International Scholars Journals

Global Journal of Sociology and Anthropology Vol. 8 (12), pp. 001-009, December, 2019. Available online at www.internationalscholarsjournals.org © International Scholars Journals

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Full Length Research Paper

Is participatory forest management (PFM) an asset or liability to local community households adjacent to Arabuko Sokoke Forest, Kenya?

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Accepted 22 February, 2019

The study examined the impact of participatory forest management (PFM) on the wealth of households living adjacent to Arabuko–Sokoke Forest (ASF). The study question was "is PFM an asset or liability to local communities living adjacent to ASF". The study hypothesized that PFM areas have higher household wealth than non-PFM zones. Between 2008 and 2009, questionnaires were used to collect data in PFM and non-PFM zones. Data on wealth parameters were collected. Data was collected up to 5 km from forest hedge along 10 km transects sampling 600 households. The results showed that in the PFM zones, community benefits arising from PFM have translated into improved household wealth. The PFM zones have households who have higher levels of education, food reliability and better housing. The non-PFM zones showed frequencies of households that have no crop field, always have insufficient food, do not own a cow, goat or chicken and have no house or are headed by females. There is need to carry out more studies on the impacts of PFM on gender and household headship. The study concludes that PFM is a critical forest conservation tool that should be implemented in non-PFM zones.

Key words: Participatory, forest, management, household, benefit, cost, Arabuko–Sokoke.

INTRODUCTION

The history of forest reserves in the former colonies is the history of struggle between competing stakeholder groups and present day policies of governments of independent African States (Barrow et al., 2002). Forest reservation took place throughout most of Eastern and Southern Africa regions during the first half of the 20th century in line with the colonial forest policy at the time to ensure a continued supply of hard wood from colonies to support British industry (Barrow et al., 2002). Forest Departments were set up to manage forest reserves to maintain colonial authorities' user rights to valuable timber, and in part to protect important watersheds, ecosystems and habitats (McGregor, 1991).

Local communities and their rights of access and use of forests were not a priority (Barrow et al., 2002) mainly because population densities and pressure on forests at that time was low, and this gave greater latitude for tolerance and compromise. As human population increased, Forest Departments in Kenya and Uganda (Barrow et al., 2002) and Zimbabwe (Matose and Clarke, 1993), used the forest statutes as a means to impose permit based access systems, thereby significantly downgrading local people's customary management systems and rights.

With land and forest pressures increasing, permit based access rights have been compromised, as land is encroached, degraded and cultivated with Forest Department reacting by blaming the encroachers and evicting them, even those who may have had legitimate secure customary rights (Barrow et al., 2002). The governments in Eastern and Southern Africa failed to evict people leading to the realization that co-management approaches that pledge greater role for local communities, the rural and urban poor as well as the private sector in the management of forests is the

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only solution (Barrow et al., 2002).

Collaborative efforts have been referred to as partnerships (Moote, 1996; Williams and Ellefson, 1997; Wondolleck and Yaffee, 1994), consensus groups (Innes 1999) and community-based collaborative (Moote et al., 2000). Collaborative approaches to natural resource management include watershed management (Natural Resources Law Center, 1996), collaborative conservation (Brick et al., 2000; Cestero, 1999), community forestry (Brendler and Carey, 1998), community based conservation (Western and Wright, 1994), community-based ecosystem management (Gray et al., 2001), integrated environmental management (Born and Sonzogni, 1995; Margerum, 1999) and community-based environmental protection (U.S. Environmental Protection Agency, 1997). Specific models have been developed, such as coordinated resource management (Anderson and Baum, 1988; Cleary and Phillippi, 1993), and collaborative learning (Daniels and Walker, 2000).

Warah (2008) defines participatory forest management (PFM) as an arrangement where key stakeholders enter into mutually enforceable agreements that define their respective roles, responsibilities, benefits and authority in the management of defined forest resources. The main objective for PFM in Arabuko-Sokoke forest is to ensure wider local ownership and support for forest conservation. The forest is surrounded on all sides by village communities. There are 51 villages actually bordering the forest and having a population of about 110,000 people represented by some 8,000 households (Gordon and Ayiemba, 2006).

