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Table of Contents: Volume 8 Number 5 May, 2016

ARTICLES

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Full Length Research Paper

Have the fishing communities of Zanzibar Island benefited from increasing tourism development?

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This study was conducted at the coastal villages of Kamikazi, Matemwe and Nungi of Zanzibar Island to understand the influence of tourism on the income generating activities of the local fishers along the Coast of Zanzibar Island. The methodology mostly involved face-to-face interviews and structured questionnaires. Results indicate that increasing tourism has impacted fishers twofold: (1) Parts of their fishing grounds were lost through development of tourist infrastructure such as resorts and hotels along the beaches area; (2) Some of the fishing gears were destroyed by tourists during activities such as diving, snorkelling, swimming with dolphins, and boat riding over inshore waters where fishing is actively taking place. Over the past twenty years of tourism development along the coastal villages of Zanzibar Island, the living conditions of the local fishers have remained low. The fact that fishers are partly losing the access to their fishing grounds is more likely to increase poverty among the fishing communities and thereby creating conflicts among the stakeholders. Employment in the tourism sector (resorts/hotels) has not been an option for the fishers because of their low educational background, except for menial jobs. The rapid development of tourism along the coastal villages of Zanzibar Island, while concomitant with a general increase in GNP of the island, has thus not led to an improvement of income generation activities of the local fishers.

Key words: Zanzibar Island, tourist, fishing.

INTRODUCTION

Tourism is currently recognized as one of the biggest and fastest growing global industry (Goessling and Schulz, 2005). It continues to be the largest economic activity and the main source of foreign exchange earnings in many countries (UNWTO, 2013). The world has witnessed rapidly growing tourism in most coastal nations over the last two decades (Wood, 2002). Nature is an important factor for the tourists, and coasts provide possibilities for various nature-based recreational activities such as swimming, surfing, sailing, boating, fishing, diving, and sunbathing (Inglish, 2000; Urbain, 2003; Bodie et al., 2008). With the increase in the number of tourists

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traveling abroad for different purposes, the popularity of the coasts for tourist activities is increasing every year (Hall, 2001; Carter, 2003). According to Choi and Sarakaya (2006) tourism is seen as an effective vehicle for economic development that can bring significant economic benefits to countries, especially for developing economies through economic growth and poverty reduction. Researchers such as Lansing and De Vries (2006), Choi and Sirakaya (2006), Font and Brasser (2002), Shunnaq et al. (2008), and Lordkipanidze et al. (2005) emphasized tourism as an important means for income generation, employment and wealth in many countries. According to Reisinger and Turner (2002a) and Ryan (2003) the beauty of the sea, landscapes and natural resources in the coastal areas attract tourists, who by passing their holidays in these areas, compensate for the stress and boredom of their everyday`s life. However, Choi and Sarakaya (2006) stated that tourism can also contribute to environmental degradation and may lead to negative social and cultural impacts. Tourism development is often followed by diverse conflicts among stakeholders (Boissevain and Selwyn, 2004). Modern tourism is closely linked to the identification and development of a growing number of new destinations. The economic impact of tourism development especially for the coastal communities is seen as important (Loomis and Walsh, 1996; UNWTO, 1999). A new policy regime is required to secure an environmentally sound coastal development and a sustainable utilization of marine resources (Noronha, 2003; Bramwell, 2004). The World Tourism Organization (UNWTO, 2001a) reported that foreign exchange earnings from international tourism reached a peak of US$ 476 billion in 2000, which was larger than the export value of petroleum products, motor vehicles, telecommunications equipment or any other single category of product or service. UNWTO (2009) argues that the economic growth brought through the development of the tourism industry goes hand in hand with an increasing diversification and competition among destinations.

TOURISM DEVELOPMENT AND THE MARINE ENVIRONMENT ON ZANZIBAR ISLAND

The International Ecotourism Society (2004) described the term ecotourism as “responsible travel to natural areas that conserves the environment and improves the well-being of the local people”. Zanzibar is home to large number of beaches, clear sea water, and coral and limestone scarps which provide excellent opportunities for beach and diving tourism. Zanzibar was developed to an attractive destination for foreign visitors after the economy of the island had suffered seriously from a decline in the spice trade. Since there is little scope for industrial development, tourism was seen as an answer to Zanzibar’s population in replacing the clove industry that had been lost mainly to the Asian producers. Zanzibar’s marine environment is characterized by coral reefs suitable for snorkelling and diving, offshore islands with large coral reefs (such as Changuu, Chumbe, Mnemba), big game fish, sea turtles and dolphins; this and the sandy beaches have increasingly attracted tourists (GoZ, 2003).

The government of Zanzibar has developed interest in tourism development in good faith hoping it would strengthen the economic growth and would help to lower poverty on the island. It was in 1985 that the trade liberalization policy advocated diversification of the economy and a greater role for the private sector (Honey, 1999). In the early months of 1986 the government of Zanzibar strongly took effective decision of tourism development along the coast to boost the economic activity. The ‘revolutionary’ government of Zanzibar passed the bill of Tourism Investment Act in 1986 which encouraged mostly foreign investors to come up with their proposals for the development of tourism infrastructure along the coastal villages of Zanzibar (Gössling, 2003). In 1992 the Zanzibar Investment Promotion Agency (ZIPA) and the Zanzibar Commission for Tourism were founded (Thorkildsen, 2006). In the processes of selecting foreign investors to establish tourist resorts along the coastal villages, only very few applications were rejected by the government. This happened before the policy for tourism development had been adopted and from then, the number of international tourists visiting the island has increased steadily (ZEB, 2005). Zanzibar, like many coastal places in developing countries has now developed a tourism policy to address issues such as promotion and marketing, infrastructure and training. The government adopted a national strategy for the ecotourism in 1994 as they believed it to be most suitable to the distinctive nature of Zanzibar and its seascape. The government of Zanzibar further believed that ecotourism should targets high class tourists to enjoy cultural and biological diversity along the coast, to constitute a potential means for sustainable development (Thorkildsen, 2006). However, the ‘normal’ tourism industry was prosperous and the economy of Zanzibar boomed and the number of international tourist arrivals to Zanzibar has continued to increase (Zanzibar Commission for Tourism, 2011). This research aims to understand: (1) what is directly measurable with regards to changes in the life of local fishers due to tourism; (2) how do the local fishers along the coastal villages of Zanzibar perceive these changes. This research relies on both secondary and primary data.

METHODOLOGY

Research area of study

Zanzibar is comprised of two main islands-Unguja and Pemba. The

Figure 1. Map of Unguja Island

islands lie between latitude 04° 50” and 06° 30” South, and between longitude 39° 10” and 39° 50” East. Unguja is the main island and covers an area of 1,666 km^2, while Pemba covers an area of 988 km^2 giving a total land area of 2,654 km^2 (Francis and Bryceson, 2001). The research for this study was conducted in the villages of Kizimkazi located in the southwest of Zanzibar, Matemwe in the northeast and Nungwi in the northern peninsula of Unguja Island (Figure 1). These three coastal villages were selected in consultation with experts at the Institute of Marine Science (IMS) and senior fisheries officials from the Zanzibar Department of Fisheries. The key selection criteria were as follows: firstly, they are the major fishing villages along Unguja; secondly, the development of tourism and recreational activities does not take place equally along the coast and differs from one village to another. The research sites had different numbers of tourist resorts, hotels and tourism-related activities. On Unguja, Nungwi is the most touristic village; it has more than 250 tourist hotels, guesthouses and bangalows. Matemwe Kigomani is the moderate touristic village with 110 tourist hotels, guesthouses and bungalows, while Kizimkazi Kigomani is the least touristically developed village with less than 70 tourist hotels, guesthouses and bungalows along the Coast of Unguja Island.

Interviews

The researcher used different participatory techniques in collecting the primary data in October and February 2011; within these

periods, semi-structured interviews were conducted with local fishers in site with low tourism (n=61) and site with medium tourism (n=59), while site with high tourism (n=50), participant observations at the three sites as well as photographs were taken. The semi-structure interview with the local fishers' is to elicit information on fisheries and tourism development related issues whether the local fishers have benefited from tourism development. The local fishers were asked to list and rank the most important types of income generating activities needed to fulfil their daily livelihood requirement before and after the development of tourism along the coastal villages. The respondents were asked open-ended questions on fisheries activities and tourism development, and their concerns about the future; the interviews takes 25 to 30 min depend on the responds of the interviewees. In-depth interviews were conducted to the official in the Zanzibar Commission of Tourism to investigate the strategy and policy use for the employment of the local fishers' communities in the tourist resort/hotel in the coastal villages of Zanzibar Island. In addition, semi-structured interviews were conducted to the resort/hotel managers/human resource manager to investigate the formality of employment of local fishers communities in the coastal villages, site with low tourism (n=3) and site with medium tourism (n=4), while site with high tourism development (n=6). The researcher held unstructured interviews with key informants in influential positions in the three coastal villages, and these include the local chiefs, teachers, employees of non-profit organizations and volunteers.

Secondary data

The researcher has analysed documents from the Department of Fisheries Development, Commission of Tourism, National Bureau of Statistic as well as information for the library at the Institute of Marine Science and other newspapers with information about the history of fisheries and tourism development in Zanzibar Island.

RESULTS

The study results derived from the interviews are presented on the following six aspects: (1) employment status of local fishers, (2) employment rates of local fishers households 'in tourism sector, (3) income generating activities prior to tourism development and income generating activities after onset of tourism development, (4) perceptions of local fishers on the current households' income, (5) income and expenditure of local fisher households, and (6) perceptions of the local fishers regarding tourism development.

Employment status of the local fishers in the coastal villages of Zanzibar Island

The occupations for the fishers were categorized into four sections in this paper, corresponding to the income generating activities mentioned (Figure 2). Interviews revealed that the majority of interviewed fishers had two types of income generating activities followed by the second high percentage of fishers who have a single type of income generating activity only.

In the study site with low tourism development have 6.71% of local fishers with three types' of income generating activities; while 1.83% of local have four types' of income generating activities. This is mainly because there are a number of sea-going tourism activities such as dolphin tourism and game fishing in contrast to the study site with medium and high tourism development.

Employment rate of local fishers' households in tourism sector

The occupations status of local fishers' households in tourism sector was categorized into four sections. There was a high rate of local fishers' households in the site with medium tourism development employed in the tourist resorts/hotels (Figure 3).

In addition, the site with low tourism development has the highest number 19.70% of local fishers involved Dolphin tour related activities. On the other hand, the site with low tourism has a relatively high number 11.50% from the local fishers' households were involved in tour guide activities. From the site with high tourism development, there is high number 14% of local fishers' households involved in game fishing activities.

Income generating activities before tourism development

The households' income generating activities of the fishers do not differ very much in the study areas. According to the responses of the interviewees, fishing was the main source of income, an activity that has been passed on from one generation to the next. The majority of fishers (57% at site with low tourism; 52% site with medium tourism and 43% site with high tourism) claimed that fishery is the most important activity, providing the highest income (Figure 4).

The next best activity for fishers (31% site with low tourism, 19% of the fishers in site with medium tourism, and 13% of the fishers on site with high tourism) stated that farming follows in importance. Seaweed farming tends to contribute significantly to the households' income of the fisher-folks particularly at the site with medium tourism development. Other activities such rangers, bus conductors contributed less to the households' income of the fishers.

Income generating activities after tourism development

The household's income generating activities varies from one household's to another as well as from one coastal village to another after the introduction of tourism along the coastal villages of Zanzibar. The majority of the fishers in the three sites of the research study indicated that fishing activity is the major source of income (Figure 5) for the local fishers' over the last 20 years, after the

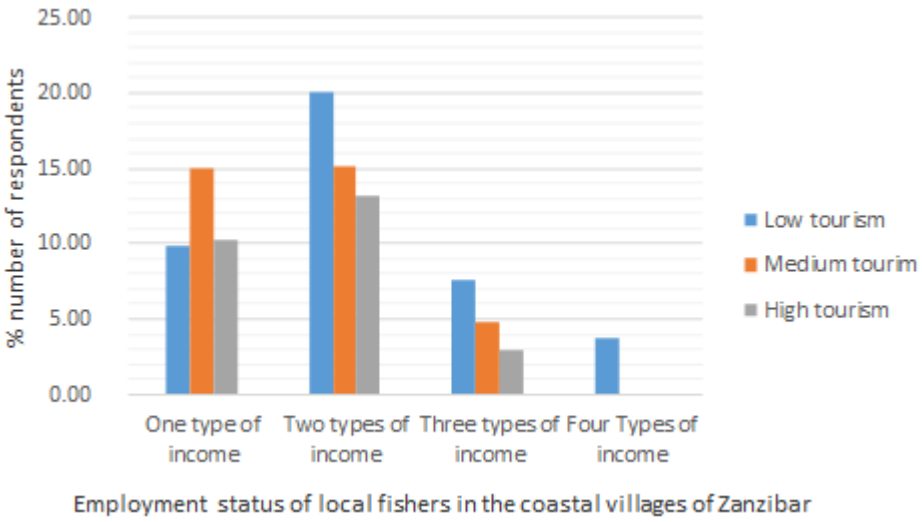

Figure 2. Percentage presentation on the status of employment of local fishers.

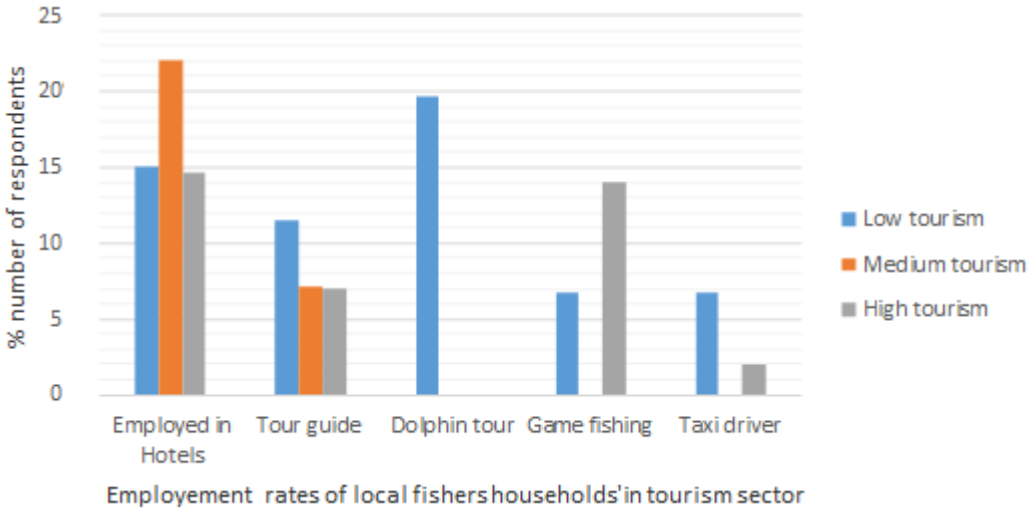

Figure 3. Percentage presentation on the status of employment rate of local fisher's household's in tourism sector.

development of tourism along the coastal villages. This research revealed that at least 57% of the coastal communities of Zanzibar Island were actively engaged in fishing and fish trading.

