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An Evaluation of Local Community Participation in Forest Resources Conservation in some Selected Districts of Ghana

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ABSTRACT

Participatory forestry management is essential for conservation, and various forestry sector reforms in Ghana have advocated for its adoption, yet conservation policies in the country have largely been formulated and implemented with profound disregard for the local communities. The effectiveness of the few reported cases of integration in some parts of the country have yet to be assessed. This study evaluated the strategy in some local communities within selected districts (Atwima, Offinso and Ejisu-Juaben) of the Ashanti region, Ghana by identifying, through a questionnaire survey, the areas and depth of involvement, capacity building and problems confronting the programme. A total of 300 locals, randomly selected, were involved in the survey. The impacts of the strategy on the health of forest reserves within the districts were assessed through field surveys. The study revealed that the local communities who were mostly farmers shallowly participated in forest management mainly by reporting illegalities (55.7%), preventing bushfires (20.3%), clearing forest boundaries (10.7%), planting seedlings (5.0%) and employment as forest guards (2.7%). In terms of capacity building, only 23% of the respondents had received training in bushfire prevention and 21% on the taungya agriculture system, demonstrating the lack of commitment on the part of the official forest managers towards deep integration. Major problems confronting the strategy included lack of logistics, interest, threats and incentives. The Asenanyo Reserve (H^I = 3.445; E = 0.881) in the Atwima district was healthier than the Asufo Reserve (H^I = 1.949; E = 0.491) in the Offinso district which was dominated by the highly ranked invader, *Broussonetia papyrifera* (62.7%), suggesting a much successful participatory conservation in the former than the latter. These findings generally indicate the existence of limited and ineffective collaboration between local communities and the Forest Service Division which must be deepened if sustainable conservation of the country's forest resources are to be achieved.

Keywords: Ashanti, Atwima, forestry, involvement, Offinso, taungya

INTRODUCTION

Conservation of forest resources is crucially important for the sustainable development of many countries in the tropics that are heavily dependent on them, as none can afford the socioeconomic cost associated with their destruction (Arrey *et al*. 2003). In many of these nations, governments, through their agencies and institutions, usually exercise the overall responsibility of safeguarding the intergrity of forest resouces by formulating and implementing various conservation policies as well as instituting the appropriate legal frameworks.

In recent times however, resource conservation using exclusionary approaches which do not encourage participation of local people has lost its popularity (Sheffy 2005). Despite some earlier criticisms that integrated conservation and development projects have not effectively safeguarded protected areas (Kramer and van Schaik 1997), many modern conservationists consider the recognition of the role of the resident communities as the "new paradigm in conservation" (Michon *et al.* 2007). It is an interdisciplinary strategy which incorporates multiple scales of ecological, social, political and economic concerns of local communities in the management of forest resources (Berkes 2004; Sheffy 2005).

Integrating local people in conservation and management efforts has become very essential due to the interactions between them and the forest resources. Recent studies suggest that almost half of the threatened biota of the world occur in regions or areas where agriculture is a common land use option, and where farms and nature reserves actually share a common ground (Paul 2003). According to Agyarko (2001), most rural communities in Ghana, for example, live very close to the forest and are major and direct consumers of goods and services from the forest, especially non-timber forest products, and at the same time the direct cause of deforestation. It has also been argued that integrating the local people in forest conservation policies can improve administrative efficiency, reduce administrative costs, address equity issues, improve environmental monitoring and ultimately lead to the sustainable utilization and conservation of the forest resources (Kellert *et al*. 2000; Zhang 2001).

Local communities in conserved areas have a direct dependence on forest resources; deriving essential services such as provision of food, clothing, shelter, furniture, water-supply sources, bush meat, and traditional medicine, among many others (Agyarko 2001). Indeed, many resident communities are inextricably linked to, and affect the forest resources that ignoring their peculiar roles in conservation activities can seriously undermine the success of such interventions. There are several approaches to participatory conservation which occurs along a continuum from active consultation to complete transfer of authority and responsibility to the local communities. The local people may be involved in decision-making, benefit sharing, consulted, formally share authority and responsibility, recognised or ignored altogether, and their involvement could be shallow or deep (Sheffy 2005).