In 1991 the average declared household income in the forest-adjacent community was estimated at KSh 17,300, giving a per capita income of only KSh 1,470 ($20 at current rates) (Mogaka, 1991). By any standards, this is an impoverished community, and it is not surprising that its members have had little concern for the conservation of Arabuko-Sokoke Forest. Instead, the forest has been seen as the source of many of their problems. In 1991, 96% of the farmers were unhappy with the forest, and 54% wanted it completely cleared for settlement (Mogaka, 1991). To reverse the local community animosity towards the forest, PFM was initiated in Arabuko-Sokoke forest.

The Arabuko-Sokoke Forest PFM process started with the development of a management plan developed consultatively by government and civil society organisations. The plan divided the forest into four main forest management zones: (i) Non-extractive zone are areas of forest lying further away from the villages and which are most important for biodiversity and no extraction of forest resources will be allowed. This zone has two sub-zones; biodiversity conservation sub-zone mainly for biodiversity research and ecotourism sub-zone for eco-tourism and conservation awareness rising, (ii) subsistence zone which are areas lying closet to villages and mostly used by villagers for subsistence. This zone has two sub-zones, community use sub-zone for collection of permitted forest products and non timber forest products sub-zone of which more limited range of products may be collected, (iii) commercial zone mainly plantations and (iv) intervention zone which is an area lying outside the forest boundary and consisting mainly private land. The products that constitute subsistence use include: fruits, herbs, honey, butterflies, silk worms, medicinal plants, firewood, grass, poles, wood for carving, timber and local incomes from allowed revenue.

The management options for all the management zones include: studies and research, habitat improvement, eco-tourism development, awareness raising, fuel wood and pole wood harvesting, non-timber forest products and medicinal plants collection and management, tree planting, rehabilitation of degraded areas, carving wood extraction, beekeeping, butterfly farming, mushroom farming, on farm tree nurseries, agro-forestry, education programmes, water resources development and capacity building. All these management options constitute a short list for activities to be implemented under PFM arrangement under the Forest Act of 2005. The PFM implementation is donor depended and delivery around the forest has varied according to donor interests. As a result, some areas have received more attention than others. Where PFM is implemented, focus has been mainly on capacity building and income generating activities targeting wealth creation for improved household livelihoods.

Despite the prominence of strategies linking conservation and development as primary conservation tools, and strong arguments for and against their effectiveness (Wells et al., 1992; Barrett and Arcese, 1995; Oates, 1999; McShane and Wells, 2004), there have been few quantitative comparative assessments of their successes and failures. Previous studies focused on proposals for a range of natural resources management tactics, such as providing appropriate development opportunities (Abbot et al., 2001), emphasizing local community involvement (Western 1994; Getz et al., 1999), adopting shared management (Murphree,1994), ensuring local autonomy (Muller, 2003), guaranteeing rights to harvest (Fearnside, 1989; Browder, 1992), promoting knowledge (Jacobson and McDuff, 1998), awarding direct cash compensation (Ferraro and Kiss, 2002), and encouraging tourism (Honey, 1999) with no focus on the impact of the initiatives on household wealth of forest adjacent dwellers.

Previous studies have also focused on local community dependency on forests (Suda, 1992; Emerton, 1993), the demand for indigenous timber (Rheker, 1992); illegal felling of timber (Emerton, 1995a, 1992f; Marshall and Jenkins, 1994) and forest costs (Emerton, 1995a; Thomson and Ochieng, 1993; Thomson, 1993) which are usually targeted by participatory forest management initiatives.

Scoones (1998) defines sustainable livelihoods

outcomes to take the form of (i) improved well-being and capabilities resulting from reduced poverty due to increased household incomes and (ii) ensured livelihoods sustainability which results to enhance household livelihoods adaptation, vulnerability and resilience due to natural resources base sustainability. PFM is an arrangement where key stakeholders enter into mutually enforceable agreements that define their respective roles, responsibilities, governance, policy, institutional structures, benefits and authority in the management of defined forest resources (Warah, 2008). The main objective for PFM in Arabuko-Sokoke forest is to ensure wider local ownership and support for forest conservation.