Seaweed farming is an important income generating activity of the fishers because 39% of the fishers' households in the site with the medium tourism development were participating in seaweed farming. It was noted that the local communities along the coastal villages have diversified sources of their livelihood after the introduction of tourism. Among the diversification of the livelihoods strategy of the fishers' was selling fruits and food which represents 17% at the site with low tourism. The livelihoods activities such as building and painting of houses, shop keeping, saloon dressing developed after the advent of tourism along the coastal villages of Zanzibar but contributes a small percentage to the fishers' household income.

Frequency of fishing activity by the local fishers in the coastal village

The response of the interviewees varied from one fisherman to another as well as from one coastal village to another. It is interested that the site with high tourism

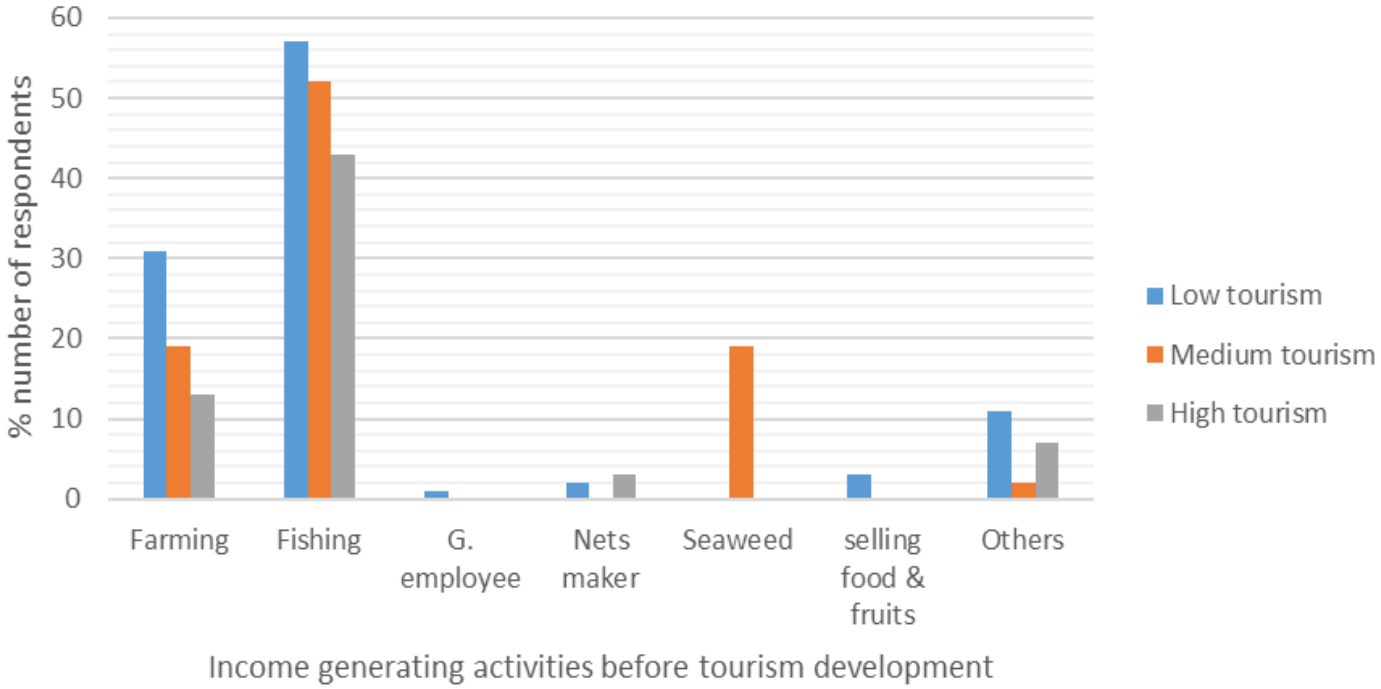

Figure 4. Percentage presentation of households 'income generating activities before tourism development.

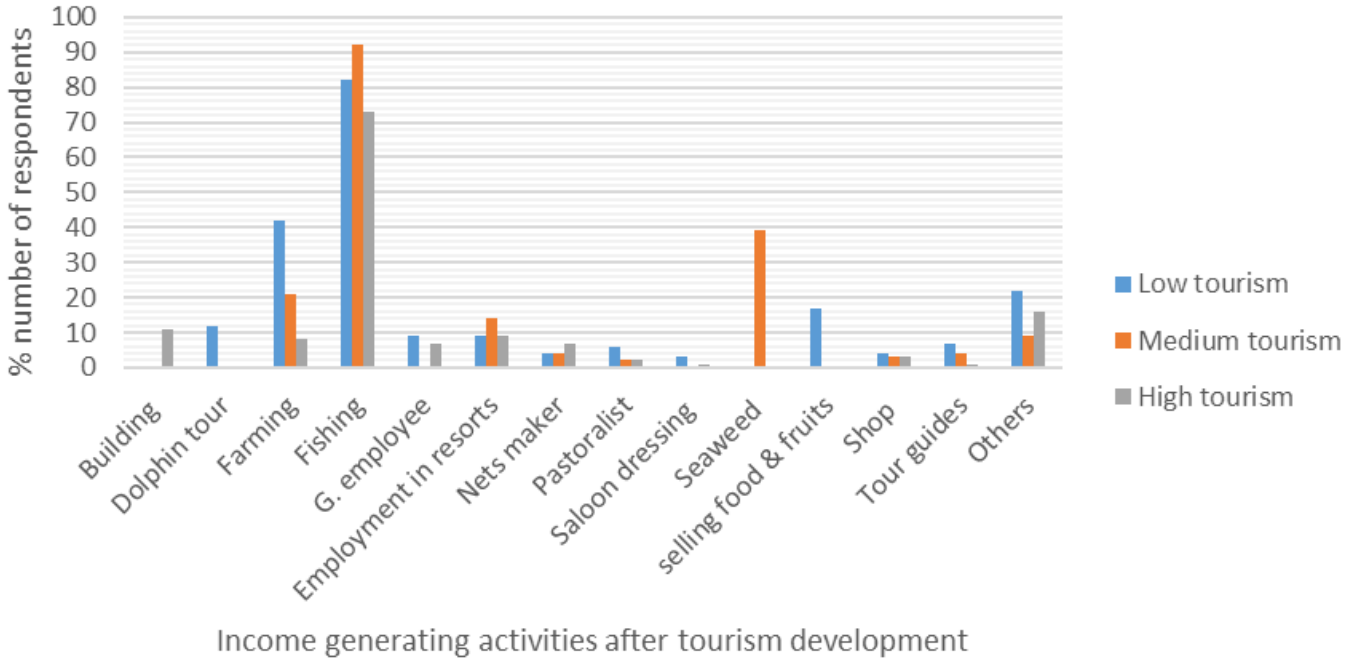

Figure 5. Percentage presentation of household's income after the advent of tourism development.

development has the high percentage (76.0%) of local fishers often going out for fishing everyday; followed by the site with medium tourism development (42.37%) (Figure 6).

The site with low tourism development has a relatively low percentage (39.34%) of local fishers' households going out for fishing every day. The research revealed that a relatively high number of locals in all three sites go

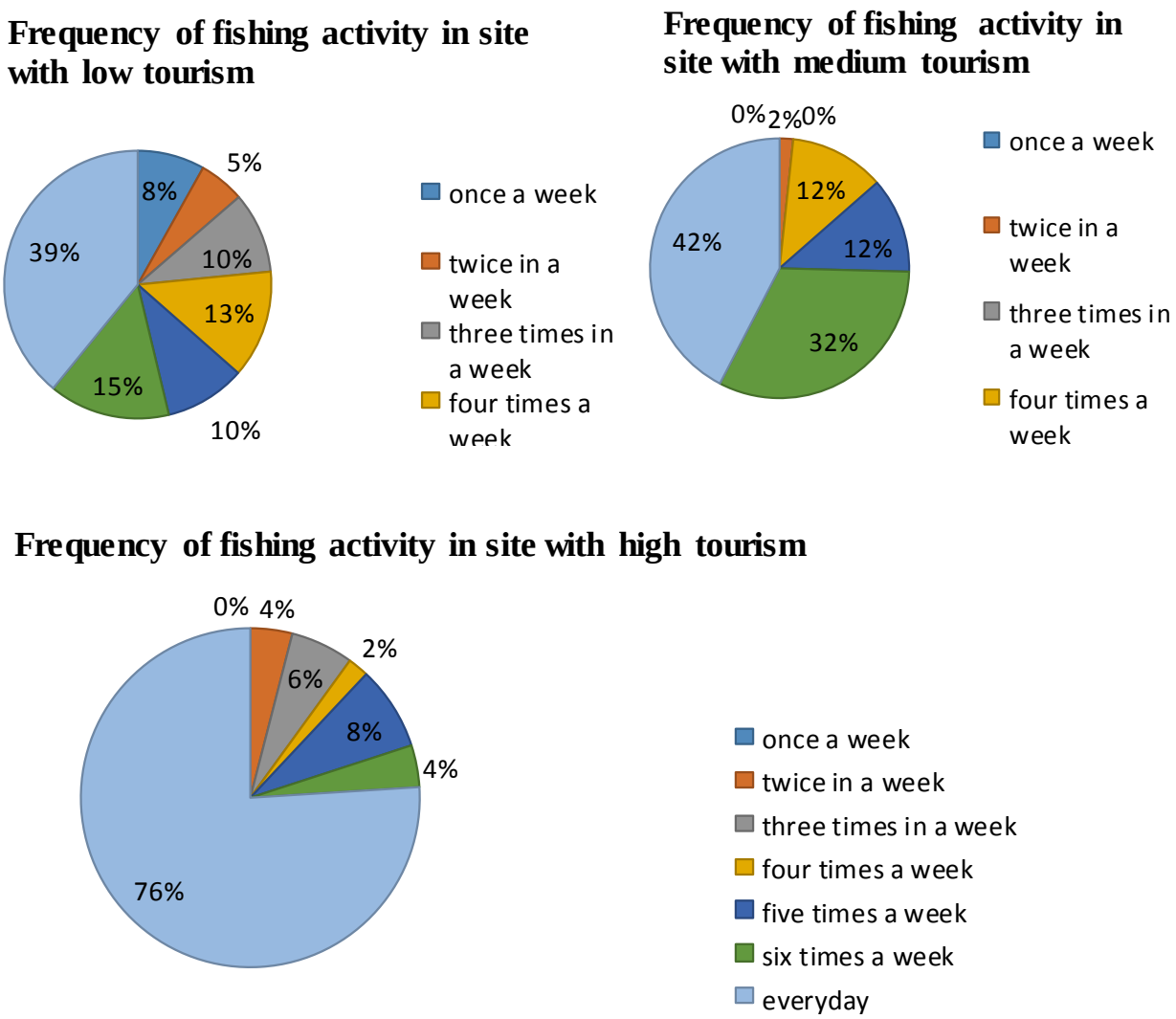

Figure 6. Percentage presentation on the frequency of fishing activity performed by fishers' households.

out for fishing between five and six days in a week.

Perceptions of local fishers on the current households' income

According to the responses from interviews (25% from the site with medium tourism, 34% of the fishers' from the site with high tourism, and 21% of the fishers' in the site with low tourism)–claimed that their household's income has increased after the introduction of tourism (Figure 7).

A smaller number of the fishers in the three sites stated that their household income slightly decreased after the introduction of tourism in the coastal villages. The assumption being made here is that the fishers' monthly income ranges between 100 and 300 US$ per month and this depends on the catches as well as seasonality.

Income and expenditure of local fisher's income

Thus, expenditure of local fisher households was divided broadly into six groups: support family, repair/build new houses, repair/buy new fishing tools, income spend to fund marriage in the family, buy cattle, and 'support other activities'. According to the responses obtained (68% of local fishers in the study site with medium tourism; 64% in the study site of high tourism and 48% of local fishers in the study site with low tourism) claimed that their households income were spent on supporting family members e.g. buying food, paying school fees, medication, and clothing (Figure 8).

The second highest percentage of local fishers' income was spent on repairing and/or buying fishing tools in the three sites of the study. At the same time, the local fishers were found to spend less of their household's

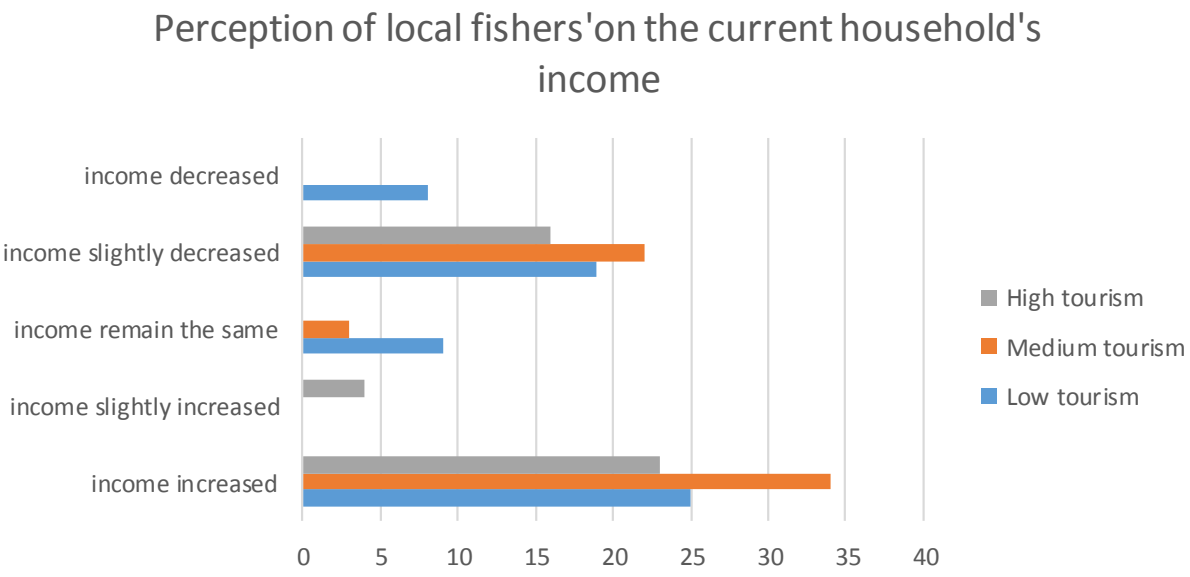

Figure 7. Percentage presentation on the perception of fishers on current households income.