Although forestry reforms carried out in 1994 by the government advocated for collaborative management of the country's forest resources, this could not significantly change forest governance in Ghana (Opoku 2006). As a result, most policies concerning conservation of forest resources have often been formulated and/or implemented with

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profound disregard for the role of the "resource owners" (Nelson and Gami 2002; Arrey *et al.* 2003; The International Development Center, IDRC 2004). The continuous adherence to the policy structure of exploitative and repressive relations between the corporate timber industry and the state on one hand and the forest-dependent communities and the public on the other hand makes local people lose self-image as the trustees of forest resources (Agyarko 2001; Opoku 2006). Most agencies and stakeholders involved in conservation are constrained by logistics, finances and personnel. Their efforts are therefore commonly fragmented, overlapping and usually fail to integrate local people in conservation technologies (Arrey *et al*. 2003; Odoom 2005). As a result, forest fringed communities have few or no rights at all in the forest reserves; they do not receive royalties from sale of concessions, have no rights to be informed about or to refuse felling of trees on their lands by timber concession holders, receive inadequate compensation for the destruction of their farms and conservation laws have stifled their land tenure system, giving them little incentives to protect the reserves (IDRC 2004). These have also led to various forms of disagreements, confrontations and resentments towards forestry, and ultimately some difficulties in realizing the aim of conservation – protection of biological diversity (Kotey *et al.* 1998).

This lack of participation has been a disadvantage to the local people and also to the idea of conservation. The fact is, local people who feel they have no stake in the resources and that their rights to livelihood have not been fully considered are least likely to cooperate in conservation practices. Consequently, they often engage in activities which adversely affect the quality and health of the forest ecosystems, including illegal felling of trees, intentional bush fires, hunting and poaching, shifting agriculture, illegal mining or "galamsey" (IDRC 2004). These activities have been largely responsible for reducing Ghana's original stretch of forest cover by approximately 90% since 1940 (IDRC 2004).

Although local community participation in forest conservation interventions is generally not a common practice in Ghana, there is evidence of limited collaboration in some parts of the country (Odoom 2005; Sheffy 2005), which might have been adopted as far back as the early 1980s (Amanor 2003). However, information on the effectiveness of the strategy and the challenges confronting it is virtually non-existent or inaccessible. The specific areas of involvement are thus not clear.

The present study was designed to determine the areas and extent of local peoples' involvement in forest conservation policy development and implementation of selected communities in the Ashanti region of Ghana, and to identify the major factors of participation which may act as barriers to effective integration. The impacts of such involvement on the quality of the forest ecosystem in the study communities, in terms of tree species diversity were also assessed. The study was expected to demonstrate the importance of local communities participation in forest resources management in order to enhance their sustainable utilization and conservation in Ghana.

MATERIALS AND METHODS

Survey areas and design

This comparative study was carried out in the Atwima and Ofinso districts both in the Ashanti Region of Ghana, with the Ejisu-Juaben, also in the same region as the control district. These districts boast of a number of forest reserves, flanked by several communities that are ostensibly involved in forest conservation. The Ashanti region is the most populous region of Ghana, occupying a total area of approximately 24,390 square kilometres (or 10.2% of the land area of Ghana) (Ghana Statistical Service 2000). The region lies within longitude 1°30′15″ West and 1°45′12″ West, and latitude 6°36′15″ North and 6°45′48″ North.

Lying within the Upper Guinean Forest Zone of West Africa, the Ashanti region is endowed with rich tropical forest vegetation, mostly of the moist semi-deciduous type (Hall and Swaine 1981). This rich natural heritage, however, has been converted to farmlands, secondary forests and scattered patches of mature forest stands, through various anthropogenic disturbances. Significant percentage of the remaining forest cover in the region are found in the form of reserves.

The most important economic activity in the study communities was subsistence farming, with as much as 60% of the inhabitants practicing the taungya system within the reserves. Few people owned less viable lands outside the reserves. Other forms of economic activity common in the communities included petty trading, livestock rearing, carving of pestle and mortar, and selling of firewood.

The survey spanned nine forest-fringed communities in the three selected districts; four each from the Atwima and Offinso and one from Ejisu-Juaben (Kubease). The communities selected in the Atwima districts were Takorade, Barneekrom, Nkontin and Otaakrom while those from Offinso were Kyebi Anhwerekrom, Nkwaankwaa, Asempaneye and Koforidua.

Evaluation of local peoples' participation in conservation

The local communities' roles in the supposed conservation programmes within the selected forest-fringed communities were evaluated using structured questionnaire sampling, focused group discussions and informal interviews. A total of 300 questionnaires were randomly administered to the local people in the three study areas (120 each in the Atwima and Offinso, and 60 in the Ejisu-Juaben district). Target groups including the community leaders, forest guards, range supervisors, taungya headmen, farmers, traders, and hunters were however met and interacted with in order to extract relevant information. Focused group discussions were held with men, women and children. The survey also sought to identify the problems faced by the local communities in trying to assist in conservation as well as the areas of capacity building which may be instrumental in ensuring successful integration.