The study assessed the impact of PFM on the household wealth of forest adjacent dwellers around Arabuko–Sokoke Forest. The question answered was "is PFM an asset or liability to local communities living adjacent to ASF"?. The hypothesis tested by the study was "PFM areas have higher measures of household wealth than areas without PFM". The assumption of the study was that if PFM has an impact to household wealth, incomes arising from income generating activities that include honey, ecotourism, buttefly farming, mushroom farming and PFM related to employment should translate into improved household status. Therefore instead of measuring actual income from PFM investment, the study measured the household wealth outcomes.

MATERIALS AND METHODS

General method

The study used socio–economic research methods in forestry by Harrison et al. (2002) to collect data on the impact of PFM on household livelihoods. Following Harrison et al. (2002) it was decided that the reference population for interview are the heads of households in the study zones as they are the people who have the experience, knowledge and skills to be able to provide reliable information on the study variables. Questionnaires were developed to cover household wealth measures for households living up to 5 km equidistance from the forest hedge. The questionnaires were administered using personal interview approach which is very good in avoiding nonresponse bias (Harrison et al., 2002). To ensure the questionnaires errors were eliminated, first, five enumerators were identified on the basis of their ability to understand and interpret the contents of the questionnaires written in simple English language. The five enumerators were trained for two days. Each enumerator was given five test questionnaires to administer as a pilot. The questionnaires were then adjusted to ensure clarity on all the questions. The testing of the questionnaires also allowed a reasonable estimation of the time to be taken to administer one questionnaire. It was established that each questionnaire would require two hours.

On the field application of the questionnaires, data on forest benefits and costs were collected following Dosman et al. (2002) who assessed the subsistence use of forest for aboriginal peoples and Adamowicz et al. (2004) who assessed subsistence hunting of the Aboriginal people following Dosman et al. (2002); Emerton (1992f) and Mogaka (1991a) who applied similar techniques to assess subsistence forest uses in Mt Kenya and Aberdares forests in Kenya. Data on PFM impacts on household wealth were collected following Barrett et al. (1995); Brooks et al. (2006); McShane et al. (2004) and Morgan–brown et al. (2009) who used questionnaires and interview methods to assess the conservation efficacy of conservation and development initiatives in different parts of the world.

The sampling frame

Data were collected from 150 households in each of the PFM and non-PFM zones at 1, 2, 3, 4 and 5 km distances from the forest hedge in both the Mixed Forest (MF) and Cynometra woodland (CW) PFM and non-PFM zones leading to a total of 600 questionnaires (Figure 1). Each transect length was 10 km for each of the four study zones.

First, the number of households in the study areas were listed and each given a number. Households were categorised into each of the 1, 2, 3, 4 and 5 km distances from the forest hedge to capture differences in benefits and costs and household perceptions resulting from household distance differences from forest hedge over the 10 km transect length. Second, random sampling was used to randomly pick thirty sample households from each sampling distance making a total of 150 randomly selected households for each of the MF and CW PFM and non-PFM study zones leading to the total of 600 households (Figure 1).

Enumerators visited the households walking from one household to the next to be sampled household. Each head of household was interviewed by a trained enumerator who verbally asked each of the questions in the questionnaire in series. Heads of households who could not understand English were asked in vernacular by the enumerator translating the questions to verbal vernacular translation. Answers were recorded by the enumerator against each of the questions. The heads of households were allowed to engage in discussions and story–telling to better understand the questions as they provided answers. Data were collected between year 2008 and 2009. Where a head of household was found not to be present, the next household not included in the sample was chosen for interview.

