28mm. The precipitation is obtained between April and July for major season and between September and October for the minor season. According to the Ghana Geological Survey the reserve is underlain by upper voltaian sandstones. The soils developed from these are generally poor in nutrient reserves. They also have low water holding capacity. Most of them, however, have capacity to utilize added fertilizers. There may be extensive, well drained, deep, non-gravelly soils and small patches of shallow iron pan and skeletal soils on the uplands. The colluvial and alluvial drift that may occur on lowlands will be sandy loam in texture.

2.2 Primary Socio-Economic Data

The study was carried out in Abrimasu Forest Reserve and five (5) selected communities fringing the forest reserve. The population of each of the communities is as follows; Aframso-2685, Teacherkrom – 489, Kobreti – 403, Kwaseakan-789 and Dome – 1326 [7]. A total of twenty (20) respondents in each of the selected communities namely Kobreti, Kwaseakan, Teacherkrom, Adome and Aframso were interviewed. These communities were selected based on the availability of the species (*Borassus aethiopum*). Household questionnaire administration was administered to one hundred (100) respondents in five communities, where consumption, collecting, processing, usage and marketing of the fruit and wood of the tree take place.

In addition to the above, focal group discussions with school teachers, community leaders (Odikro) and assembly members, women and men groups, teenage children groups were also carried out to gather information about socio-economic potential of *Borassus aethiopum* within the five selected communities. Field observations on the farmlands and in market places, personal communication and desk study were also used.

2.3 Inventory of *Borassus aethiopum* Populations

The *Borassus aethiopum* trees were counted in the Abrimasu forest reserve and off reserve to find out the stocking levels. This helped to establish the availability of the *Borassus aethiopum* both on and off reserve and to assist future decision on extraction of the resource. Three compartments in Abrimasu Forest Reserve were randomly selected. In each of the compartments, a 100 by 100 (meter) plot was set up, Strip lines of 25m intervals were cut within each 1ha plots. Counting of *Borassus aethiopum* trees was carried out as they occur and as the enumerators walked along the strip lines or transects, parameters such as diameters and heights of the trees were measured, again the coordinates position of the trees were taken using Geographical Positional System (GPS, S62). Similarly a 100m x 100m plot was set up

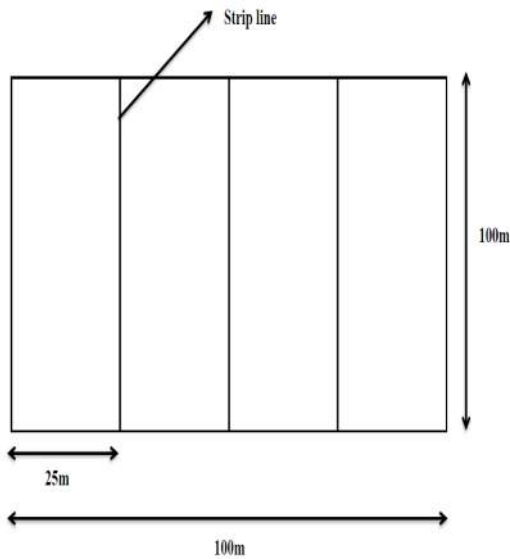


Figure 1. Diagram of strip lines to determine stocking stripe line

on the farmlands of three randomly selected communities namely Teacherkrom, Kobreti and Kwaseakan of the study area, strip lines of 25m intervals were cut and *Borassus aethiopum* trees counted while walking along the transect lines (figure 1). The off reserves are the farmlands of the community members within the study area.

2.4 Data analysis

The results of the questionnaire and interviews were analyzed using Statistical Package for Social Science (SPSS) software and the results presented in bar charts and tables. The mean number of *Borassus aethiopum* stands in the forest reserve and that of the off reserves were compared using t-test at 0.05 significant level.

3. RESULTS AND DISCUSSION

3.1 Respondent's familiarity

Figure 2 shows the length of time respondents have known the existence of *Borassus aethiopum*. Twenty-six percent (26%) of the respondents had known *Borassus aethiopum* between one (1) and five (5) years, twenty-two percent (22%) of the respondents had known *Borassus aethiopum* between six (6) and ten (10) years whiles fifty-two percent (52%) had known *Borassus aethiopum* for more than ten years (10).