Impacts of participatory conservation on forest health/quality

The health/quality (in terms of tree species diversity) of forest reserves in the selected districts were assessed and compared as an indicator of the impacts of local peoples' involvement in conserving those resources. The Asenanyo and the Asufu West Forests were surveyed in the Atwima and Offinso districts respectively, whilst the Bobiri Forest Reserve, which is well-managed and protected by the Forestry Research Institute of Ghana (FORIG), was used as the reference site.

Tree species, measuring diameter at breast height (dbh) ≥ 10 cm, were identified and their densities determined in three 1-ha plots randomly located in each of the reserves. All economically valuable plants encountered were also noted. The densities and relative densities of species were calculated using the following formulae:

Density = number individuals of a species per hectare

Relative density = [number of individuals of a species × 100] / total number of individuals

The Shannon Diversity Index and Evenness (Begon *et al*. 1996; Cox 2002) were also calculated for each of the reserves as follows:

$$\text{Diversity Index, } H^1 = -\sum_{i=1}^{s} p_i \ln p_i$$

$$\text{Evenness (equitability), } E = \frac{H}{\ln S}$$

where p_i = proportion of the ith species

$\ln p_i$ = natural log of p_i

E = evenness or equitability

S = species richness

Plant identification was done with the assistance of a plant idenfication expert and nomenclature followed Hawthorne (1990).

Table 1 Socioeconomic characteristics of the study communities based on a baseline survey.

Characteristics	№ of respondents			P-value*
	Atwima (n = 120)	Offinso (n = 120)	Ejisu-Juaben (n = 60)	
Mean age in years	35	29	31	0.999
High educational level (up to SSS or MSL)	37 (30.8%)	25 (20.8%)	14 (23.3%)	0.964
No formal education	44 (36.7%)	55 (45.8%)	14 (23.3%)	0.964
Married	96 (80.0%)	98 (81.7%)	50 (83.3%)	0.990
Dependents numbering more than four	90 (75.0%)	84 (70.0%)	48 (80.0%)	0.973
Actively involved in farming	86 (71.7%)	76 (65.0%)	30 (50.0%)	0.916
Preferred to do agriculture	29 (24.2%)	39 (32.5%)	12 (20.0%)	0.961
Livelihood dependent on forest resources	82 (68.2%)	101 (84.2%)	24 (40.0%)	0.947

S.S.S. = Senior secondary school, and M.S. L. = Middle school level. *P-value based on a student's *t*-test at 5% significance level.

Data analysis

Descriptive and inferential analyses of data obtained from the questionnaire and vegetation surveys were done using MS Excel and the Genstat Discovery Edition 3 software (VSNi Ltd, UK).

RESULTS AND DISCUSSION

Socio-economic characteristics of the local communities surveyed

The forest-fringed communities surveyed in this study generally showed similar socio-economic characteristics, with agriculture being the mainstay of the local economies. Approximately 50–72% of the local people interviewed were actively engaged in farming (**Table 1**). This is typical of most rural communities in Ghana from where over 80% of the country's agricultural products are obtained (Adovor 2001). It is also consistent with the findings that the agricultural sector including forestry accounts for about 70% of total employment, contributes up to 43% of the gross domestic product (GDP) and provides livelihood for over 2.5 million people in Ghana (Agyarko 2001). In a stituation such as this, forest land clearly remains the most essential and accessible asset to the local people, who out of necessity, often sacrifice part of it for agricultural activities.

Apart from farming, many of the local people in the Atwima and Offinso districts (68.2–84.2%) also depended heavily on the forest resources for other sources of livelihood. Even those who were into petty trading, carpentry, masonry, palmwine tapping, among others, all had their livelihood or jobs directly or indirectly tied to forest resources. They derived most of their raw materials from the forest. This is consistent with the observation that 60% of Ghana's communities are forest-dependent (Opoku 2006). In the Ejisu-Juaben district, however, only about 40% of the respondents indicated they derived some form of livelihood sources from the forest resources. This could be explained by the fact that the Bobiri Forest Reserve, managed by the Forestry Research Institute of Ghana (FORIG), is an important butterfly sanctuary and a research centre, hence the many restrictions.

Most forest-fringed communities have not only evolved with the forest but must also exploit its resources to survive. However, their over-reliance on agriculture, utilizing outmoded practices such as shifting cultivation, has been a major source of concern; responsible for most of the deforestation and biodiversity loss in Ghana (IDRC 2004). This practice if not checked or properly managed, can seriously impact on the remaining forest resources within the study communities.