Data collection and variables

Enumerators asked households to indicate their measures of wealth. Specific data was collected on: size of crop field (large or small or no crop field or no land), food sufficiency (sufficient, insufficient, occasional, often insufficient or always insufficient), cash crop annum income (US$ > 700 or 400 to 700 or 150 to 400 or < 150), livestock numbers (5 to 20 cows, goats, chicken or 1 to 4 cows, goats or chicken, no cow, no goat or no chicken); level of household education (university, post secondary, secondary to primary or no education); type of house (permanent brick house, metal/tile/wooden wall house, thatched/bamboo house or no house/temporary shed), and household headship (female, male or child headed). Data were analysed using Chi-squired analysis comparing the proportions of household's frequencies within each of the test household wealth variables. Analysis was done at two levels: overall PFM zones and non-PFM zones and PFM and non-PFM zones disaggregated into the MF and CW study zones.

RESULTS

Household wealth and livelihoods status in the PFM and non-PFM zones. The study results showed that ten out of the 32 household wealth parameters have higher

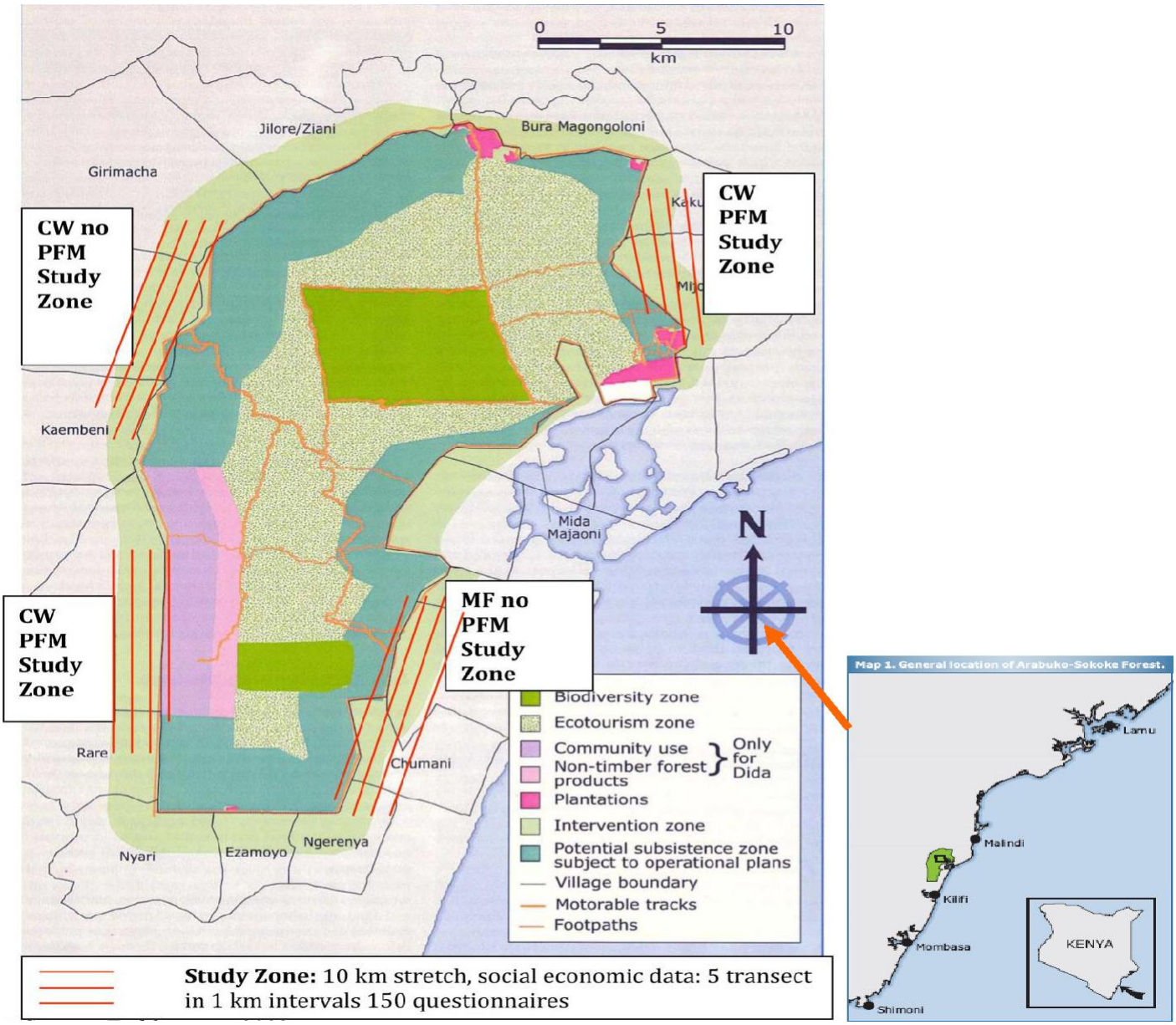

Figure 1..AAmapshowingstudystudylocationlocationanddataandcollectiondatacollectionzonesinzonesMFandinCWMFPFMand andCWnonPFM-PFMandzo**n**eso PFMinArabukozones-SokokeinArabukoForest-.Sokoke Forest.

frequencies of households in the PFM zones than the non-PFM zones. The PFM zones have higher numbers of households who have a large crop field (larger than 5 acres), enough food or occasionally insufficient food, more than 20 goats, and one to four chicken. Also, the PFM zones have higher numbers of households with family members who have schooled at secondary and primary education levels. In this study zone, higher numbers of households than in the non-PFM zone have a metal/tile/wooden walls house (Table 1 and Figure 2).

The non-PFM zones show higher proportions for 18 household wealth parameters. Of these 18 parameters, nine parameters do show that the non-PFM zones have higher proportions of households with cash crop annum incomes greater than US$ 700, cash crop annum income between US$ 150 to 400, cash crop annum income less than US$ 150 but greater than US$ 75. Also, higher proportions of households in the non-PFM zones had five to twenty cows, one to four cows, five to twenty goats, greater than 20 chicken and family members with university education (Table 1 and Figure 2).