3.2 Income from *Borassus aethiopum*

Figure 3 shows the income respondents earn annually from *Borassus aethiopum* trade. Forty-four percent (44%) of the respondents earn more than GHc400.00 whiles twenty-four (24%) earn within GHc300.00 to GHc400.00 and thirty-two (32%) of the respondents earn less than

GHc300.00 per annum. The products that are sold include lumber, fan, "tuekokoo" (boiled maize with *Borassus* juice) and young shoots. However, because of the abundance of the palm the products are not sold within the study area they are transported to other communities such as Mampong, Ejura, and Agona where *Borassus* is scarce. But with the lumber, respondents who have *Borassus aethiopum* on their farms only need to buy fuel and hire a chain saw operator to saw it for them, for a fee whilst those who do not have, need to buy. It was observed from the focal group discussion that some of *Borassus* lumbers are exported to Niger and Burkina Faso to earn foreign currency.

3.3 Parts used by respondents

Parts of *Borassus aethiopum* mostly used by respondents as represented in figure 4 shows, 19% of respondents said they use fruits of *Borassus aethiopum* for food. They are either eaten in the raw state or are processed for food. 8% said they made use of the wood of *Borassus aethiopum* for construction and building purposes, because of its strength properties and resistance to decay. Also, 4% of the respondents said they use the bark of *Borassus aethiopum* for medicinal purpose such as aphrodisiac; a drug that is said to give people a strong desire to have sex and also improves sexual performance. The Roots' powder mixed with shear butter is used to treat sore throat and bronchitis; this is confirmed by [9], that the use of *Borassus aethiopum* root, shoot and fruits in the traditional medicine is for the treatment of various ailments. Fifty-four percent (54%) of the respondents use the young sprouting *Borassus* shoot known as hypocotyls. They consume more of these young shoots than any other parts, it is this part that is mostly sold because of its abundance, everyone has access to it, and so it is sold outside the study area. They consume it, either in the form of food known as Tuekokoo' (i.e. boiled maize with juice of *Borassus*) or palm wine (Yabira). Tuekokoo' is boiled maize with juice of *Borassus* spp and it is prepared from the fruits. It complements the diets of the people, the white albumen in the three woody kernels of the seeds are consumed mostly by children. This is confirmed by [8] that in many rural areas in tropical countries palm trees are sources of numerous substantially important products providing household medicine, fuel, wood for building and household tools but also primary materials for local industries. The fruits are relevant during the famine season or dry season when they had sold all their stored food stuff. "Yabira" is a locally prepared wine often taken by the elderly. The village had been named, "Yabiraso" because Yabira (palm wine tapping) used to be the main occupation of the people of that village. Fifteen percent (15%) of the respondents collect the various parts of *Borassus aethiopum* to sell for income, especially geotextiles (use by mining companies to conserve the

soil), hats, fans etc.

3.4 Sources of collection of *Borassus aethiopum*

Figure 5 shows the sources of collection for *Borassus aethiopum*. Thirty-four percent (34%) of the respondents collect the needed *Borassus* part from inside the Abrimasu Forest reserve while sixty-four percent (64%) of the respondents collect *Borassus aethiopum* from trees occurring outside forest reserves. 34% of the respondents collect *Borassus aethiopum* from the Abrimasu Forest reserve while 64% of the respondents collect *Borassus aethiopum* from outside forest reserves. According to the respondents *Borassus aethiopum* is abundant mostly in areas that had experienced some form of fire hence it is described as sun-loving tree or fire resistance tree. It was revealed that those living in towns get parts or products of *Borassus aethiopum* either from Ejura, Mampong, Agona or purchase from Kobreti, kwaseakan and other areas.

3.5 Quantity of Parts of *Borassus aethiopum* Being Used

Table 1 shows the parts of *Borassus* plant and an estimated quantity of the part that are harvested /extracted by inhabitants of the five fringe communities around the Tonton Forest Reserve. About 31% of the respondents indicated that they extract the fruits and in one year approximately 4000kg are harvested. 19% extract approximately 2500kg of the leaves annually, 15% do harvest approximately 2000kg of the young shoots per annum, 1% do extract about 50kg of the bark annually, while 35% extract the wood and this amount to an approximate volume of 125m³ per annum.

Table 1. Parts and estimated Quantities of *Borassus aethiopum* being used in the five fringe communities

Parts Used	Qty Per Annum	(%)
Fruits	4000kg	30.65%
Leaves	2500kg	19.16%
Young shoots	2000kg	15.33%
Bark	50kg	0.38%
Wood	125m ³	34.48%

3.6 Respondents view on of *Borassus* plant's ability to promote growth of associated agricultural crops

Figure 6 shows the views of respondents on the ability of *Borassus aethiopum* to promote growth of associated agricultural crops. With respect to associated food crops, 33% of the respondents said that *Borassus aethiopum* promotes the growth of agricultural crops associated with the trees in agroforestry farming systems, 61% of the respondents did not agree with the issues that *Borassus* trees promote the growth of associated food crops in farming systems.