The majority of people interviewed were within the youthful and productive age of 20–40 years. The communities were also characterised by low levels of education and large family sizes. Only 30.8% of the people interviewed in the Atwima area and 20.8% in the Offinso could reach the Senior Secondary School or the Middle School Level of formal education, whereas between 23.3–45.8% of the respondents in all three areas had no formal education (**Table 1**). This state of affairs further underscores the importance of the forest resources to the local communities. With a considerable proportion of the populace lacking any formal training, skills or knowledge, agriculture will continue to provide the most viable source of livelihood for the people for a long time to come, and this implies the continual conversion of more forest lands into farm lands. The low literacy level also connotes serious negative implications for the conservation of the forest resources in that the communities are less likely to appreciate the consequences of deforestation as has been observed by Agyarko (2001).

Areas and extent of local people participation in forest conservation activities

From the perspective of co-management of the forest reserves, the participation of the local people in the selected districts could best be described as shallow (Sheffy 2005). Although there could be diverse areas of participation, five main areas were identified in this study, namely: reporting illegalities (55.7%), prevention of bushfires (20.3%), employment as forest guards (10.7%), planting of seedlings (5.0%) and clearing of boundaries or creation of firebreaks (2.7%) (**Fig. 1**). Notably, none of these areas depicts involvement at the decision-making level or suggests the sharing of authority and/or responsibility between the local people and the Forest Service Division (FSD) of the Forestry Commission, which is the body mandated to protect the forest. These findings apparently confirms the observation by Odoom (2005) of limited collaboration between the FSD and the local communities towards forest resources conservation. The results also go contrary to the ideals of Ghana's sustainable forestry strategy, which requires the FSD to collaborate with the local communities as primary clients in managing the forest resources, and to agree with them at the highest or decision-making level on the objectives of forest reserve management (Agyarko 2001). The local communities were expected to be involved in the planning, execution and monitoring of forest conservation policies. The realities were however different. Although inputs of the communities were sometimes sought through their representatives or opinion leaders, they did not reflect in the related activities. These findings are in keeping with the claim that the workings of the forestry sector still strongly adheres to the top-down approach in conservation where policies are formulated at the top hierarchy and imposed on the local communities (Amanor 2003; Opoku 2006).

In respect of the five areas, more people from the communities in the Atwima district appeared to be involved in forest conservation than those in the Offinso district, the only exception being in the area of bushfire prevention. For instance, whereas 65.8% and 10% of the respondents were engaged to report illegalities and plant seedlings respectively in the Atwima district, only 15% and 1.7% of those from Offinso participated in that order (**Fig. 1**). The percentage of the people employed as forest guards in the two districts were however the same (10%). These suggest that the communities in the Atwima districts could be slightly more interested in forest resource conservation than their counterparts in the Offinso district, and this could be partly attributed to the comparatively higher literacy level of the respondents from the former district (Agyarko 2001). The variation in the extent of involvement among the communi-

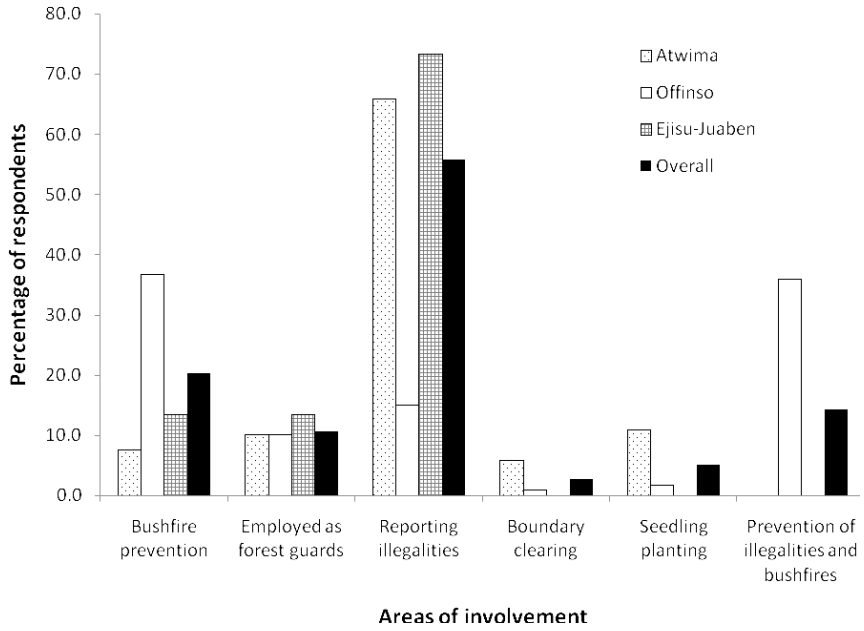

Fig. 1 Major areas of local people involvement in forest resources conservation in three selected districts of Ghana.