The remaining nine wealth parameters are measures of extreme impoverishment that show higher significant chi-squire values in the non-PFM zones than PFM zones. The non-PFM zones have significant chi-squire values indicating higher proportions of numbers of

Table 1. Comparison of chi-squire values for household wealth parameters between the PFM and non-PFM zones categorised by forest and habitat types.

	PFM zones	Non-PFM zones		MF A	MF B	A vs B X_2	CW C	CW D	C vs D X_2
Household wealth parameters	**No. of HHds**	**No. of HHlds**	**X^2**	**No. of HHds**	**No. of HHlds**	**X^2**	**No. of HHds**	**No. of HHlds**	**X^2**
Crop field >5 acres—large	38	9	420.5*	6	9	4.5*	32	0	512*
Crop field <5 acres—small	115	176	1860.5*	44	87	924.5*	71	89	162*
No crop field	93	66	364.5*	87	13	1238*	6	53	1104.5*
No land	2	28	338.0*	1	24	264*	1	4	4.5*
Enough food	9	1	32.0*	1	1	0	8	0	32*
Occasionally insufficient food	104	53	1300.5*	78	9	2380.5*	26	44	162*
Often insufficient food	113	126	84.5*	52	31	220.5*	61	95	578*
Always insufficient food	8	94	3698*	2	91	3960.5*	6	3	4.5*
Cash crop p/a US$ 400-700	0	4	8.0*	0	4	8*	0	0	0
Cash crop p/a US$ 150-400	19	16	4.5*	17	5	72*	2	11	405*
Cash crop p/a <75-150	86	102	128.0*	61	57	8*	25	45	200*
Cash crop p/a US$ 400-700	114	131	144.5*	34	41	24.5*	80	90	50*
No. of cows: 5 to 20	14	26	72*	6	9	4.5*	8	17	40.5*
No. of cows: 1 to 4	53	77	288*	18	41	264.5*	35	36	0.5
No. of cows: None	61	95	578*	9	53	968*	52	42	50*
No. of goats : >20	4	1	4.5*	2	0	2	2	1	0.5
No. of goats: 5 to 20	58	107	1200*	25	53	392*	33	54	220.5*
No. of goats : 1 to 4	89	87	2.0	56	35	220.5*	33	52	180.5*
No. of goats : None	35	44	40.5*	4	28	288*	31	16	112.5*
No. of chicken : >20	6	24	162.0*	4	23	180.5*	2	1	0.5
No. of chicken : 5 to 20	133	137	8.0*	66	72	18*	67	65	2
No. of chicken : 1 to 4	85	75	50.0*	53	19	578*	32	56	288*
No. of chicken :None	5	25	200.0*	0	16	128*	5	9	8*
Female-headed households	10	44	578.0*	8	40	512*	2	4	2
University education	1	7	18.0*	0	7	24.5*	1	0	0.5
Secondary education	31	19	72.0*	24	19	12.5*	7	0	24.5*
Primary education	123	83	800.0*	104	54	1250*	19	29	50*
No education	150	101	1200.0*	74	61	84.5*	76	40	648*
Permanent brick house	15	14	0.5	8	14	18*	7	0	24.5*
Metal/tile/wooden walls house	70	14	1568.0*	40	4	648*	30	10	200*
Thatched/bamboo walled house	179	184	12.5*	106	48	1682*	73	136	1984.5*
No house/temporary shed	2	85	3444.5*	2	84	3362*	0	1	0.5