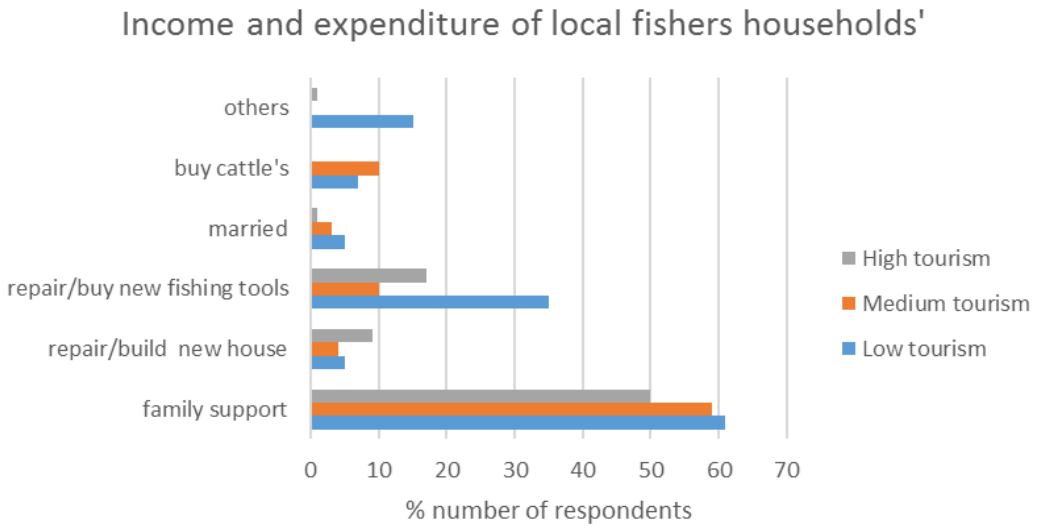

Figure 8. Percentage presentation on the income and expenditure of local fisher households' income.

income on repairing and/or building of new houses, for wedding purposes as well as buying cattle's. Twelve percent (12%) of the households' income in the study with low tourism were spent on buying other items, such as bicycles, mobile phones, cigarettes and alcohol.

Perceptions of the local fishers regarding tourism development

The local fishers were asked about the kind of activities tourists conduct in the each of the coastal villages, and whether tourists' activities have forced the local fishers to abandon their respective fishing ground along the coastal villages. Local fishers perceived that tourism related activities such as diving and snorkelling, boat riding, and dolphin tourism, have negatively influenced their fishing activities, which in turn have negatively impacted fishers households' income generating activity. Photo 1 shows tourist activities in the coastal villages of the study.

The majority (62.3, 98.31, and 66% in low, medium, and high impact tourism sites) of the fishers interviewed perceived facing severe restrictions from accessing their ancestors fishing grounds in Mnemba Island and

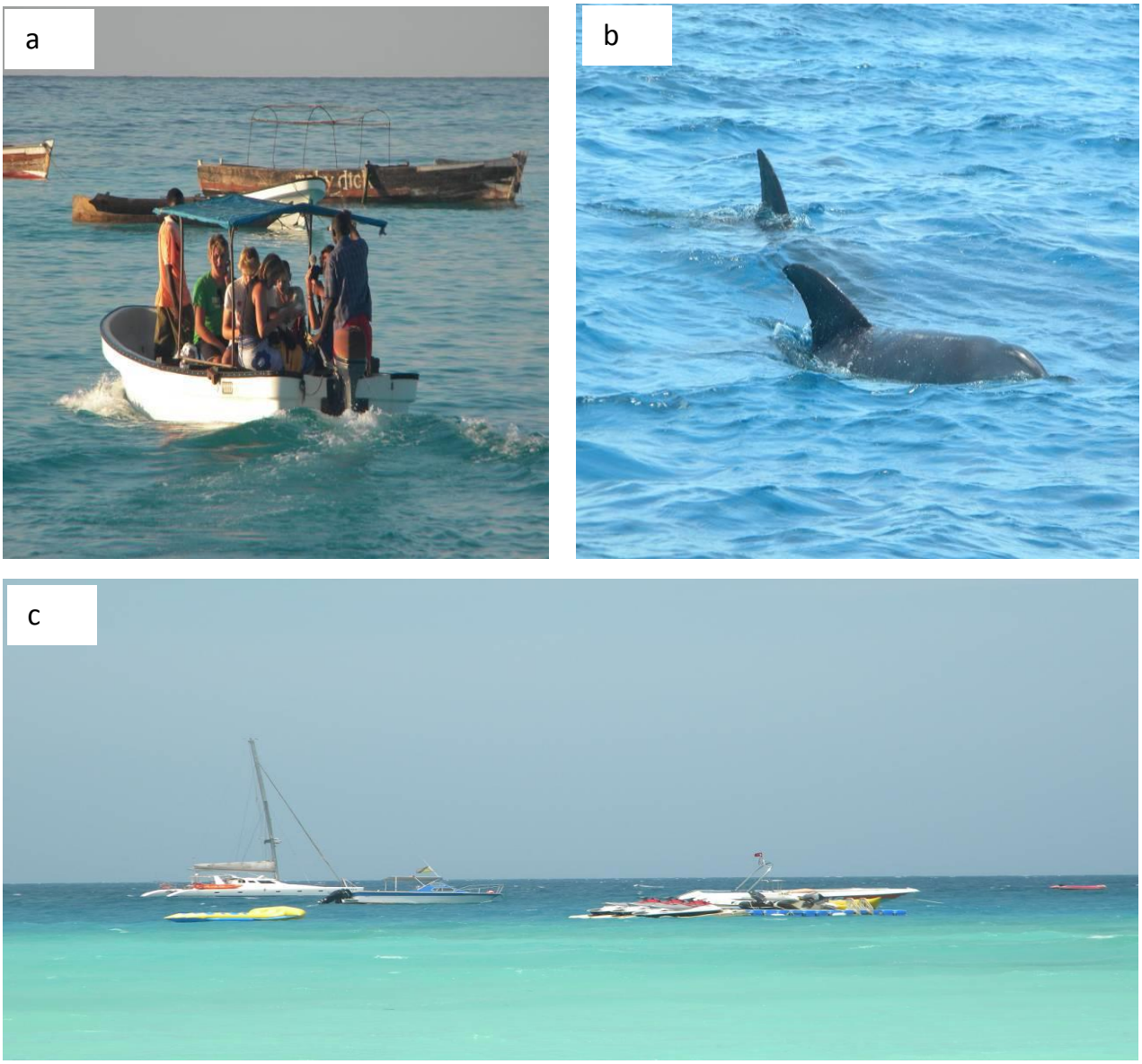

Photo 1. (a) and (c) boat riding activities in the coastal village of Zanzibar Island site with high tourism; (b) ecotourism activities in site with low tourism (Photo taken: John Sebit Benansio).

Kichwani after the introduction of tourism development. The local fishers reported that various tourists activities destroyed their fishing gears (such as nets or basket traps) and free the fish that were caught (Figure 9).

The local fishers were allowed to park their fishing crafts/canoes at least 200 m away from the tourist resorts and hotels. Moreover, the local fishers in the study site with low tourism revealed that there is a high competition between the tourists and the local fishers for fishing grounds. The tourists wanted to swim with the dolphins, while the fishermen want to catch fish. The tourist activities in the sea, particularly in the study site with low tourism, have caused conflicts with boat drivers who are used to take tourists into their fishing grounds.

DISCUSSION

Employment status of the local fishers in the coastal villages of Zanzibar Island

The income of local fishing households in the coastal villages of Zanzibar are affected greatly by types and the multiplicity of income generating activities, and other assets such as fishing boats, boat engines, fishing gears. The local fishers' communities prefer going to the sea for fishing rather than to get employment in the resorts/hotels because of the poor payment in the tourist resorts/hotels. The majority of local fishers in the coastal village had opportunity of joining tourism related activities such as

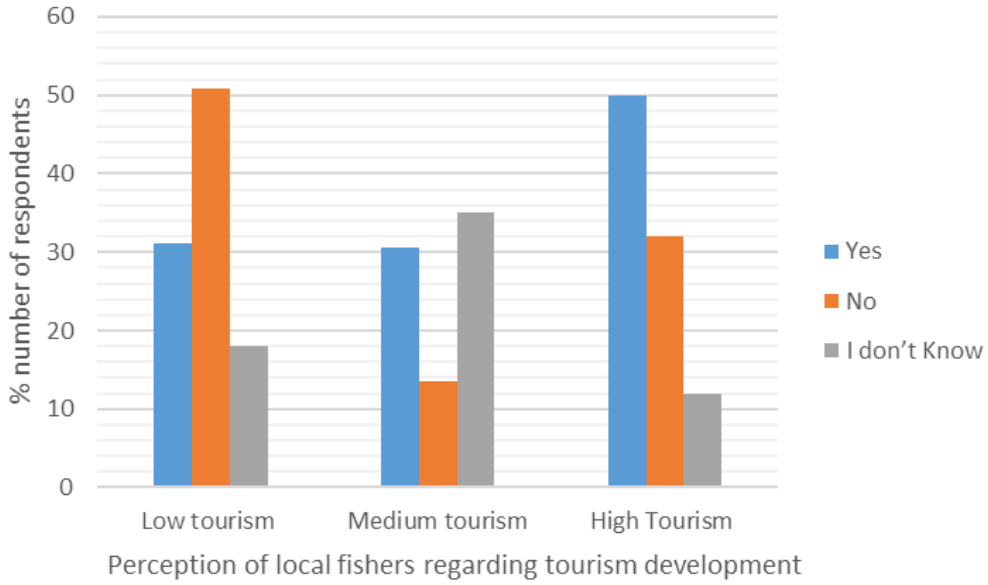

Figure 9. Perceptions of local fishers regarding tourism development.

dolphin tour, sporting and tours guides. Employment in fisheries is likely to stabilize or decrease due to combinations of labour substitution by technological change and management measures to reduce over-capacity in the sector (World Fish Centre, 2011). In turn, the socio-economic status of local fishers in the coastal villages of Zanzibar is based on the fisheries productivity (Sesabo and Tol, 2005; Jayaweera, 2010).

Households income generating activities general patterns

Employment rate of local fishers' households in tourism sector

This research revealed that less than 15% of local fisher households in the coastal villages were employed in resorts/hotels at the low positions such as cleaner, gardener, security guard, cooks and laundry services. The local fishers in the coastal villages of Zanzibar Island have never depended on single source of income generating activities; however the advent of tourism development have benefited a few local fishers' households in the coastal villages. Future emphasis should focuses on the review of the current policy regime to improve the working conditions of the local people as well as payment systems in the tourist resorts and hotels. Mill and Marrison (1999) and Edgell (1999) revealed that tourism increased the chances of employment and hence development of income generating activities. McIntyre (1993) describes that the hosting communities received different kinds of benefits from tourism, which lead to an improved quality of life for residents. Findings of this research confirm those reported by Lange and Jiddawi (2009) who showed that the local communities along the coast of Zanzibar receive only 20% of income from tourism, while 80 percent of income from tourism related sector goes to stakeholders outside local communities. Gossling (2003) revealed that 50% of local communities participate in tourism related activity in the coastal village of Kiwengwa. On the other hand, research conducted by Jayaweera (2010) stated that there is a low participation of local communities in tourism related activities in the coastal villages of Zanzibar Island; higher participation of local communities' households in tourism related activities were found in the coastal village with low tourism development. Researchers (Gossling, 2003; Lange and Jiddawi, 2009) underlined lack of language proficiency, low literacy rates and low skills of local communities to have greatly contributed to low participation of local communities in tourism related activity. Schilcher (2007) argued that instead of aiming at job creation in tourism related activities, policies should focus on improving incomes and working conditions of the local communities.

Fisheries

Discussion with local fishers in the coastal villages argues that the reason behind fishing being the main occupation in the coastal villages of Zanzibar Island was due to lack of land suitability for farming. On the other hand, the low level of income generating activities in the coastal villages has greatly contributed to the increase in the number of the local fishers. This research study concluded that the introduction of tourism along the coastal villages of Zanzibar Island has nothing to do with the steadily increase in the number of local fishers, since

fishing as an activity in the Western Indian Ocean has a long history. Feidi (2005) states that the majority of the coastal communities in Zanzibar Island were poor to an extent that they cannot afford to purchase modern fishing inputs. For instance the author of this research noted that there is a high number of students dropping out from school, especially the adolescent. This high rate was caused by lacking financial support for education because most parents in the coastal villages of Zanzibar Island were poor.