On the other hand 6% of the respondents were undecided.

3.7 Effect of *Borassus aethiopum* on other crops

The respondent's perception on the influence of *Borassus aethiopum* in their farms on associated food crops was assessed. According to 22% of the respondents (figure 7), *Borassus aethiopum* reduces crop yields, 40% of the respondents said *Borassus aethiopum* kills the crops and 38% of the respondents said it causes mechanical damage to the crops, as a result of falling fruits and leaves. The weight of the fruits and the large size of the leaves cause damages to the associated matured food crops as well as young food crops.

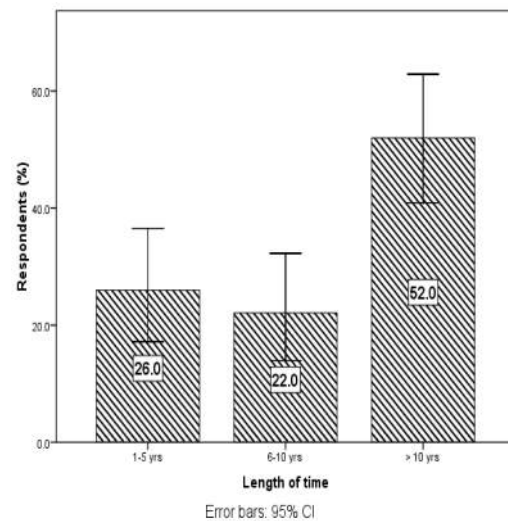


Figure 2. The length of time of which respondents have known *Borassus aethiopum*