*=Significant X^2; p = < 0.05; df = 1; PFM = Participatory Forest Management; No. of HHds = Number of households; MFA = MF PFM; MF B = MF no PFM; CW A = CW PFM; CW D = CW no PFM.

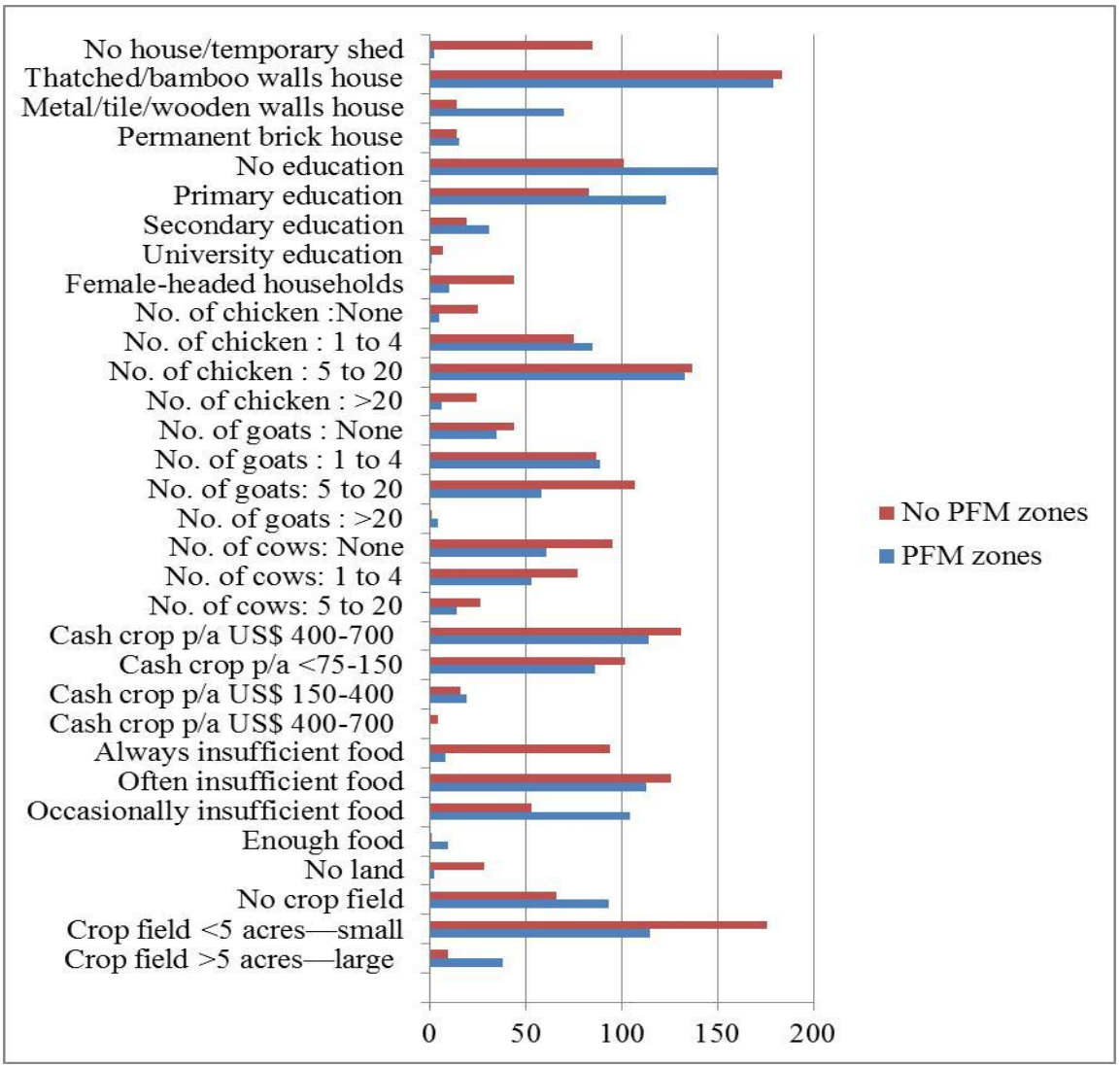

Figure 2. Bar graph showing the number of households (x-axis) for each wealth parameter (y-axis) in the PFM and non-PFM zones in ASF.

households who have small crop fields that are less than 5 acres, households that always have insufficient food, households that do not own a cow, households that do not own a goat, households that do not own any chicken, households headed by females, households that reside in a thatched/bamboo wall house and households without a house or having just a temporary shed (Table 1 and Figure 2).

When the data are disaggregated into MF and CW PFM and non-PFM zones, the results showed both the MF and CW PFM zones have three wealth parameters that show significant chi squire values for higher frequencies of households in the PFM zones. There were higher frequencies of households in the PFM zones that have primary and secondary education and metal/tile/ wooden walls housing. However, six parameters showed higher frequencies of households in both the MF and CW non-PFM zones that had small crop fields, no land, earn cash crop annum income less than US$ 150, had five to twenty cows, goats and no chicken at all (Table 1).

In the MF PFM zone, some twelve parameters showed higher frequencies of households who have: secondary education to primary education, metal/tile/wooden wall houses, thatched/bamboo wall houses, no crop field, occasionally insufficient food, often insufficient food, cash crop annum income of US$ 400 to 700, cash crop annum income of