Frequency of fishing activities performed by the local fishers

Fishing is arguably one of the hardest types of occupations in the world based on own experience, and the researcher twice joined the fishing expedition with local fishers' in the coastal village to gain firsthand experience. "Our people are used to freedom. You go to work when you want in the morning; you come back home when you want. Some people put in a certain number of hours every day. Some people put in more. But you don't have to punch a time clock. You are your own man. On the other hand, that requires a certain something about a person, because occasionally we see somebody who will need to work under a boss and who does not have the whatever-it-takes to carry on his business" (Ellis, 1986: 109). The fishermen like to fish because they think that they are the "boss for themselves" working independently, even for the captains who don't own fishing crafts or the crews that work for the owner or the captain of the boats. The present study revealed that fishing effort along the coastal villages of Zanzibar Island has increased. Local fishers have intensified the frequency of fishing activity due to high demand of fish and seafood in the tourism resorts/hotels along the coastal villages. It is also interesting that the division of fishing labor in the coastal villages of Zanzibar Island varies from one coastal village to another. For instance, in the coastal village with low tourism development, fishing labor is divided in three categories. The first group often goes out for fishing very early in the morning at around 4:30 to 5:30am and the catches from this group of local fishers reaches at the landing site/auctioning centers' at 11:00 to 12:00pm. The second group of local fishers' often goes out for fishing in the afternoon between 12:00 and 2:00pm, and their catch reaches at the landing site/auctioning centers 'at around 5:00 to 6:00pm. Most of the catch landed in the evening was sold to the women fish trader in the coastal villages. The third group of local fishers usually goes out for fishing in the evening between 5:30 and 6:30pm and the catch for this group of local fishers' reaches at the landing sites/auctioning very early in the morning at around 4:30 to 5:30 am for marketing. The author of the research noted that the second group of local fishers was the most dangerous as most of group were young that joined fishing business recently with continues development of tourism in the coastal villages of Zanzibar Island. This group of youth was observed to use the most destructive fishing gears to catch as much fish, because of the high demand in the tourist resorts/hotels. The local communities in the coastal villages of Zanzibar Island name this category of young local fishers as "grouping fishing" because they often go out for fishing in large number range between 13 and 20 per fishing boat. Once this group of young fishers reached the respective fishing ground, they will set their fishing nets, and then afterward, all of them will go down diving chasing the fish in the direction where they have set their nets. These findings confirm what Jiddawi and Öhman (2002) found that, after the introduction of tourism development in the 1990s along the coastal villages of Zanzibar, the local fishers were highly motivated to concentrate particularly on demersal fish species such as snappers, groupers, emperors, parrotfish as their prices were relatively high and this has greatly contributed to the decline of catch per unit effort as well as fish sizes.

Perceptions of local fishers on the current households' income

An increase of the household income of local fishers depends on the fishing inputs such as canoes/boat, nets, engine. The author of this research noted that the income earned by local fishers per trip varies according to season and the number and quality of nets used. The majority of local fishers along the coastal villages of Zanzibar Island often perform their fishing activities between 24 and 28 days in a month. Therefore, improvement of the income generating activities of local fishers is often seen as a central objective of fisheries management programmes, especially in developing countries (Lawson, 1984). The majority of local fishers' households in the study sites often borrow money to meet their expenditure in the lean season for buying food and other necessary households' items. The main reason for indebtedness of local fishers' in the coastal villages depends on their income and expenditure pattern. According to DoF (2010) there is a rapid increase in the number of fishers'; the increases have affected the marine fisheries resources, and the income of fishers along the coastal villages of Zanzibar Island. Katikiro (2009) stated that the decline of environmental factors was said to be mostly caused by uncontrolled utilization of marine and coastal resources due to destructive fishing methods.

Income and expenditure of local fisher household income

The income and expenditure of households varies, depending on how large or small the households of local

fishers in the Island are. The local fishers' households that do not own fishing craft/gears kept on borrowing money from his master that owned fishing craft/gears to meet their household's expenditures such as buying of food, school fees, health and clothes in the lean season from the period of April to October. The local fishers will refund the money borrowed to his master in the peak season from the period of November to February. Local fishers also received regular income as a share from the owners of the fishing crafts/canoes. These findings are in line with those of Crona et al. (2010), Platteau et al. (1992) and Russel (1987). The wholesalers/fish retailers are the major providers to local fishers with the capital on credit basis. The credit is extended as a means of securing priority access to products once harvested insuring a steady supply of goods. Crona et al. (2010) revealed that the relationships between local fishers and wholesalers/fish retailers become stronger through such loans for small-scale fisheries. Russel (1987) divided credit into two types; the first is the capital extensions for investment in the production process in fisheries, including financial support for investing in new and/or repairing of gears. The second type of credit constitute smaller amounts of capital recurrently issued as credit over extended periods of time, used to cover basic alimentary needs during the period of low income.

Perceptions of the local fishers regarding tourism development

Increased of tourism development along the Zanzibar Island has led to a sparing of coastal areas for touristic activities, through by which fishermen have lost access to parts of their traditional fishing grounds. As a consequence fisheries catches have declined and fishermen are being forced into alternative income generating activities for satisfying their daily needs. The investors used the beach areas to develop the infrastructures of tourist resorts/hotels and the local fishers' faced serious restriction from accessing their fishing ground after the introduction of tourism and a good example for that is the Mnemba Island. According to Ali and Juma (2003), cited in Zanzibar Coastal Resources (2009), the advent of tourism development over the last 20 year was believed to be a wide-ranging issue contributing to both positive and negative impacts on the local community. Chachage (2000) cited in Zanzibar Coastal Resources (2009) revealed that the local fishers are losing access to the beaches, sea and other natural resources for their socioeconomic activity after the introduction of tourism development. Ap (1992) stated that it is important to understand the perceptions of local community in the first stage of tourism development, as this is considered to be the most significant aspect in planning and policy considerations for successful tourism development. According to Cooke (1982), the perceptions of the host community towards tourism are more favorably when the local community perceived they were able to influence decisions and outcomes related to development. Mowforth and Munt (2003) describe how local communities in Third World countries were exploited with only little means of control available for them to steer the direction of tourism development in their regions. According to Lange and Jiddawi (2009) states that lack of language proficiency greatly contributed to the limited number of young people working in tourist resorts/hotels along the coast of Zanzibar.

Conclusions

The introduction of tourism along the coast of Zanzibar Island has both positive and negative impacts on the activities of the local fishing households. The development of new tourism infrastructure such as construction/building of new resorts/hotels on the beaches area has restricted of local fishers accessing their respective fishing grounds had affected the income generating activities of their households. The living conditions of local fishers along the coastal villages of Zanzibar Island remain poor with almost no changes over the past twenty years of introduction of tourism development. Although the introduction of tourism has diversified the livelihoods of local fishers, the participation of local fishers' households in ecotourism and tourism related activities were less significant as a results of poor educational background for the majority of local fishers' households. In addition, the advent of tourism development in the coastal village has benefited the local fishers' as their households' income because of new market been created by for fish and seafood high in the resorts/hotels. The new market created after the development of tourism in the coastal villages has encouraged many households in the rural areas of Zanzibar to venture into the business of fishery industry. The increases of rural communities from the coastal villages in the business of fishery industry are likely to accelerate overfishing in the near future.

Conflict of Interests

The authors have not declared any conflict of interests.

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Scaling out control of banana xanthomonas wilt from community to regional level: A case from Uganda's largest banana growing region

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Banana xanthomonas wilt (BXW) has been successfully controlled in major banana growing areas between 2005 and 2008. This was due to combined use of participatory approaches for mobilising technology users such as farmer field schools and Integrated Agricultural Research for development (IAR4D) using cultural practices. However, the approaches focussed on small communities of about 30 to 300 farmers. Between 2010 and 2012, BXW prevalence in the region increased to 34 and 45%. In 2012, the strategy for BXW control changed from approaches that target technology users at community (village level) to those that target many technology users at regional level. Then the action plans of districts and sub-counties were designed to achieve the goal of the regional action plan rather than support action plans of a community. The overall implementation of the regional plan was spearheaded and coordinated by the regional taskforce, instituted by regional stakeholders. BXW prevalence reduced from about 45% in June 2012 to about 13% in September, 2013, with banana production recovery of 40% from the peak of BXW epidemic in all the 10 districts of the Ankole region. The approaches used have been described in this paper to hopefully contribute to scale out BXW control to other main banana growing areas in Uganda and beyond.

Key words: Banana, BXW, participatory approaches, scale-out.

INTRODUCTION

Many large investments in research and development aim to achieve high rates of adoption but without strategy for encouraging the desired levels of adoption (Millar and Connell, 2010). Consequently, there are poor investment returns and unsatisfactory benefits. Furthermore, agricultural scientists and development specialists often face difficulties in moving beyond demonstrating technologies with farmers on a small scale, to ensure livelihood impacts across larger numbers of households, villages and districts (Snapp and Heong, 2003). It is often believed that if technologies prove useful to farmers, then their diffusion would occur naturally through peers, family members or farmer associations, but does not always happen for complex technologies.

Attempts to scale out complex or risky technologies have resulted in social inequities, environmental degradation, loss of cultural connections and low farmer adoption (Fujisaka, 1994; Walters et al., 1999; Cary et al.,

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2002; Kiptot et al., 2007). A range of case studies reported factors that favour successful scale out of technologies including, clear and tangible benefits for farmers, strong leadership, peer learning, support from officials and donors, availability of credit and security of land tenure, a strong civil society, socio-economic and cultural diversity across communities or areas, the quality of community participation, communication between development partners, and enabling government policies and resources (Gundel et al., 2001; Kolavalli and Kerr, 2002; World Bank, 2003; Gillespie, 2004; IIRR, 2000). If research scientists and extension workers are working towards scaling out useful technologies, they need to have a sound understanding of how farmers learn, how they experiment and innovate, and how local decisions are made in the family and social structures (Scoones and Thompson, 1994; Cary et al., 2002; Pannell et al., 2006).

All the aforementioned are made possible through use of participatory approaches in community mobilisation for participation in a development initiative such as control of banana xanthomonas wilt (BXW) (Bessette, 2004). The key elements of participatory approaches include getting communities together, facilitating them to formulate and implement action plans, mobilizing political and other leaders to support community efforts and ensuring their effective monitoring and evaluation (Kubiriba and Tushemereirwe, 2014). It was possible to control BXW to below 5% in major banana growing areas in Uganda for more than 3 years and more than 90% of the farmers participating in farmer field schools (FFS) controlled in their fields and their communities (Kubiriba et al., 2012a). The efforts, however, focused on small disease pockets in communities of about 100 to 300 farmers or farmers' groups of about 30 farmers. It was not clear whether the same level and kind of institutional support and capacity building within and across participating organizations and their networks, farmer organisation and participation would still deliver similar or higher successful control of BXW at higher epidemic levels on many banana fields across ten districts. Yet, BXW prevalence increased to such levels of 34 and 45% in the whole South-western banana growing region of Uganda between 2010 and 2012, where more than 60% of Uganda's bananas are produced.

This paper describes the adjustments made in the approaches used to organise the various organisations to participate, build capacity for the players for BXW control, legislative support, monitoring and evaluating the activities and effectively communicating the successes to enable effective BXW control beyond the small pockets to a regional scale.

The scale out process

The following detailed activities are aligned to the principles of participatory approaches for technology promotion, that is a process of collective analysis, learning and action. The activities vividly bring out issues of shared understanding of the problems, priorities, agreement on achievable, sustainable change and action, capacity building and empowerment for local stakeholders to solve their own problem as shown in Table 1.

A stakeholders' meeting

A meeting of stakeholders from the 10 districts of Ankole sub-region was held in June, 2012 in Mbarara. Participants included the technical wing (District National Agricultural Advisory services (NAADS) Coordinators, District Agricultural Officers and District Production and Marketing Coordinators); political wing (Local Council V (LCV) Chairpersons, Secretary for production for the district) and administrative wing (Resident District Commissioner (RDC), Chief Administrative Officer). The most severely affected sub-counties in each of the 10 districts were represented by their Local Council III (LCIII) Chairperson, Chief and NAADS Coordinator. Farmers' representatives, Zonal NAADS Coordinator and Zonal Agricultural Research and Development Institutes (ZARDI) and National Agricultural Research Organisation (NARO)'s National Banana Research Programme also participated.

The stakeholders reviewed district action plans for BXW control and discussed the implementation modalities. The stakeholders identified the elements of success in the district reports. They included formulation and implementation of by-laws by sub-county chiefs to compel non-compliant farmers to control BXW; involvement of multi-sectoral stakeholders for mobilization and sensitization of communities; community based surveillance persons/extension workers. Challenges identified were politicization of the enforcement of by-laws and need to use non-elected chiefs to enforce by-laws; limited numbers of extension staff and need for training trainers; limited resources to control the disease; need to mobilize other players, for example, NAADS to support BXW control. The review of district action plans was reinforced with experiences shared by the farmers and sub-county leadership of Mwizi, Mbarara District in a field visit. BXW had been effectively controlled in a whole parish of Rubagano of Mwizi sub-county using a combination of farmer field schools and sub-county byelaws. BXW had been eradicated from this parish for over 5 years. The shared experiences were used to formulate a model district action that formed basis for improvement of existing district action plans.

A regional multi-stakeholder platform was established during the meeting. The platform was chaired by the RDC, Mbarara, with membership representative of Zonal NAADS; MBAZARDI; MAAIF; NARO; star-performing farmers, sub-county chief, 2 DAOs and Chairperson LCIII. The terms of reference for the platform (Table 2) became the action plan for the Ankole region covering 10 districts. The goal for regional action plan was to reduce BXW prevalence to below 0.1% from 45% in 18 months. The elected political leaders on the platform were given the role of spearheading mobilisation of farmers, also their voters, for the control of BXW. The technical wing (NAADS, extension and research staff were given a role of effectively delivering technical information for BXW control and the administrative wing the role of supervising the technical staff and mainstreaming BXW control district and sub-county action plans in their respective development programmes. Other platforms for BXW control were established at the district comprising of Chairman LCV, Production secretary, NAADS Coordinator, District Agricultural Officer and at sub-county level comprising of LCIII Chairman, Production secretary, NAADS Coordinator, Chief and 5 councillors and at village level comprising of farmers and opinion leaders.

Demonstration of successful control of BXW on hotspots

Hotspots (the most affected villages) were selected in the most

Table 1. Alignment of activities with process of participatory approaches.

Stage	Activities
Collective assessment of the problem	A stakeholders' meeting; (i) Most players in the banana industry in the region participated; (ii) Agreement that BXW is a problem that needs urgent collective control, (iii) Shared experiences on BXW control in meeting and in field
Design of action plan to tackle the problem drawing from experiences of the community	(i) Action plan developed in the meeting using best practices and shunning bad practices of BXW control from the similar communities
Collective implementation of the Action plan	(i) Platform for implementation of BXW in region also agreed in the meeting (ii) Capacity building for stakeholder to implement a collective action plan through BXW control demonstration on hotspots and training of local government staff. (iii) Scale out activities; Field days, BXW control campaigns, information dissemination
Participatory monitoring of the action plan	Participatory monitoring evaluation where all stakeholders are able to track achievement of targets set collectively and gain confidence from observed positive change

Table 2. Regional strategy for the Ankole region.