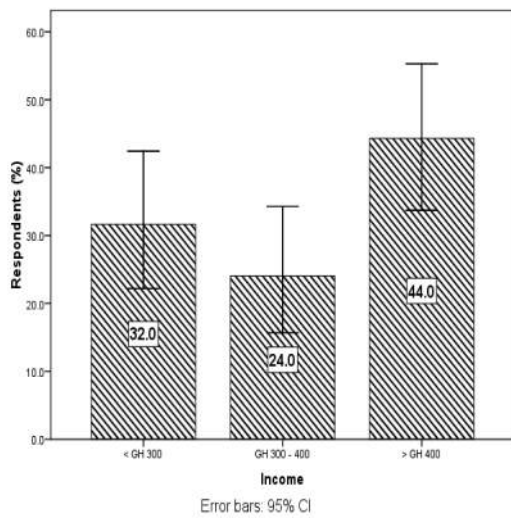


Figure 3. Income respondents earn annually from *Borassus aethiopum* trade

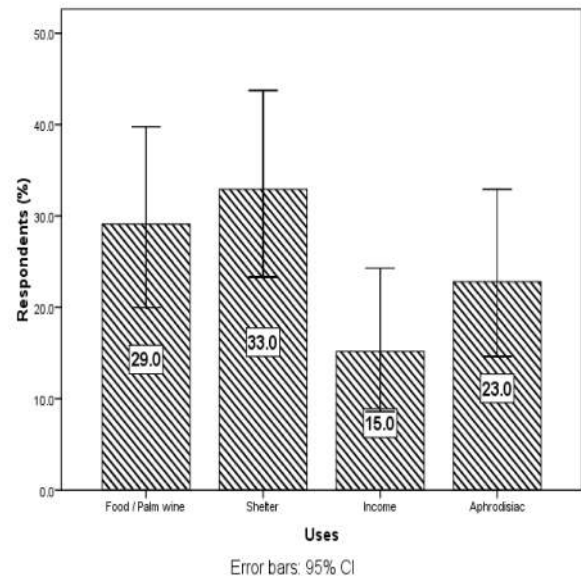


Figure 5. Various uses of *Borassus aethiopum* by Respondents

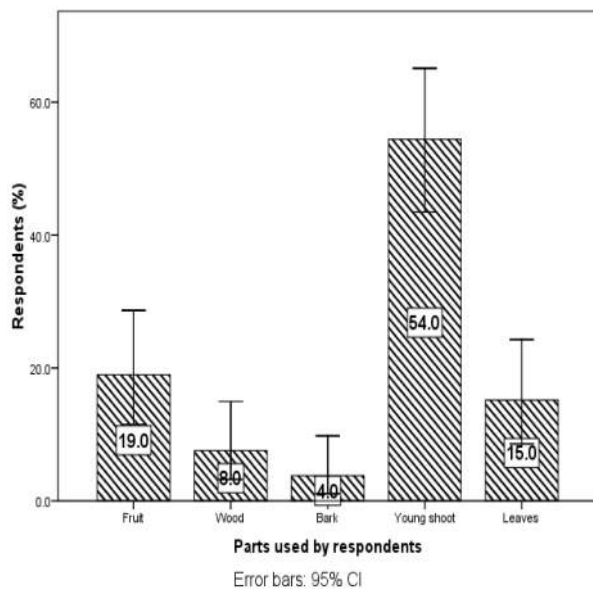


Figure 4. Parts of *Borassus aethiopum* mostly used by respondents

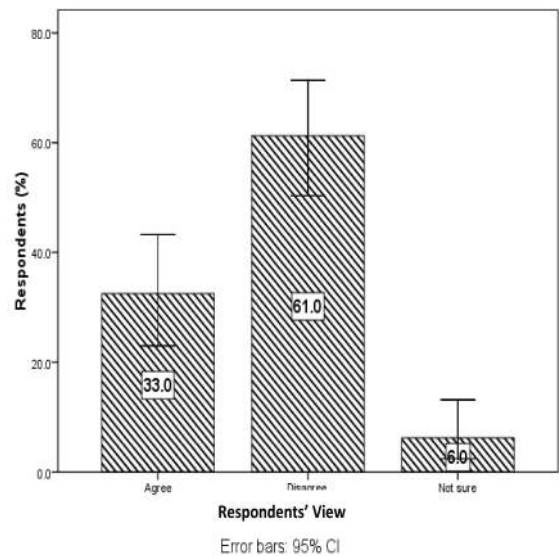


Figure 6. Respondents' views on the ability of *Borassus aethiopum* to promote growth of associated agricultural crops

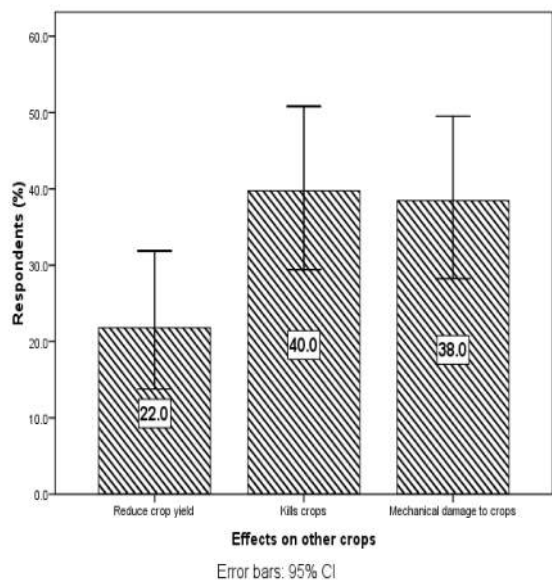


Figure 7. Effects of *Borassus aethiopum* on other crops

Table 2. Stock/ha, height, diameter and volume of *Borassus aethiopum* in On-Reserve and Off-Reserve

Sampling location	Stock/ ha	Height of trees (m)	Diameters of trees (cm)	Volume (m ³ /ha)
Forest reserve	49.67±14.74	28.67±0.57	42.03±0.29	3.97±0.03
	33.00-61.00	28.20-29.30	41.70-42.20	3.94-3.99
Off-reserve	32.00±18.52	22.13±2.68	30.03±0.85	1.57±0.24
	18.00-53.00	19.10-24.20	29.40-31.00	1.29-1.74
Total	40.83±17.83	25.40±3.98	36.03±6.60	2.77±1.32
	18.00-61.00	19.10-29.30	29.40-42.20	1.29-3.99
t-statistic	1.293	4.125	23.142	17.145
d.f	4	4	4	4
Sig. (2-tailed)	0.266	0.015	0	0

3.8 Stocking density of *Borassus aethiopum*

From Table 2, the mean number of *Borassus aethiopum* trees per hectare in the Forest Reserve ($M=50\pm15$) was significantly more than the mean number of *Borassus aethiopum* trees per hectare in off-reserve ($M = 32 \pm 19$). It was found that, the mean height (m) of *Borassus aethiopum* in forest reserve ($M = 28.67 \pm 0.57m$) was more than the mean height (m) of *Borassus aethiopum* in the off-reserve ($M = 22.13 \pm 2.68m$), the test for equality of means was statistically significant ($(t_4) = 4.125, p = 0.015$). The mean diameter (cm) of *Borassus aethiopum* in forest reserve ($M = 42.03 \pm 0.29cm$) was significantly more than the mean diameter in off-reserve ($M = 30.03 \pm 0.85$). The test for equality of means is statistically significant ($t(4) = 23.142, p = 0.000$). From Table 2, the mean volume (m^3) of *Borassus aethiopum* per hectare in forest reserve ($M = 3.97\pm0.03 m^3$) was significantly more than the mean volume (m^3) of *Borassus aethiopum* per hectare in off-reserve ($M = 1.57\pm0.24 m^3$), the test for equality of means is statistically significant ($t(4) = 17.145, p = 0.000$).