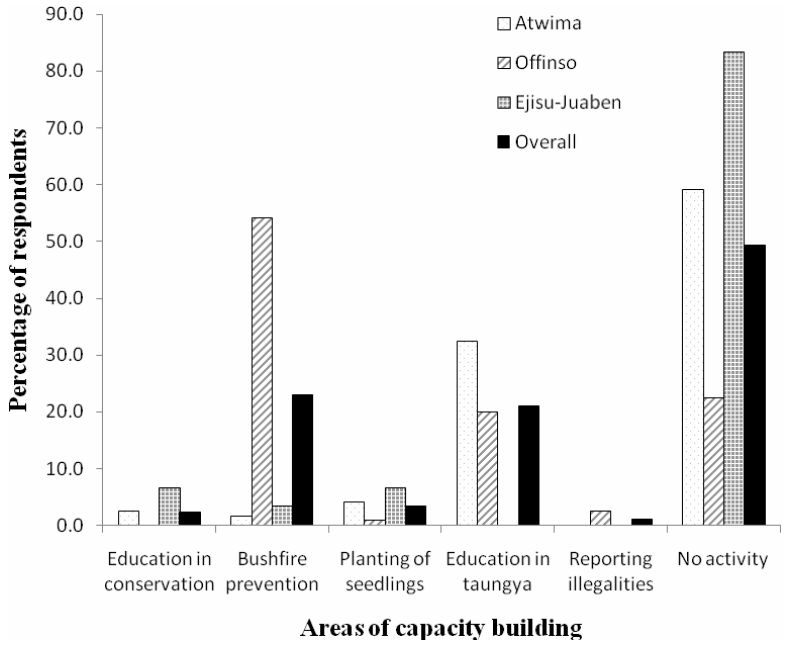

Fig. 2 The various areas of capacity building towards forest conservation.

ties in the two districts could also be a reflection of the level of conservation education or sensitization of the locals on the importance of conserving the forest resources and other measures put in place by the forest managers (**Fig. 2**). Statistically, the numbers of people involved in forest conservation in the two districts were not different ($p = 0.921$).

Although many of the respondents believed reporting illegal logging activities could be their main contribution towards conservation, their reluctance or unwillingness to assist in this way was not unnoticed. Most of the people could simply not report the culprits (their "neighbours") to the appropriate authorities due to the strong community life they shared. Other reasons cited were the lack of equity in benefit sharing or appreciation of the multiple benefits that could be gained if the forest reserves were conserved (IDCR 2004). Suffice to state that condoning the illegal activities retards the process of community involvement towards conservation.

Fire prevention was seen by most of the local communities as the second most important area for collaborative forest management. This was particularly so in the Offinso district because reserves in this district which lie in the dry semi-deciduous forest zone of Ghana (Hall and Swaine 1981) are prone to wild fires and as a result, the FSD had undertaken various fire campaigns in the district. In addition, a number of farmers were involved in the taungya system in the Offinso district, where it was most popular, and those people felt the need to protect their farms from fire outbreaks. This explains the relatively high number of respondents (36.7%) who were engaged in bushfire prevention in the Offinso district (**Fig. 1**). The taungya system is a collaborative management strategy and its implementation is an attempt by the FSD to involve the forest-fringed communities in reforesting the degraded reserves. This system however does not seem to be sustainable because of numerous challenges related to the supply of seedlings, maintenance of the trees, maturity time, unwillingness of farmers to move from land after harvesting their crops, sabotage, sharing of benefits, etc. (Jordan and Walter 1992; Pleydell 1994; Nkwantabisa, pers. comm. 2005).

The Atwima and Offinso districts both compared favourably with the control site, the Ejisu-Juaben district, in terms of involvement. In the case of the latter, the local people were involved in only three out of the five main areas identified (**Fig. 1**). The relatively higher percentage of people in this district who were employed as forest guards (13.0%) as well as those engaged in reporting illegalities (73.3%) is however noteworthy. The Bobiri Forest Reserve