Output	Activity
Coordinate the formulation of districts' action plans and implementation	(i) Each district ensuring that their work plans are completed and ready for implementation; (ii) Implementing the work plans; (iii) Review the work plans and level of implementation.
Creating communities of good practice in most affected Sub counties	(i) Identification of the worst hit areas (sub counties /hot spots) in the different districts; (ii) Mobilization and sensitization of relevant actors for BXW control; (iii) BXW management activities implemented in all the hot spots; (iv) Task forces formed in the hot spots and trained to follow up with communities on BXW management; (v) Up scaling of BXW control activities to the neighbouring communities.
Systems of picking new information very quickly and reporting it	(i) Creating a community based surveillance system in all sub counties that reports on the BXW status and level of control.
Dissemination of information and training at regional basis	(i) Conducting field days at the sub county level; (ii) Farmer tour/ exchange visits; (iii) Conducting radio talk shows at least once a month.
Inter district / government cooperation in BBW control e.g. quarantine	(i) Formation of BXW control regional team (Task force); (ii) Establishing the BXW level at various districts Conducting review workshops to review the level of implementation
Monitoring and evaluation of control activities	(i) Reports on progress of implementing BBW control activities; (ii) Technical staffs (SPs and other extension staff(s)) compiling monthly reports from various sub counties for the district; (iii) Quarterly review reports from the districts; (iv) Semi- annual reviews; (v) Spot visits by the regional team

Goal: Reduce BXW in affected farms from 50 to 0.1% by Dec 2013.

affected sub-counties in each of the 10 districts during the regional stakeholders' meeting described. A hotspot was a LCI village, comprising of about 300 households, where all the banana fields were affected by BXW. The regional platform members, the district teams (Production secretary, NAADS Coordinator, District Agricultural Officer) and sub-county teams (Production secretary, NAADS Coordinator, Chief) moved together to the selected hotspots. The meeting at the hotspots had been aggressively mobilized by the sub-county teams with an aim of getting most of the farmers in the village to attend. During the meeting, the BXW problem (identification, means of spread and control practices) was described by the farmers. The visiting team members only filled the missing gaps. The visiting teams also shared the experience of successful and unsuccessful control of BXW in other banana growing areas. The discussions informed the farmers' decisions made to effectively control BXW from their fields. These farmers' decisions were then crystallized in a community action plan for BXW control, complete with time lines and a monitoring and evaluation framework. Task forces were established in each of the 10 host spots to mobilise the farming community to institute BXW control as agreed in the community meeting. The village platform members also tracked BXW control in the village and reported progress of BXW control activities to the sub-counties and districts.

Local government stakeholders trained in BXW control using participatory approaches

Platform team members at the district and sub-county levels were trained by the regional platform members as BXW control was being initiated at the hotspots. A training meeting took place at the sub-county headquarters of the most severely affected sub-counties. The trainers were the regional platform members and the participants were members at the district and the sub-county platforms. The regional platform shared with them technical information of BXW control and stakeholder mobilisation for the technology uptake by the farming communities. Issues of different offices not working well together (team work) came up as one of the reasons for lack of BXW control in their areas of operation. They were advised by members of the regional platform of their level (e.g. Chief by chief on the regional platform) do execute their work as a team and that this would not only affect BXW control but also other areas of service delivery.

All the platform members moved to the hotspot villages. The regional platform members spearheaded facilitation of the village meeting with participation of all other stakeholders including farmers, sub-county and district team members. At the end of the whole exercise capacity had been built for platform members at village, sub-county and district to effectively deliver technical information and also mobilise the receptive machinery for the BXW control technologies in all areas.

Scaling out BXW control

Already scale-out of BXW control was being effected on the hotspot villages, the platforms of the sub-counties hosting the hotspots had formulated sub-county action plans to mobilise farming communities in all affected villages in the sub-counties using the skills gained in the regional meeting and training meetings at the sub-counties. The district platforms were to refine the district action plans using the model district action plan formulated during the regional stakeholders' meeting and mobilise all affected sub-counties in their districts to effectively control BXW.

Field days were conducted in Kitagata-Sheema District and Bukiro-Mbarara District, the outstanding performing hotspots, in January, 2013 to reinforce scale out of BXW control already kick-started. Other than the hotspots, BXW had been effectively controlled in other 9 neighbouring villages in Kitagata of Sheema District and in other 10 villages in Bukiro of Mbarara, together covering about 3,000 fields cleared of BXW in 4 months. Participants from Districts of Mbarara, Ntungamo, Isingiro, Ibanda and Kiruhura attended the field day in Bukiro-Mbarara. Participants from Districts of Sheema, Mitooma, Bushenyi, Buhweju, Rubirizi attended the field day in Kitagata - Sheema District. Invited guests from each District included LCV Chairperson, RDC, Chief Administrative Officer, District Production Secretary, District Production and Marketing Officer, District NAADS Coordinator. All sub-counties in the Districts hosting the 2 field days were represented by stakeholders structured as at district level. NARO's Banana Research Programme, Mbarara Zonal Agricultural Research Institute, together with Zonal NAADS Coordinator also attended.

BXW control campaigns

Even after conducting field days to showcase successful BXW control in the hotspots, the regional platform was not sure that BXW would be controlled in almost all affected fields to reduce BXW incidence to less than 0.1% in the whole of Ankole originally agreed in the regional action plan. It was decided that a community mobilisation approach code named 'Intervention for Rapid Results' be used to remove all infected plants in the whole of Ankole in 30 days. The BXW control campaign run from 20th May, 2013 to 20th June, 2013.

All households affected by BXW were listed village by village using the networks of stakeholders at community and parish level already established. The sub-county platforms identified 2 convenient days in the week solely devoted to BXW control during the 30 days. The information was shared with the District and regional teams. The regional, district and sub county teams set up programmes of supervisory visits. The kick out BXW campaigns were launched by the LCV Chairpersons of the Districts of Mbarara and Bushenyi on the eve of 20th May, 2013 on FM radios. Then community taskforces ensured that all infected plants are removed by the farmers. All sub-counties actively implemented bye-laws (Plates 1 and 2). Meanwhile the BXW control campaign was continuously covered on regional FM radios of Radio West and Bushenyi FM.

Dissemination of information about BXW control

The Mbarara Information Officer was facilitated to mobilize the media to attend and document activities on all major events and were widely aired on Local and National FM radios. Articles covering the field days also featured in the National newspapers (Plate 3). Documentaries were produced. The regional platform aired radio spot messages for 30 days at the onset of second rains in August and September, 2012 when the farmers are massively pruning their plantations. During the same period, two radio phone-in talk shows were led by LCV Chairperson of Mbarara on Radio West in Mbarara and LCV Chairperson of Bushenyi on Bushenyi FM. The two radios have listenership from the regions of Ankole, Kigezi, parts of Mt. Rwenzori in Uganda and Northern parts of Tanzania and Rwanda. Both activities were to sensitise farmers about the dangers of spreading BXW through cutting tools and urging local governments to actively participate and support BXW control.

Monitoring and evaluation

The BXW control activities were monitored using three fronts. Various review meetings were held at different levels. At the village

4 ENTATSI, Orwakabiri, Maaci/Katumba 26

Abagaiga Babateire Ahari Rumanda Ahabwa Kajunde

Amodias Ayebazibwe Bwizibwera

KOOTI OMURI Bwiizibwera ekuriirwe omuramuzi Okipi Robert esabiiti ehweire esindikire kabura muriro abagaiga 3 Kyamugorani ahabwa Kajunde.

Omu kiirwamu orubanja boona baikiriize omushango gw'okugira ngu bakanga kurwanisa endwara ya kajunde n'okuteera ripooti yendwara ya kajunde.

Abatweirwe omu kihome bamanyirwe nka Makokyera Silver orikuruga omuri Kakondo 11 Bukiro, Kashari , Kamugisha Ndunde kuruga omu kyaro nikyo kimwe hamwe na Kato Bamuhaga orikuruga omuri Kaziga 1 Bukiro, Kashari, Mbarara. Omu kiirwamu omushango omuramuzi agizire ngu amateeka g'okuikwata aba kajunde akagachangaho mbwenu tiwe yaagateirelho na munonga eiteeka rya 2 ry'obitagiro rya kajunde ngu omuntu yaakwatwa atagambire ninga atarwanise kajunde omu rutookye rwe ngu naaza kutanizibwa

Makokyera, Kamugisha na Kato baaheza kukwatwa

50,000+ za buri mutumba ogurwaire. Omu kaire ako nikwe omuramuzi kubaragiira kwihamu enkaito akaragiira abaserukare kubatwara omu kihome kubitebya. Nikwe kubatwara omu kihome reero za motoka zaabo ezi babaire beizire nikwe kuzipakinga aha kihome babyesire ebizaano. We Kazywanisa wa NAADS Mugabe Vincent ow'egoomborora ya Bukiro agambiire

Entatsi ngu nibenda kugumizamu n'omuhiigo kureeba ngu barwanisa kujunde omu gomborora egyo. We ow'egoomborora ya Bukiro Ronald Taremwa agizire aba-ahabw'okwerwara ngu baine akasente bakanga nkana okurwanis endwara ya kajunde ngu ow'esente tarikugambwa ngu nibaza kutwara sente baziheereze omuramuzi abeibeho orubanja.

Plate 1. News about 3 rich farmers who defaulted on BXW control in Bukiro sub-county, Mbarara District in Vanercular newspaper.

Daily Monitor
WEDNESDAY, JANUARY 30, 2013
www.monitor.co.ug

western

Civil society, civil servants clean Ntungamo town. Civil Society Organisations members and government employees in Ntungamo Municipality at the weekend participated in a general cleaning campaign. Members from Excel Real Actors, Ntungamo Municipal Council Staff, and politicians said the move was aimed at improving the sentation of the area. Speaking at the end of the exercise, Ntungamo Deputy Mayor Monica Kobusingye urged residents to maintain cleanliness and appealed to civil society organisations to take the lead in the campaign. [Perez Rumanzi, Monitor]

Ankole farmers face prosecution over Banana Wilt disease fight

Struggle. Leaders say farmers from districts neighbouring Mbarara should step up the fight against the banana disease in order to ensure food security.

BY RAJAB MUKOMBOZI

MEASURES

Some of the measures for control of BBW include disinfecting tools using pk or fire after use, uprooting and burying the infected plant and discouraging use of pangas and other garden tools from one plantation to another, especially by matooke traders.

MBARARA. Authorities in Mbarara District have warned farmers against encouraging the spread of Banana Bacterial Wilt disease (BBW), which has destroyed plantations in Ankole in recent months.

During a field visit to Bucuro Sub-county, which had been hit by the disease on Monday, local leaders observed that farmers elsewhere had failed to follow the recommended measures to check the spread of BBW.

Bucuro and Mwizi sub-counties have shown signs of success in the fight.

"Enough sensitisation has been done on the control of the disease, now what remains is to arrest and prosecute those [farmers] who have failed to follow control," Mr Nickson Kabuye, the Isingiro District Resident District Commissioner (RDC), said.

Some of the leaders visit a banana plantation in Mbarara on Monday. PHOTO BY RAJAB MUKOMBOZI

Mbarara enacted a bylaw two years ago to prosecute farmers who do not heed control and eradication measures recommended by agriculture extension workers. Several culprits have been taken to court and fined.

Mbarara RDC Clement Kandole said Ugandans were citing human rights to shield themselves from prosecution.

He, however, warned that laxity on the part of farmers would not be tolerated in the fight of the banana disease.

RDCs, farmers, CAOs, district chairpersons and extension farmers from Isingiro, Ibanda, Ntungamo, Sheema, Bushenyi, Mitooma, Rubirizi and Buhweju had visited Mbarara to learn from Bucuro success story in the fight against the wilt disease.

But Nya District LCS Chairman Denis Turinawe said the neighbouring districts would be frustrating their efforts if they don't force farmers to comply.

Kabale

40 injured in accident

About 40 people were on Monday seriously injured after the bus they were traveling in veered off the road. The 7am accident occurred at Heissero, about 40km from Kabale town on the Kabale-Kisoro road. The police spokesman for Kigezi, Mr Elly Maate, said the bus from Kampala was headed to Kisoro. [Robert Muhereza, Monitor]

Kiboga

District in huge debt

Kiboga District is chocking in debts, officials have said. The district had a Shs519 million debt accruing from lost court cases since 2011 and has only cleared Shs97m. The CAO, Ms Roselyn Adong Ruhoni, said they have to pay the debt, a thing that the district chair, Mr Israel Yiga, said has constrained their activities. [David Ayebale, Monitor]

Plate 2. BXW control in the Daily Monitor newspaper, January 2013.

Banana farmers urged to accept expert advice

BY FRED ANYINE

SHEEMA. Banana farmers in Ankole sub-region have been urged to follow advice from farming experts if they are to sustain banana growing.

The chairperson of task force on Banana Bacterial Wilt (BBW) disease control in the sub-region, Mr Clement Kandole, made the appeal during a field study on the impact of the disease in Kitagata Sub-county, Sheema District on Wednesday.

"It is possible to fight and eradicate the disease using the skills and knowledge acquired from sensitisation programmes by the technocrats," Mr Kandole said at Kashekuro Church of Uganda which has a demonstration centre for control of BBW.

This comes after politicians, civil servants and farmers from the sub-region joined efforts to fight the disease that is threatening to wipe out their livelihood.

They are also supported by the Food Agricultural Organization and the Ministry of Agriculture.

He also called for by-laws to deal with those who do not want to cooperate.

Mr Kandole, who is also the Mbarara District resident district commissioner, also warned that political interference would undermine the efforts in fighting the disease.

Farmers gave testimonies on how they have managed the disease, such as cutting and uprooting infected banana plants and chopping them, avoiding sharing of farm tools, and regular surveillance of banana plants, among others.

Kabarole

Two suspects held

Police in Fort Portal are holding two people for allegedly killing a man over a girlfriend. The western region police spokesperson, Mr Bakari Muga Bashir, said the suspects allegedly killed Bagume Patrick, 23, who had gone for to a dance party in Kyakazinc village in Buharo Sub-county. The deceased is said to have picked quarrel with the suspects, leading to a fight. Mr Bakari said the deceased was stabbed in the neck with a knife and died instantly. Investigations are ongoing. [Ruth Katusabe, Monitor]

Varsity designs programme to protect River Mpanga

BY RUTH KATUSABE & FELIX BAGUMA

River Mpanga which is under threat as a result of human activities.

KABAROLE. Mountains of the Moon University (MMU) in Kabarole District has designed a public awareness programme to protect the environment in the Rwenzori sub-region.

The package involves using Mpanga Game designed to create a change in their livelihood and protect the natural resources, especially River Mpanga that emanates from Mount Rwenzori and snakes through several districts in the sub-region.