In the forest reserve all the parameters (stocking, diameter, height and volume) are more than their corresponding parameters in the off-reserve areas; these are due to favorable growth conditions such as absence of Wild Fires in the forest reserve. Again for the fear of prosecution the citizens have not been exploiting the *Borassus aethiopum* stands in the forest reserve as they do in the off-reserve areas. The stock level of *Borassus aethiopum* in the off-reserve areas of Abrimasu Forest Reserve is less than in the on-reserve area and this could be attributed to agricultural practices where the trees are cut down to make way for the cultivation of the land and also destruction of the young shoots by cattle as they feed and trample on them. Community members also take away the seeds for consumption and to germinate to get the young shoots.

3.9 The Mampong Forest Services Division District Manager's comments

According to the Mampong Forest Services Division District Manager, there used to be rampant illegal exploitation of *Borassus aethiopum* in the forest district, as a result he instituted stringent measures to clamp down the illegal activities and has since written to the Forest Services Division's Head Office seeking directives as to how to manage the *Borassus aethiopum* in both off reserve and on reserve areas. He suggested that stumpage fees be paid by prospective contractors who apply for permits. He also said the use of chainsaw machines to exploit the *Borassus* must be stopped since there was a law which prohibited the use of chainsaw machine in converting timber to lumber in Ghana. In view of this there is no issuance of harvesting permits for *Borassus aethiopum* in the Mampong Forest District.

3.10 Summary of Key Findings

From the study it was observed that 54% of the respondents consume the young shoot which is a serious threat to the future *Borassus aethiopum* population. It was observed that 64% of the *Borassus aethiopum* population was destroyed by fire, this is confirmed by Hawthorne who stated that "Fire is now by the greatest threat to the long term productivity, generic wealth and general health of the forest" [10]. The decline and destruction of *Borassus aethiopum* stands by annual wildfires has affected the natural regeneration stock in the study area. It was observed that the Abrimasu Forest Reserve had experienced severe wildfires than the off-reserves because most of the off-reserve areas are farmlands where legumes and cereals are cultivated; as a result much care is taken to prevent wildfires. It was deduced from the research that about 74% of respondents used weedicides on their farmlands to weed grasses and therefore prevent severe wildfires on their farmlands. It was noticed during the study that 62% of *Borassus* population was exploited for shelter and palm wine which is another threat on the stocking of *Borassus aethiopum*. Over exploitation is a serious threat, it was observed that 39% of the species is exploited annually unchecked and also the natural populations are being reduced by drought and agricultural practices. They argue that strict management practices be adopted and enforced to sustain the *Borassus aethiopum* population for the benefit of the local people. It was observed that mostly, fruits and branches of *Borassus aethiopum* fall at night and early dawn hours in the morning, hardly do they see the fruits and branches dropping in the afternoon, there is superstition attributed to this which none could explain. To them *Borassus aethiopum* does not pose any danger of hitting a farmers head or back as a result of fruit drop.

4. CONCLUSION

The study revealed that, the mean stock level of *Borassus aethiopum* was estimated to be between 33 trees per hectare and 61 trees per hectare in the Abrimasu Forest Reserve and in the off-reserve areas stock level was found to be in the range of 18 trees per hectare and 61 trees per hectare. Food/wine (29%), shelter (33%), income (15%) and Aphrodisiac (23%) were some of the socio-economic benefits the five fringe communities of the Abrimasu Forest Reserve. *Borassus aethiopum* played an important role in socio-economic enhancement of the rural people in Mampong Forest District; hence more attention should be paid to ensuring the sustainable management of the species in Ghana.

5. RECOMMENDATIONS

In order to ensure the sustainable management of *Borassus aethiopum* the following recommendations are sug-

gested

1. There should be further study on the soil conditions responsible for regeneration of *Borassus* seedlings.
2. There should also be a study on growth rate of *Borassus aethiopum* in Ghana.
3. Measures should be developed to ensure sustainability of *Borassus aethiopum*; this is necessary due to the extinction of known timber species. The Forest Services Division should begin to establish plantations of *Borassus aethiopum*.
4. Forest Services Division should research into the germination of *Borassus aethiopum* seed so as to reduce the dormancy period to less than one month.

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