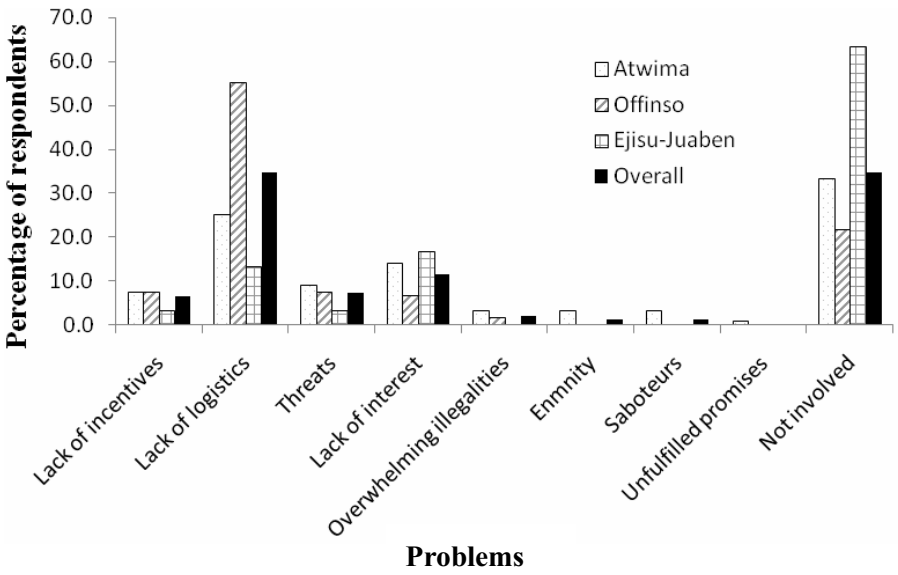

Fig. 3 Major problems faced by the local people in helping with forest conservation efforts within the districts.

located in the Ejisu-Juaben district is a popular and well-protected forest reserve/butterfly sanctuary in Ghana, under the strict control and management of the Forestry Research Institute of Ghana (FORIG). This largely explains why the local people do not get frequent access to the reserve and thus their low levels of participation in its conservation.

Despite the importance of capacity building in ensuring the success of conservation activities, very little seems to be happening in this regard within the districts studied. Almost half of the local people interviewed, especially those in the Ejisu-Juaben district, had not been taken through any form of training or education to build their capacities and competencies as part of the conservation programme (**Fig. 2**). For those who had been given training, most of it centered on bushfire prevention (23%) and education on the taungya system of agriculture (21%), especially in the Offinso district. These results further demonstrate the lack of commitment on the part of the managers to ensure effective collaboration with the local people. Clearly, the people need to be empowered and well-equipped if they are to play any meaningful roles in managing forest resources.

Problems confronting local communities involved in conservation activities

The results of the study showed that many problems confronted the local people who participated in forest conservation efforts of the districts. The most serious of these problems as captured in this study were lack of logistics, lack of interest on the part of the Forest Service Division officers, various forms of threat and lack of incentives, reported by 34.7, 11.7, 7.3 and 6.7% of all respondents respectively (**Fig. 3**). Other problems faced by the local communities in respect of their participation in forest conservation programmes were overwhelming illegalities, enmnity among family members and friends, saboteurs and unfulfilled promises on the part of forestry officials. Higher number of complaints were received from the local communities in the Atwima district than in any of the two districts.

These problems have the tendency of seriously undermining the effectiveness of any collaborative efforts (Kotey 1998; IDRC 2004) and must be addressed if the desired objectives of such efforts are to be achieved.

Impact of participatory conservation on forest health/quality

The diversity of species has been observed to contribute significantly to ecosystem stability (Hobbs *et al*. 1995) and is thus often used as an indicator of forest health (Parkes *et al*. 2003). Based on this, the Asenanyo Forest Reserve located in the Atwima district could be said to be the most stable or healthiest forest reserve among the three, as it emerged the most diverse with Shannon Diversity Index, H^{l} = 3.445, despite recording the least number of individual trees (**Tables 2** and **3**). The Asenanyo Forest recorded 50 tree species but had *T. scleroxylon* and *Funtumia elastica* (both native although not highly valued) as the most abundant species with relative densities of 6.46 and 6.20%, respectively. The Asufo West Forest Reserve in the Offinso District recorded the highest species richness of 50 diffferent species but was the least diverse (H^{l} = 1.949) and the species were less equitably distributed (E = 0.491). The forest was also dominated by the notorious invader, *Broussonetia papyrifera* (62.70%) and *Triplochiton scleroxylon* (4.04%). There were also fewer number of economic trees (24 species) than comparable areas of the other two forest reserves. The control reserve, Bobiri Forest in the Ejisu-Juaben District was more diverse than the Asufo reserve (H^{l} = 2.782) and dominated by two native species *Celtis mildbraedii* (11.89%) and *F. elastica* (9.55). Its relatively low species richness (46 species) could however be explained by the fact that the area had seen considerable exploitation prior to its strict reservation measures.

Ecosystems with high native species diversity are known to be highly resistant to invasion by exotic species in the absence of covarying extrinsic factors (Naeem *et al*. 2000). The high abundance of *B. papyrifera* (locally known as york) could thus be an indication of loss of resilience of the Asufo West Forest which could be due to excessive logging and other anthropogenic disturbances.