According to Mr Clovise Kabaseke, a lecturer at the university, the game is different from others because everyone is a winner.

"Every player wants to achieve, at the end of the game it identifies the problem of every human activity done on the river and also gets a solution," Mr Kabaseke said at the game inauguration workshop in Fort Portal on Tuesday.

Fort Portal Municipality MP Alex Ruhunda promised to market the idea and lobby Parliament to invite MMU officials to present it to the House.

MMU decided to design the game to protect River Mpanga after a report from the district environment and natural resources department showed that there is over exploitation and degrading of the river.

Mr Gerald Twehazi, the speaker for Kasenge District, also urged to residents to embrace the project.

Plate 3. Speech of Chairman LCV Sheema District capture in the National Daily, January 2013.

level, farmers exchanged experiences of BXW control. They named farmers that successfully controlled BXW and shamed the ones not controlling BXW. In totality, the farmers gained confidence as they progressively recognised it is possible to control BXW and put in more efforts in the control of the disease. Inception regional stakeholders meeting already described was held in July, 2012 to set up action plans and their implementation mechanism. Another similar meeting held in July, 2013 was to track the progress of the control efforts over the past year. The success stories shared in the meetings were an encouragement for the partners lagging behind. It was also realised the long list of challenges highlighted in initial meeting as serious hindrance to effective BXW control had been overcome easily in communities that effectively controlled BXW. There were also regional, district and sub-county platform meetings before and after major activities for organisational purposes.

There was a surveillance system instituted at the community level to primarily inform the sub-county platforms of the defaulting farmers for effective implementation of the byelaws. The community taskforce members and farmers were responsible for tracking all infected plants in all villages. Data collected through this front by sub-county platform was also used to report to the district. The real value of this data was in encouraging all farmers with infected fields to control BXW, not in scientific reporting value.

BXW infection data was collected by members of the regional platform under the guidance of NARO team members in August, 2012, December, 2012 and June, 2013. Data was collected on BXW incidence, BXW prevalence and yield recovery. Rather than collect data on randomly selected fields, to give an average picture of BXW control, as is the common practice in Research, we opted to collect data on the worst scenario cases, which would give a wholesome BXW control picture in the region. We collected data in most infected villages (hotspots). Data in randomly sampled fields was collected for the national survey in November 2013. These two data sets are the ones reported for this paper.

RESULTS

Information reported by the District teams in Stakeholders' meeting, July, 2013

Information reported by the districts teams during the meeting showed a wholesome district picture of BXW control status. In Rubirizi District, for example, all households in 10 sub-counties had fields affected by BXW in June 2012. The district was net-importing bananas from Isingiro and Bushenyi Districts. In June, 2013, most households had BXW incidence drastically reduced and fields got back into production. Overall BXW incidence reduced from 75 to 15%. The affected households were cutting 2 to 7 infected plants per week. 20 lorries of bananas were sold from the district every week.

In Mbarara District, number of affected household reduced from 2931 in July, 2012 to 771 in July, 2013, with overall BXW incidence reduction from 15 to 3%. There were pockets of BXW infection in the sub-counties of Rubindi, Biharwe, Bugamba, Rugando and Kashare of the previously BXW infected 14 sub-counties.

In Bushenyi District, the number of households affected by BXW August, 2012 ranged from 15 to 353 which reduced to 0 to 42 per sub-county after the BXW control campaigns (June, 2013). Pockets of BXW infection were in sub-counties of Nyabubare, Kyamuhunga, Keizooba, Ibaare and Central of the 12 previously affected sub-counties. Other districts reported similar levels of successful BXW control included Isingiro, Mitooma, Ibanda, Buweju and Kiruhura. Ntungamo District lagged behind because the technical team did not properly constitute the bye-laws and had sizeable opposition during their implementation. But all the same, Ntungamo reported reduction of BXW incidence by 80%. Again the value of such reports from review meetings is stakeholder mobilisation rather than scientific reporting.

In August, 2012, 93.4% of the farmers in selected hotspots had over 20 infected plants in their fields. The rest had 1 to 20 infected plants and no farmer had a field with no BXW infection (Table 3). The hotspot in Isingiro was the most affected with 200 fields with over 100 infected plants. By December, 2012 (within 4 months), 17.9% of the farmers in selected hotspots had over 20 infected plants. There were no farmers in the hotspots of Districts of Mbarara, Isingiro, Ntungamo, Rubirizi, Sheema and Buhweju with more 20 infected plants in their fields. Proportion of farmers with 1 to 20 infected plants in their fields were more than 90% in hotspots in the Districts of Isingiro, Ntungamo and Rubirizi and between 50 and 77% in the hotspots of the Districts of Mbarara, Sheema, Buhweju, Kiruhura and Ibanda. Outstanding successful BXW control was with farmers in hotspots of Mbarara, Buhweju and Sheema with 34, 33 and 23% of previously infected fields, respectively were cleared of BXW infection within 4 months. The sub-counties hosting the hotspots in Districts of Mbarara and Sheema had in addition greatly controlled BXW in 10 and 9 other villages surrounding the hotspots (data not available) and were selected to host the field days to showcase successful BXW control.

In July, 2012, about 600 banana bunches per month were sold from hotspots in Mbarara and Bushenyi. Farmers in hotspots of Isingiro and Ibanda sold 50 and 200 bunch per month, respectively, the rest of the hotspots hardly sold any bananas (Figure 1). In November, 2012, banana sales had increased in the hotspots of Mbarara, Isingiro, Rubirizi, Sheema and Kiruhura. There was drastic reduction in banana sales in Bushenyi District.

By June, 2013, BXW had been controlled in over 90% and over 70% of the previously affected fields in 6 and 3 hotspots, respectively. It was only the hotspot in Bushenyi, where BXW had been effectively controlled on only a half of the previously affected fields. Farmers continued to remove infected plants from their fields at an average of less than 4 infected plants per farmer per week (Table 4).

BXW status of the Ankole - national survey data

Survey data collected from all the main banana growing regions of Uganda revealed that 29.1% of the banana

Table 3. Level of implementation of BXW control activities in the 10 hotspots.

District	Number of households cutting various numbers of infected plants			
	0 plant	1-20 plants	20-100 plants	>100 plants
Baseline – August 2012				
Mbarara	0	55	130	100
Isingiro	0	0	0	200
Ntungamo	0	0	58	10
Rubirizi	0	0	155	32
Sheema	0	7	95	56
Buhweiju	0	19	30	50
Kiruhura	0	0	50	100
Mitooma	0	0	90	20
Ibanda	0	15	56	35
Bushenyi	0	0	90	12
4 months later - December 2012				
Mbarara *	97	188	0	0
Isingiro	20	180	0	0
Ntungamo	1	67	0	0
Rubirizi	17	170	0	0
Sheema*	15	50	0	0
Buhweiju	33	66	0	0
Kiruhura	6	83	61	0
Mitooma	0	12	88	0
Ibanda	0	71	25	10
Bushenyi	0	23	70	9
11 months later - June 2013				
Mbarara *	273	12	0	0
Isingiro	186	14	0	0
Ntungamo	50	18	0	0
Rubirizi	157	30	0	0
Sheema*	149	9	0	0
Buhweiju	87	12	0	0
Kiruhura	142	8	0	0
Mitooma	104	6	0	0
Ibanda	99	7	0	0
Bushenyi	54	48	0	0

fields still had infection in the Southwest including the Kigezi region (Table 5). BXW prevalence in Ankole alone is 13%. While BXW was effectively controlled on 60.9% of the previously affected fields in the South West, BXW effectively controlled 87% of the previously affected controlled BXW in Ankole. This translated into banana production recovery of 40% (Figure 1).

DISCUSSION

Governments, citizens, and donors across the globe want to see evidence that their investment in agricultural research and development leads to significant and widespread livelihood improvements among poor households (Pachico and Fujisaka, 2004). This will not happen if technologies developed to increase agricultural productivity and improved quality remain either on shelf or are promoted to only a small section of users from small demonstration trials (Hawkins et al., 2009). Farmers need to be engaged in a facilitated, interactive learning environment which enables them to deploy the technology within their specific environments, compare

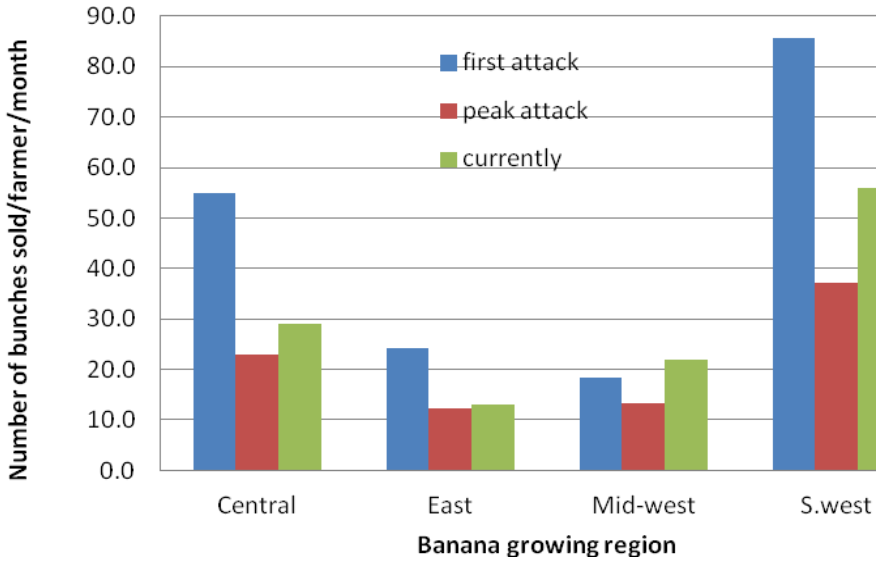

Figure 1. Mean monthly banana sales from previously affected fields on the 10 hotspots.

Table 4. Mean number of infected plants being continuously removed from affected fields per week.

District	Mean number of infected plants removed per field per week	
	July 2012	June 2013
Mbarara	82	2.5
Isingiro	150	1
Ntungamo	73	2
Rubirizi	75	1.3
Sheema	89.7	2
Buhweju	95.6	1
Kiruhura	120	1
Mitooma	76.4	0.8
Ibanda	82.7	1.2
Bushenyi	70.6	3.5

Table 5. BXW prevalence in Uganda by region as at November 2013

Region	% of farms that still BXW	% of previously affected fields where BXW was controlled
Central	56.0	36.2
East	66.7	24.1
Mid-west	54.6	28.5
S.west	29.1	60.9
Over all	**51.1**	**37.4**

results with their peers, and see impacts as they emerge (Pannell et al., 2006). Then farmers would be linked with networks of organizations, enterprises, and individuals focused on getting many more people who use the technologies for greater economic benefit, together with the institutions and policies that affect their behavior and

performance (Bentley et al., 2007).

Innovation platforms of actors need an initial push or opportunity to break barriers against joint discussion, action, sharing and learning (Waters-Bayer et al., 2009; Hall et al. 2006; Röling and Wagemakers, 1989). Rather than kick-start this process in farming communities (Tushemereirwe et al., 2006), this was initiated at regional level comprising of hundreds of farming communities. A regional action plan for BXW control was developed, with goal of controlling BXW to below 1% in 18 months at regional level. All other action plans developed at district, sub-county and village levels were to support achievement of the goal set at regional level. This was contrasting to approaches earlier used for BXW control (Tushemereirwe et al., 2006), where focus of action was at village and action plans at the sub-county and district levels were only supportive to the community action plans. The regional platform, the implementing wing of the regional action was absent in the previous participatory approaches.

Scaling-up is a multi-stakeholder process consisting of framing the context, promoting participation, fostering learning, strengthening institutions, and disseminating successful experiences (CSD NGO, 2008). Successful BXW control at the selected hotspots had the value of showing the surrounding, less affected communities that it was possible to control BXW. The idea was to have hundreds of farmers (a mix of all categories; the rich, the poor, the widows, the old) demonstrating successful BXW control. Farmers targeted for scale-out mirror themselves in farmers at hotspots, with similar capacity, benefits, roles and responsibilities and therefore gain confidence that they can also do it. Other players at sub-county and district levels who support farmers to take up technologies also mirror themselves where there is successful BXW control at their levels. Besides, successful BXW control became so conspicuous and obvious that other target farmers and their supporting structures would not miss it. The situation seems to be different when a few farmers demonstrate the benefit of the BXW control at a smaller scale (Tushemereirwe et al., 2006).

Farmers' knowledge on, and their decision to control plant diseases is shaped by accessibility and packaging of information about improved technologies for disease control (Sherwood, 1997). Previously, awareness campaigns were based on information generated by the Research team and were also always spearheaded by the Research, supported by Inspectors at Ministry of Agriculture, production departments at local government (Bagamba et al., 2006). This time round, information was picked from the participating communities as they implemented BXW control and packaged by the media houses that eventually disseminated it. Information was more focussed on how the stakeholders were organised to control BXW, covering the mobilisation, implementation of byelaws. Farmers tend to use information from fellow farmers than from any other sources (Bagamba et al., 2006), we thought capturing information from farmers, free of scientific jargon and disseminating through radio and newsprint would improve information access and used for decision making by the final beneficiaries.

Linking of farmers with networks of organizations and individuals which focused on getting many more people to use the technologies for greater economic benefit (Bentley et al., 2007) was executed through field days and BXW control campaigns. They were held in hotspots that achieved BXW control beyond their own communities (in at least 10 other surrounding affected communities). Clearly there were lessons to learn by their peers in way the farmers organised themselves for drastically reducing BXW incidence and surveillance for diseased plants at community level. Additionally, there were lessons about successful support of the practicing farmers by the administrative and political support through effective formulation and implementation of bye-laws at sub-county level. The idea was to mobilise the network of partners necessary to institute and monitor BXW control activities in all affected villages in Ankole using the farmers and sub-county leaders with fresh experiences of successful control of BXW on star performing hotspots. While the field days served the purpose of the showing the scaling partners that it was possible to control BXW at large scale, the BXW control campaigns aimed at supporting the same scaling agents in implementing what they experienced. No wonder it was code named 'Intervention for Rapid Results' to be used to remove all infected plants in the whole of Ankole in 30 days.

Another important aspect for successful scale out is for farmers and scaling partners to compare results with their peers, and see impacts as they emerge (Pannell et al., 2006). Scientists collected BXW control data representing worst case scenario, rather than average scenario is the common research practice. The idea was to capture a wholesome BXW control status, rather than a normal distribution picture. This seemed to be effective in captured data at large scale. This then was used update stakeholders on the implementation of the regional action plan in various review meetings, who would confirm it by sharing their own experiences.