US$ 150 to 400, one to four goats and one to four chicken (Table 1). In the MF non-PFM zone, eighteen household parameters showed significant Chi-square values. Six of these parameters showed significant chi-squire values for households who are female-headed, households who have no house/ temporary shed, households with no goat, households with no cow, households with no chicken and households who always have insufficient food (Table 1).

However, in the MF non-PFM zone there are higher

proportions of numbers of households who; have a large crop, earn cash crop income greater than US$ 700, have five to twenty cows, have one to four cows, have five to twenty goats , and who have greater than twenty chicken (Table 1). The MF non-PFM zone also shows higher proportions of numbers of households with members who have university education and who have permanent brick house. In the CW PFM zone, nine household wealth parameters showed significant chi-squire values for households that have: secondary education, no education, permanent brick house, metal/tile/wooden wall houses, large crop field, insufficient food, no cow and no goat. The CW non-PFM zone showed significant chi-squire values for households who have; no land, no crop field or have a small crop field less than 5 acres often insufficient food and thatched/bamboo walls houses and no chicken (Table 1).

However, significant chi-squire values favour higher household frequencies in the CW non-PFM zone who: have primary education, have cash crop earnings of US$ 400 to 700 and US$ 150 to 400, and also less than US$150. Also households here in the CW non-PFM zone own five to twenty cows, five to twenty and have one to four chicken (Table 1).