Table 2 Summary characteristics of the three forest reserves surveyed within the selected districts.

Attribute	Asenanyo Reserve (Atwima)	Asufo West Reserve (Offinso)	Bobiri Reserve (Ejisu-Juaben)
Number of individual trees	387	1134	2296
Number of species	50	53	46
Number of families	19	20	18
Number of economic species	37	24	29
Shannon diversity index, H^{l}	3.445	1.949	2.782
Shannon evenness, E	0.881	0.491	0.727

Table 3 List of tree species identified in the three forest reserves sampled in the study districts with their families and relative abundance.

Species	Family	Asenanyo Reserve		Asufo Reserve		Bobiri Reserve	
		Density (№/ha)	Relative density (%)	Density (№/ha)	Relative density (%)	Density (№/ha)	Relative density (%)
Albizia adianthifolia	Fabaceae	-	-	-	-	0.33	0.04
Albizia ferruginea	Fabaceae	1.33	1.03	4.33	1.15	0.33	0.04
Albizia zygia	Fabaceae	3.00	2.33	1.33	0.35	2.74	0.36
Alstonia boonei	Apocynaceae	2.33	1.81	2.00	0.53	7.69	1.00
Amphimas pterocarpoides	Fabaceae	-	-	0.33	0.09	1.92	0.25
Aningeria robusta	Sapotaceae	-	-	1.00	0.26	-	-
Aningeria sp.	Sapotaceae	0.67	0.52	1.00	0.26	0.33	0.04
Antiaris africana	Moraceae	0.67	0.52	2.33	0.62	-	-
Antiaris toxicaria	Moraceae	1.00	0.78	2.67	0.71	5.13	0.67
Baphia nitida	Fabaceae	-	-	-	-	0.64	0.08
Blighia sapida	Sapindaceae	-	-	-	-	18.59	2.43
Blighia unijugatus	Sapindaceae	-	-	6.33	1.67	-	-
Bombax buonopozense	Bombacaceae	-	-	1.67	0.44	-	-
Broussonetia papyrifera	Moraceae	-	-	237	62.70	-	-
Bussea occidentalis	Fabaceae	-	-	-	-	2.26	0.29
Canarium schewinfurthis	Burseraceae	1.00	0.78	-	-	-	-
Carapa procera	Meliaceae	2.00	1.55	-	-	7.69	1.00
Carapa sp.	Meliaceae	1.67	1.29	-	-	-	-
Cedrella odorata	Meliaceae	-	-	2.67	0.71	-	-
Ceiba pentandra	Bombacaceae	3.67	2.84	1.00	0.26	0.33	0.04
Celtis adolfi-friderici	Ulmaceae	3.33	2.84	-	-	5.13	0.67
Celtis mildbreidii	Ulmaceae	20.00	15.50	2.00	0.53	91.03	11.89
Celtis sp.	Ulmaceae	2.00	1.55	5.33	1.41	-	-
Celtis zenkeri	Ulmaceae	1.33	1.03	4.33	1.15	-	-
Chrysophyllum albidum	Sapotaceae	0.33	0.26	0.33	0.09	-	-
Cleistopholis patens	Annonaceae	-	-	0.33	0.09	-	-
Cola nitida	Sterculiaceae	0.33	0.26	-	-	0.64	0.08
Corynanthe pachyceras	Rubiaceae	0.67	0.52	-	-	1.62	0.21
Cylicodiscus gabunensis	Fabaceae	1.37	1.06	-	-	-	-
Daniella ogea	Fabaceae	1.00	0.78	0.33	0.09	-	-
Discoglyprema caloneura	Euphorbiaceae	-	-	-	-	0.64	0.08
Distemonanthus benthamianus	Fabaceae	0.67	0.52	-	-	3.21	0.42
Drypetes floribunda	Euphorbiaceae	1.67	1.29	7.00	1.85	-	-
Drypetes sp.	Euphorbiaceae	-	-	0.67	0.18	-	-
Elaeis guineensis	Arecaceae	0.33	0.26	0.33	0.09	0.33	0.04
Entandophragma angolense	Meliaceae	1.67	1.29	3.00	0.79	30.13	3.94
Entandopgrama candollii	Meliaceae	-	-	-	-	7.05	0.92
Entandophragma cylindricum	Meliaceae	1.33	1.03	-	-	-	-
Erythrophlanus africanum	Fabaceae	0.33	0.26	1.00	0.26	-	-
Fagara viridis	Rutaceae	3.33	2.58	0.33	0.09	-	-
Ficus capensis	Moraceae	-	-	0.33	0.09	-	-
Ficus exasperata	Moraceae	1.67	1.29	12.33	3.26	0.64	0.08
Funtumia elastica	Apocynaceae	8.00	6.20	6.67	1.76	73.08	9.55
Griffonia simplicifolia	Fabaceae	-	-	0.67	0.18	-	-
Guarea cedreta	Meliaceae	1.00	0.78	-	-	25.64	3.35
Hannoa klaineana	Simaroubaceae	1.00	0.78	2.00	0.53	1.92	0.25