Scale out of technologies should finally result in more quality benefits to more people, more quickly, more equitably, more lasting over a wide geographical area (IIRR, 2000). Most farmers (90%) were able to clear BXW from previously infected fields within a year. Within 4 months, some banana sales recovery was recorded from fields previously affected by BXW. Banana production recovery of 40% was reported from the South Western region. This demonstrates that with right engagement of stakeholders and a technology beneficial to end-users, some plant epidemics can be effectively controlled within relatively a short time at a relatively large scale. The

scale-out process detailed in the paper that led to achievement of the results is adoptable in other banana growing regions for more effective BXW control in Uganda and beyond.

Conflict of Interests

The authors have not declared any conflict of interests.

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Women-Poverty-Productivity Nexus: A case study of women in riverine areas of Nigeria

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While many studies related to poverty and livelihoods of rural women have been carried out, very few have singled out women in riverine areas. The study examined the status of rural women in these areas of Ondo State using a case study approach. Multi-stage random sampling technique was used to select 50 women from 6 villages of the Ilaje Ilumeje Community. Data were collected through personal observations and the use of a structured questionnaire. The data were analyzed using descriptive and econometric tools. The results showed that the level of education is low, over 50% of the women live in poverty and most of them spend over 9 h in one farm or household activity. The efficiency analysis shows that family labor and capital resources are being under-utilized and should be increased. The results also imply a need for a more detailed study of women in these environments. The study recommends that the degree of vulnerability is high and as such consumption and production aids be designed specifically for them.

Key words: Poverty, time use, women efficiency, productivity.

INTRODUCTION

Rural poverty is a condition of life characterized by malnutrition, illiteracy, disease, unsanitary surroundings, high infant mortality and low life expectancy (Mcnamara, 1975; World Bank, 1996; Bhat and Lone, 2013). This statement summarizes the state of most rural economies in Africa. The economy of these developing countries is based on agriculture with at least 60% of the populace being involved. This invariably means that about the about 70-80% of the total food produced in these areas is by rural farmers; in their words, farming is their basic source of income. With respect to this fact, rural poverty has also been defined as the income of the agricultural sector lagging behind that of the urban or non-agricultural sector (Adekanye, 1984; Vijayakumar and Olga, 2012). This view point which is very popular but rural poverty is not just a difference in income between rural and urban dwellers; it involves value judgment, something one cannot verify or demonstrate except by inference or suggestion even with a measure of error. This pre-supposes that poverty is multifaceted. Its dimensions include small fragmented holdings, illiteracy, lack of access to credit, health and educational facilities (Adekanye, 1983; Braun and Gatzweiler, 2014). Poverty has both quantitative and qualitative aspects. Poverty in its different dimensions is yet to be effectively curbed because of high population growth rates, investments in

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high growth capital intensive sectors and a neglect of the agricultural sector.

A neglect of the agricultural sector invariably means a neglect of women. Women are “the hidden productive force” in any country (Durmont, 1969; Ogbonna and Okoroafor, 2004) hence their role in food production cannot be overemphasized. Women bear the main responsibility for food production, processing, trading and household chores; without women’s dedication to food crop, fruits and vegetable production, the farm family probably would be worse off. These contributions are often acknowledged but unrecorded in national accounting procedures. Poor or improper accountability of women’s contribution paved the ground for the feminization of poverty. Women work hard to feed, support, supplement household income and expenditure by tending small plots of land, processing and selling farm outputs without full control or adequate access over land, capital or credit. ‘Rural poverty’ thus becomes synonymous with ‘women’.

But the environment has placed some constraints on women such that efficient productivity is hampered. For example, coastal areas are being eroded due to sustained changes in weather conditions; and invaded by water hyacinth making the economic activities of women in particular difficult (Olorunlana, 2013; Ogunlade, 2010). This makes fishing and related activities which women are known for unattractive to them and in some cases negative attitude and perceptions are being developed about their sources of livelihoods (Olubanjo et al., 2005). The invisible efforts or participation of rural women are also increasing as a result of urbanization and rural urban migration, thereby implying an increase in female headed homes. Consequently they become more vulnerable to poverty, they continue to struggle in the presence of pseudo rights to resources and poor access to extension services. The impoverished state of rural women is made worse by low status esteem, lack of control over labor/service and lack of control over the choice of socio-economic activity. The situation makes it imperative that more than ever before, the productive force of the economy should be streamlined for development agenda because the weight of poverty still falls most heavily on them. In view of this the study set out to examine the dimensions of poverty experienced by rural women, their levels of productivity and resource use efficiency so that policies concerning productivity, poverty alleviation, hence rural poverty will take this into consideration.

METHODOLOGY

Study area

The study was carried out in Ilumeje Community, Ilaje Local Government Area of Ondo State. Ondo State was created on the 3rd of February, 1976. Its capital is Akure and covers an area of 20,595km^2 and lies between longitude 4°30' and 6° east of Greenwich Meridian, latitude 5°45' and 8°15 north of the equator. It has a warm tropical climate. The rainy season last between April to October and the dry season start in November, ending in March. The mean temperature is 21 to 27°C. Rainfall is 2,000 mm in the southern parts and 1150 mm in the northern areas. Rainfall decreases in amount and distribution from the coast to the hinterland. The population is 3,884, 485 (1991 census). Ilaje Ese Odo Local Government is in the southern part of Ondo State. It was carved out of the defunct Okitipupa Local Government. It has a population of 93, 644 (1963 census); with about 350 to 400 towns and villages. It covers an area 7,280 km^2. It has the southern boundary as the Atlantic Ocean. The seven villages that make up Ilumeje Community exist alongside each other; they came together in 1981 in order to help each other develop. The seven villages are Itebu-kunmi, Mahintedo, Igbo-Egunrin, Igbolomi, Igbobini, Imoluwa and Madagbayu. The communities have the same dialect; they are involved in farming and fishing though particular villages are noted for either of the two. For example, Itebu-kunmi is noted for fishing while Mahintedo is noted for food crop farming. The crops planted or cultivated by most villages include cassava, yam, vegetables and pepper. Cassava and yam are the staple food in the region.

Sampling design and data collection

A multi-stage random sampling procedure was used; in the first stage the community was purposively selected; in the second stage 5 villages were randomly selected and the 3rd stage 10 households were randomly selected from each of the 5 villages making the sample size 50. In-depth interviews with the aid of structured questionnaires were used to collect data. Observational methods were also used. The data collected include socio-economic; production, income and expenditure.

Tools of analysis

The data were analyzed using inferential and descriptive statistics. The statistical tools used are frequency distribution and percentages; correlation coefficient; multiple regression to estimate production function. Time use data of the women was obtained by asking questions on what they spend their time doing at specific periods; these were analyzed using descriptive tools. The same was done for their male counterparts. Resource productivity analysis was carried out to investigate if resources are being optimally used and the nature of the returns to scale.

Productivity analysis

Multiple regression method is applied in order to assess the relationship between selected variables or factors inputs and output. It is used in this study to determine factors that affects respondents’ productivity. A production function is specified to represent the relationship between the quantities of the inputs employed in the production process and the amount of output produced; making it possible to predict the quantity of output derivable from particular or specific input combinations o the addition to output that could be obtained when one of the factors is changed by a unit keeping the others constant.

A variety of functional forms are possible in regression analysis but the particular function(s) to be selected depends on several factors such as goodness of fit, statistical significance of regression coefficients and a priori expectation. From the estimated function (production) measures of resource use efficiency can be derived by calculating the marginal productivity of any one resource or all resources taken together. The marginal value productivity of individual resources provides a framework for policy decisions on resource adjustments. Positive marginal value productivity implies

that output could be raised by using more of a given resource but the magnitude of marginal value productivities must be compared with marginal factor cost of the resources in order to determine the worth of an increase in the level or resource use. In other words, the differential between marginal value product and marginal cost indicates the scope of resource adjustment necessary to attain economic optimum.

Model specification

The postulated model indicates the relationship between farm income (Y) and some explanatory variables for the farmers. The farm income was regressed against explanatory variables-farm size, family labor, hired labor, capital expenditure, years on the job and education. The ordinary least squares technique of multiple regression analysis was used to estimate the parameters of the specified function.

$Y = F(X_1, X_2, X_3, X_4, X_5, U)$

Where:
Y = Gross farm income (₦)
X_1 = Land size in acres
X_2 = Hired labor in Naira
X_3 = Family labor in Man-days
X_4 = Educational level
X_5 = Capital Expenditure
U = Error term

Definition of terms

Gross farm income (Y): This is the total value of all output of cassava on the farm including the ones sold in the open market or consumed by the household.

Farm size (X_1): This was measured in hectares planted whit the crop. The land /farm size for any farmer was the amount of land cultivated under cassava.

Hired labor (X_2): This is that which somebody outside the family does in exchange for money payment and therefore measured as the total value of the labor employed in cassava production.

Family labor (X_3): This comprises the labor of the women and children-both male and female who partake in the cultivation of farms in question.

Capital expenditure (X_4): This includes the cost of input in terms of fertilizers, seeds and depreciation on equipment such as hoes and cutlasses.

Experience (X5): Defined as the time when the women start working to the time of the interview.

Error term (U): Included to take care of all other variables known to affect income but not included in the model.

Specification of the appropriate functional form

In this study, the Linear, Cobb-Douglas, semi-Logarithmic and Exponential functions were fitted to the data. The statistical analysis or tests carried out include the coefficient of multiple determination, R^2, the adjusted R^{-2}, regression coefficients, the F-ratios and the t-values.

Linear functional form: These are linear in variables and parameters. The assumption here is that the marginal influence of an explanatory variable on the dependent variable is constant for all values of that explanatory variable. This becomes evident for the partial derivative which is a constant b_j, the regression coefficient. But the elasticity of the dependent variable with respect to an explanatory variable is not necessarily constant. The equation is given as:

$$Y = b_o + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + U$$

Double-Logarithmic/Cobb Douglas function: They are functions which are non-linear on parameters as well as variables. They are called logarithmic functions because they are linear in logarithmic transformation and hence, they are also called log linear functions. They are double logarithmic function because the logarithmic transformation involves both dependent and explanatory variables. One important characteristics of this function is that the regression coefficients are also the elasticity of production function. This function assumes elasticity of production over the ranges of inputs and allows either constant, increasing, or decreasing marginal productivity. The functional form is given as:

$$\ln Y = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + U$$

Semi-Logarithmic functions: The semi-logarithmic functions are linear in logarithmic transformation and they are semi-logarithmic functions because the logarithmic transformation involves only the explanatory variables. The functional form is given as:

$$Y = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + U$$

Exponential functions: The logarithmic transformation affects the dependent variable alone. The marginal influence of the explanatory variable on the dependent variable is not constant but varies with Y; the elasticity varies with the value of X. In equation form it is given as

$$\ln Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + U$$

A priori expectation

The independent variables whose influences are being examined are expected to have a positive effect on the farm income and output respectively. This means that the parameter estimated should be positive which indicates that an increase in any of the explanatory variables should bring about increase in the dependent variable.
The choice of appropriate functional form is very important in empirical econometric studies. This is because failure to use appropriate functional form will result in bias and/or inefficient estimators. The criteria for selection are:

i) Statistical significance of regression coefficient as indicated by the t-ratio.
ii) Magnitude of the coefficient of multiple determinations R^2 and R^{-2}.
iii) Significance of F-ratio as indication of overall significance.
iv) Appropriateness of the signs of explanatory variable.

Based on these the linear function was selected as the best fit for the production function.

Measurement and analysis of poverty levels

The measurement of poverty was done using the Lorenz Curve

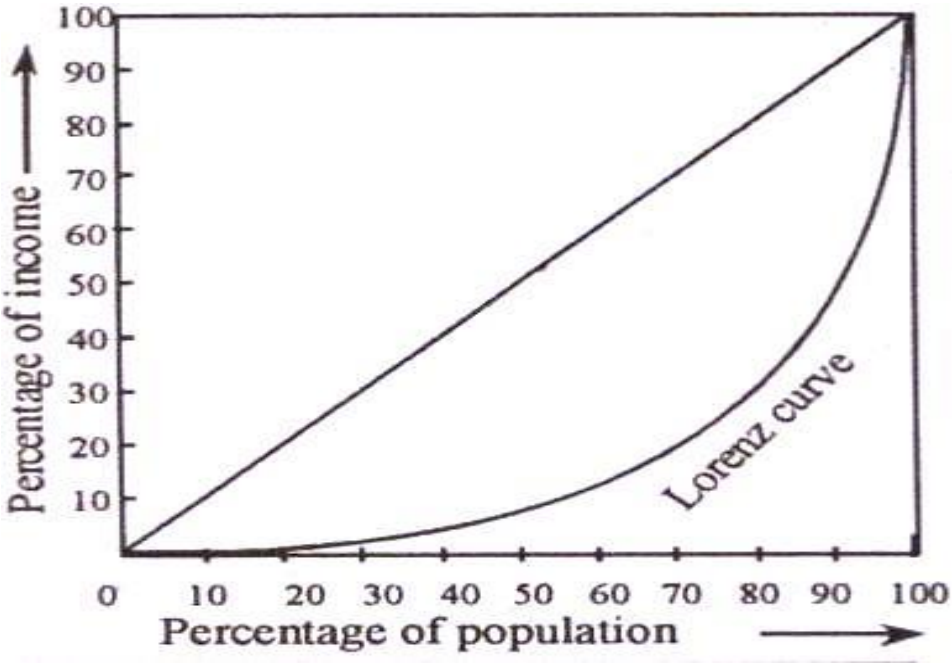

Figure 1. The Lorenz Curve. Source: http://economicsconcepts.com/lorenz_curve_and_gini_coefficient.htm

(Figure 1). The Gini Coefficient is a single measure of relative poverty and the most frequently encountered in studies of income distribution. In order to draw the curve from which the Gini Coefficient may be estimated, the percentage of income given to income recipients is measured on the vertical axis. The income recipients are arranged in percentiles on the horizontal axis. Income recipients are ranked from the poorest to the richest mainly from the left to the right. Thus a certain percentage of the population of the poorest group receives a certain percentage of the income. The line of complete equality is represented by the 45° line which is also called the egalitarian. This complete equality will only occur if "A" percentage of the population received "A" percentage of the income. The curve of the perfect inequality represents the case where one person has 100% of the income (represented by the curve angle DCB). The space between the Lorenz curve and the 45° line represent the area of concentration, that is, enclosed by the theoretical egalitarian and the observed Lorenz curve.