DISCUSSION

Previous studies by Matiku et al. (2011); Ngala (2010); Mogaka (1991) showed that resource extraction levels by forest adjacent households was a major threat to the conservation values of the forest. Other studies by Sinclair et al. (2011) showed that supporting school fees for educating children from poor households adjacent to the forest improves household attitudes towards Arabuko-Sokoke Forest. Also, Matiku et al. (2011) showed that households from the PFM zones derive net positive benefits from the forest due to PFM supported nature-based enterprises (beekeeping, butterfly farming, mushroom farming, ecotourism and forest related employment) compared to non-PFM zones where households incurred a net loss. Matiku et al. (2011) showed that households next to the forest receive the most forest benefits. As PFM targets forest adjacent dwellers, households next to the forest in PFM zones thought the forest is an asset to their livelihoods (Matiku et al., 2011).

Chambers and Conway (1992) qualifies a sustainable livelihood to comprise the capabilities, assets (including both material and social resources) and activities required for a means of living. In this study PFM zones had households with higher levels of education, higher food reliability and better housing. This may indicate that PFM related income, which is the main difference with non-PFM zones, has begun to make an impact to the core wealth measures of the forest adjacent households. The non-PFM zones showed households that had higher frequencies of households that have no crop field, have always insufficient food, have no cow, have no goat, have no chicken and have no house or are headed by females.

Other studies by Scoones (1998) indicate that a livelihood is sustainable when it can cope with and recover from stresses and shocks maintain or enhance its capabilities and assets, while not undermining the natural resources base. However separate studies by Matiku et al. (2011) showed higher forest quality in PFM zones than non-PFM zones in Arabuko-Sokoke Forest.

This might imply that unlike the PFM zones, households in the non-PFM zones were impoverished strangling to make ends meet through unsustainable extraction of forest resources. According to Chambers and Conway (1992) the livelihoods depend on four categories of assets: stores: tangible assets including food stocks, gold, jewellery, savings (economic capital). In this study, the PFM zones had households with higher livelihoods status compared to non-PFM zones. Resources: tangible assets including land, water, trees, livestock (environmental capital) which in the case of Arabuko-Sokoke Forest there seems to be little link between measured economic incomes and the tangible assets indicating that PFM incomes seem not to be converted into tangible assets. However, in the PFM zones, there is observable change towards improved quality of living measured by education status, food availability and reliability and housing.

Although, the non-PFM zones showed higher frequencies of households with livestock, there are low levels of educated household members, housing is very poor and food is always insufficient. Matiku et al (2011) found that households in PFM zones are more aware of the significance of the forest to their livelihoods. They also re-invest incomes from nature-based businesses in to household quality enhancement. Households from PFM zones explained butterfly farming, honey harvesting and mushroom farming have helped them generate incomes that they use to pay school fees, food and also to cultivate their farms for food production. Their level of PFM awareness on their livelihoods was therefore very high compared to non-PFM zones where households are still waiting for their turn to receive support for livelihoods improvement to reduce their dependence on the forest.

From a management perspective in a PFM framework, they results may suggest forest managers decisions to initiate PFM in Arabuko-Skooke Forest is not only a benefit to forest conservation and ecosystem services but also an asset to households in line with Millenium Ecosystem Assessment (2005). The forest products that are regulated by PFM within management agreements between households and forest managers in Arabuko-Sokoke forest include: fruits, herbs, honey, butterflies, silk worms, medicinal plants, firewood, grass, poles, wood for carving, timber and local incomes from allowed revenue.

In Arabuko-Sokoke Forest, the household livelihoods ‘sustainability’ aspect is largely depended on PFM

resources becoming available to all households around the forest so as to ensure that forest natural capital resource base is maintained for present and future generations.

Conclusion

The study concluded that PFM is an asset and tool for livelihoods improvement in Arabuko-Sokoke Forest. PFM does seem to reduce the number of households within the abject poverty levels but does not necessarily make local households richer as there seems to be no relationship between PFM investment and wealth storage inform of assets. It is unclear why female headed households are significantly higher in the non-PFM zones than in the PFM zones. However, it is probable that men in those zones are subjected into extreme work conditions trying to meet the demands of their large families to the extend that most of men may succumb or women in the non-PFM zones choose to terminate their marriages due to inability of men to meet the needs of their households. There is need to carry out more studies on the impacts of PFM on gender and household headship.

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