Hymenostegia afzelii	Fabaceae	4.33	3.36	-	-	5.13	0.67
Jatropha curcas	Euphorbiaceae	-	-	0.33	0.09	-	-
Khaya ivorensis	Meliaceae	-	-	2.67	0.71	14.10	1.84
Lannea welwitchii	Anacardiaceae	-	-	1.67	0.44	-	-
Mansonia altissima	Sterculiaceae	3.33	2.58	1.00	0.26	28.10	3.68
Melicia excelsa	Moraceae	2.33	1.81	0.33	0.09	0.64	0.08
Microdesmis zenkeri	Pandaceae	7.00	5.43	0.67	0.18	-	-
Monodora tenuifolia	Annonaceae	2.00	1.55	-	-	-	-
Morinda lucida	Rubiaceae	-	-	0.67	0.18	-	-
Morus mesozygia	Moraceae	-	-	o.67	0.18	-	-
Musanga cecropoides	Moraceae	5.67	4.40	2.67	0.71	-	-
Myrianthus arboreus	Moraceae	-	-	-	-	5.77	0.75
Nesogordonia papaverifera	Sterculiaceae	3.33	2.58	2.33	0.62	40.38	5.28
Newbouldia laevis	Bignoniaceae	-	-	3.67	0.97	2.90	0.38
Petersianthus africanus	Lecythidaceae	1.67	1.29	-	-	10.26	1.34
Piptadeniastrus africanum	Fabaceae	1.33	1.03	0.33	0.09	5.77	0.75
Pterygota macrocarpa	Sterculiaceae	2.33	1.81	1.67	0.44	90.38	11.81
Pycnanthus angolensis	Myristicaceae	3.33	2.58	3.33	0.88	2.90	0.38
Rauvolfia vomitoria	Apocynaceae	0.33	0.26	1.33	0.35	1.92	0.25
Ricinodendron heudelotii	Euphorbiaceae	6.33	4.91	6.67	1.76	-	-
Sterculia oblongata	Sterculiaceae	1.00	0.78	1.33	0.35	3.21	0.42
Sterculia rhinopetala	Sterculiaceae	-	-	10.67	2.82	168.59	22.02
Sterculia tragantha	Sterculiaceae	-	-	-	-	2.90	0.38
Strombosia glaucescens	Olacaceae	-	-	-	-	2.56	0.33
Terminalia ivorensis	Combretaceae	1.00	0.78	0.67	0.18	5.13	0.67
Terminalia superba	Combretaceae	3.33	2.58	4.67	1.24	8.97	1.17
Tetrapleura tetraptera	Fabaceae	0.67	0.52	1.67	0.44	-	-
Tieghemella heckelii	Sapotaceae	0.33	0.26	-	-	-	-
Trichilia monadelpha	Meliaceae	2.33	1.81	3.00	0.79	2.90	0.38
Trichilia prieuriana	Meliaceae	-	-	-	-	32.79	4.28
Triplochiton scleroxylon	Sterculiaceae	8.33	6.46	15.33	4.06	41.03	5.36

Not being oblivious of the possible influence of other prevailing factors and the complex dynamics of tropical forest ecosystems (Michon *et al.* 2007), the diverse and quality nature of the Asenanyo reserve could be said to be a reflection of the relatively high level of local communities involvement in forest conservation in the Atwima district compared to the other districts. The roles played by the local people in conservation, including reporting of illegal forest harvesting and other activities, prevention of bush-fires in the reserves, reforestation (planting of seedlings), employment as forest guards and clearing of forest boundaries to prevent encroachment and wildfires (**Fig. 1**) apparently contributed (both directly and indirectly) to the current state of the reserves. This observation is supported by the idea that community participation is central to effective natural resource management (Amanor 2003). When the professional forest manager recognises the local communities as partners in conservation and provides for them the appropriate logistics, incentives, education or training, the local people quickly begin to feel a sense of ownership and would be keen in ensuring that forest resources are sustainably utilized. This will certainly ease pressure on the natural forests and ultimately results in their conservation.

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