The Gini coefficient is the ratio of this area to the total area under the line of equality. The simplest method of computing this is by taking the sum of the area under all the trapezoids such as WXYZ and subtracting it from the area under L. As a measure of income concentration, the Gini Coefficient ranges from 0-1. The larger the coefficient the greater the inequality; the figure 0 (zero) represents perfect equality, 1 represents perfect inequality. Alternatively, Gini Coefficient may be measured by the area of concentration divided by the area of triangle DCB. The shape of the Lorenz curve will indicate the degree of inequality in the income distribution. The curve definition must touch the 45° line at the lower left corner and upper right corner (as can be observed in the Hypothetical Lorenz Curve).

Problems

The Lorenz Curve can intersect so that different curves can give the same Gini Ratio because of difference in inequality of the range. The extreme nature of the reference standard perfect equality makes the measure insensitive to changes in income distribution. The insensitivity is greatest for changes in the incomes of low income groups which may be small in absolute terms but still important in percentage terms to the poor households themselves and redistribution in policy terms. To avoid the arbitrariness this may present in Lorenz Curve, different particular parts of the curved are looked at. The poorest 20 or 40% may be checked to know how the poor are faring or top 5, 10, 20% to check the concentration of wealth.

RESULTS AND DISCUSSION

Bio-graphic and socioeconomic characteristics of respondents

Of the 50 women interviewed, only 2% were teenagers, 26% of them were above 50 years in age while 72% ranged between 21 to 50 years. This indicates early marriage and long child producing /caring periods. This indirectly means that the women are active for a long period in their lives, often keeping the home and working on the farm.

The long procreation period shows that there would be break periods in the productivity of the women; such many time outs would reduce her overall productive capacity apart from weakening their health (Santhya et al., 2010). The average age of women is 41 years while the range is 30 years; that the women start out early in life to fend for their families indicate that they would have gained a lot of practical experience which if tapped could

Table 1. Socio-economic characteristics.

Item	Frequency (n=50)	%
Age		
<20	1	2
21-30	12	24
31-40	12	24
41-50	12	24
>50	13	26
Marital status		
Married	31	62
Separated	10	20
Widowed	9	18
Educational status		
None	24	48
Primary School	13	26
Secondary	4	8
Others	9	18
Primary occupation		
Farming	30	60
Trading	11	22
Fishing	4	8
Others	5	10
Family size		
1-5	27	54
6-10	17	34
11-15	4	8
16-20	2	4
Monthly income (₦)		
<=5000	19	38
5001-10000	24	48
10001-15000	7	14
Monthly expenditure		
<=5000	6	12
5001-10000	37	74
>10000	7	14

lead to an increase in income and as such raise their living standards.

Most of the women (62%) were married; 20% of them were separated from their husbands while 18% of them were widows. None of them was single and some of the married women lived separately from their husbands (who pay occasional visits) so they still have to cater for the family. A proportion of 38% of the women were heads of their homes which implies that all the financial, physical, social, psychological burdens would be borne by them. The heaviest of all is the economic burden which hangs on their necks. These women are usually the poorest of the poor; since their capacities will be over stretched. The proportion could be higher because some married women do live separately with kids. About 50% of the married women leave separated from their spouses. The reasons they gave for this include the presence of another wife elsewhere and husband's occupation involving travelling. Consequently the burden of survival falls on them. This shows that while more men are leaving farming for the women; their burden becomes heavier. This scenario explains why poverty is feminized in this region.

Less than 50% of the women had no formal education, which indicates a high level of illiteracy among the women. Some 26 percent have primary level education, 8 percent got to the secondary school level while another 18 percent attended teacher training college or modern school. The low level of education among the respondents would affect their innovativeness, rate of adoption and response to change. All these being low would affect their productive capacity and help them no further than what they are now. The prevalent low level of education has not deterred them from being involved in different activities as a source of livelihood for them and their families. The women consider farming (30%), trading (26%), fishing (12%) and those who are civil servants such as teachers (14%) as primary sources of income. However all of them have farms, the product of which they sell and consume. They also make crafts such as mats. None of them saw house-keeping as a productive job nor do they use it as a deterrent to their occupations. The fact women do not consider housekeeping to be a productive activity is the reason why women's economic contributions at the national level are under-reported. Tshuma and Jari (2013) found that the informal sector is a source of income for households in poor communities. The average income by month is N6,680. About 54% of the women earn less than this while the remaining 46% earn more. The average monthly expenditure is N6,772.34. This figure is higher than the monthly income, which suggests that the level of indebtedness would be high. The expenditure amount represent about 90% of the income which implies no savings and the households are probably borrowing to survive (Table 1).

Time use of women in rural riverine areas

This is considered in two ways: the average number of hours which women spend on specific activities and a comparison of what men and women do at particular periods of the day. In the latter, questions were asked on activities of both husband and wives at particular periods, while the former involves calculating average hours allocated to each activity for all women. Most of their time is spent working: 6.25% on leisure, 25% on sleeping and

Table 2. Daily activities and time allocation.

Activity	Average hours spent per day	Percentage of total in a day
Farming	5	21
Trading	3	12.5
Processing	3.3	13.75
Household chore	2	8.33
Child care	1.2	5
Others	2	8.33
Hours of work	16.5	68.75
Leisure	1.5	6.25
Hours of sleep	6	25

Source: Author's Computation.

Table 3. Average monthly expenditure and poverty distribution.

Item	Amount	Percentage of total expenditure
Food	6491.74	95.8
Health	23.6	0.4
Water	0	0
Clothing	144.2	2
Electricity	0	0
Transport	112.8	1.8
Housing	0	0
Total	**6772.34**	**100**
Core Poor: <=2,257.00	(1) 1,618.36	0.5
Moderate Poor: 2,257.01-6771	(26) 121,686.12	36.0
Non-poor: >6,772.34	(23) 215,187.28	63.5
Total	**(50) 338,617.00**	**100**

Figures in parentheses represent number of households.

68.75 on working (Table 2). Further analysis shows that men have more hours of sleep, leisure and shorter hours of work (Appendix 1). According to Blackden and Wodon (2006), overlooking the differences in men's and women's contributions to "household time overhead" can lead to inappropriate policies which have the unintended effect of raising women's labor burdens while some-times lowering those of men.

Determination of respondents in poverty

This begins with drawing the poverty line. Ideally this line should be defined in terms of household per capital income but the basic needs approach specifies that the mean household expenditure per month be used. Thus households below the poverty line will be termed poor while those above will be termed none poor.

For this particular study, poverty line was established based on the mean household expenditure per month on some basic needs: food, health (medication), water, clothing, electricity, transport, and housing. Poverty is then calculated identifying core poverty group, moderate poverty as well as the non-poor groups. A core poverty household is identified if it spends less than one-third of the average expenditure on basic needs while a moderate poverty household spends less than two thirds of the average expenditure on basic needs. In addition, the non-poor is identified if it spends more than the average expenditure by households.

The average expenditure on basic needs of households was calculated by taking the average expenditure of all the respondents on the basic requirement (mentioned above) which includes food and non-food items. Table 3 shows the average amount spent by each sampled house in the study area where food is shown to constitute the bulk of monthly expenditure of the households. The poverty line stands at ₦6772.34. Following the assumption above the core poverty line is ₦2,257.00 while the moderate poverty line is ₦4,514.89. From the

Table 4. Correlation matrix of production function.

Correlation function	G/farm income	Farm size	Hired labor	Family labor	Capital expenditure	Experience
G/Farm income	1.000					
Farm size	0.3911	1.000				
Hired labor	0.3571	0.3886	1.000			
Family labor	0.3087	0.4406	0.3329	1.000		
Capital expenditure	0.8381**	0.5018**	0.4345	0.3579	1.000	
Experience	0.3083	0.4766*	0.2872	0.3836	0.3478	1.000

1-tailed significance * =0.01; ** =0.001.

monthly expenditure of each household in the study, it is shown that only a household falls in the core poverty group. It can be seen that only two percent of the sample is in core poverty while 22% are moderately poor. In all a total of 54% could be said to live in poverty while 46% are not poor. Ologbon et al. (2014) found that 60% of households in the riverine areas of southwestern Nigeria lived in poverty. The percentage of the total expenditure spent by those above the poverty line is 63.5% while the remaining 36.5% is spent by those below it.

Poverty depth measurement

To show the poverty profile of the respondents more clearly, other poverty indicators were used. They include:

Head count index: This is the proportion of the population whose measure of standard of living, (consumption) is less than the poverty line. It is useful as quick indication of the scope of the poverty problem, though it is insensitive to differences between individuals in the depths of severity of their poverty. Head count index is poor (people below the poverty line) as a percentage of total sample size. It is given by:

(Poor × 100) / Total sample = (27 × 100) / 50 = 54%

Poverty gap index: This is the difference between the poverty line and the mean expenditure of the poor expressed as a ratio of the poverty line. It is also called the Income Gap Ratio. It gives a good indication of the depth of poverty but does not capture its severity. It is given by:

(Poverty line - Mean expenditure of the poor) / Poverty line

= (₦6772.34 – ₦4566.83) / ₦6772.34
= ₦2,205.51 / ₦6,772.34
= 0.325
≈ 0.33

The implication of this is that the poor expend a third of what the non-poor spend in a year or the non-poor earn three times more than the poor although the figures may give the impression that there is not much gap between the chosen poverty line and the average monthly expenditure of the household.

Determination of the Lorenz

The Gini coefficient which shows the severity of the poverty curve was calculated using the formula below

Gini Coefficient: $=1-(X_{i+1} - X_i)(Y_i + Y_{i+1})$

Where:
X*i* = Percentage of household
Y*i* = Cumulative percentage of expenditure distribution

This was calculated to be 0.22 which implies that there is an even spread in the expenditure around the 45 line to some extent. Particular points on the Lorenz Curve were checked to see how the different groups of people are faring. For this study, the lowest 10 and 20% of the sample were also checked; and the top 10 and 20% of the sample are also checked. The first 10% cover a total of 3.81% of the total expenditure, while the first 20% spends a total of 10.1% of the total expenditure. The top 10 and 20% spend 18.59 and 32.88% of the expenditure respectively.

Productivity analysis

Correlation analysis of production function

The correlation matrix below (Table 4) shows that the variables are all positively correlated. Capital expenditure is shown to be highly correlated with land or farm size and income. This shows that an increase in capital expenditure per hectare will increase the income of the farm family. Experience is also highly correlated with land size, implying that being an experienced farmer will help to increase output per hectare of land. Others though

Table 5. Summary of fitted equations.

Functional form	Variables						Coefficient of determination		Test of significance
	Constant	Land	Hired Labor	Family Labor	Capital Exp.	Experience	R^2	R^{-2}	F-Cal
Linear	-18088 (-1.61)	-1007.8 (-0.352)	-1.82 (0.42)	8.5 (0.123)	8.4*** (5.422)	115 (0.231)	0.70	0.62	9**
Exponential	18090 (0.291)	-5096.5 (-0.447)	-20.79 (-1.148)	201.7 (0.693)	8.1 (1.294)	656.7 (0.321)	0.15	-0.08	0.6
Double-Log	-33439 (-0.826)	-1325.6 (-0.445)	-4.5 (0.478)	6.4 (0.089)	8.4*** (5.490)	147.8 (0.287)	0.71	0.61	8**
Semi-Log	-28435 (-1.386)	-4113** (-2.722)	6.95 (1.443)	59.6 (1.643)	0.807 (1.037)	906.6*** (3.471)	0.60	0.48	5**

Figures in parentheses are t-values calculated; *** Significant at 5%; ** significant at 10%.

positive are weakly correlated to income.

Resource productivity analysis

Four functional forms (Linear, Exponential, Double-Log and Semi-Log) were fitted in the regression variables to estimate their effects on farm income; based on the criteria stated earlier, the linear function was found to be the best hence it was chosen as the 'lead equation'. The aim of this section therefore is to find the marginal physical product, elasticity of production, opportunity cost, marginal returns to opportunity cost ratio, and marginal value product based on the equation. With these it is possible to investigate if resources are being used optimally and find out the nature of returns to scale. The expressions of the equations in explicit forms are presented in the Table 5.

The coefficient of determination of the lead equation is 0.70 which means that 70% of the total variation in income is explained by the independent variables while the remaining 30% could be explained by such variables as weather, technology which are not included in the equation. The f-ratio shows the overall significance of the equation and it is significant at both 1 and 5%. This shows that the coefficient of determination obtained for the equation is significantly different from zero.

The coefficient of land size and hired labor are both negative and insignificant at the critical level of test chosen. This implies that increasing the farm size could have a negative effect on income since such could lead either to underutilization of land, over use of land due to intensive mono-cropping system or inefficiency; or land is not very productive and diminishing returns has set in. Labor increase might also affect income negatively. These results are contrary to the a priori expectation. Capital expenditure (X_4) is the only significant variable at the critical levels tested. It is also positive which implies that the variable cost of farming is low and an increase in it would lead to increase in farm output and ultimately farm income; the implication also is that farming is capital intensive. Family labor and experience are positive but not significant. An increase in both of them should raise output per hectare but the results run contrary to a priori expectation suggesting that allocation of family own resources may be in line with other objectives rather than farm income. The Beta-coefficients is used to differentiate the net effect or relative importance of each independent variable to the dependent variable. It shows the increase or decrease in the dependent variable (standard deviation units) resulting from an increase of a standard deviation unit in each independent variable. For the study it reveals that the highest influence of change in income or output is given by capital. Family labor and experience contribute very marginally positively while the net effect of farm size and hired labor is negative (Table 6). This indicates diminishing marginal returns with respect to labor resources.

Elasticity of production, marginal physical product, marginal value product and marginal returns to opportunity cost

The elasticity of production shows the change in output relative to a unit change in input; other inputs remaining constant. A ratio greater than unity implies that change in output out paces change in input; and production is said to be relatively elastic. A ratio equal to unity implies that output changes at the same rate as input, and production elasticity is said to be unitary. While a ratio less than unity indicates that the proportionate change in output is less than that of input and production is said to be inelastic. The elasticity of a linear function is given by:

$$\frac{dY}{dX_{it}} \cdot \frac{X_{it}}{Y_t}$$

The elasticity of the dependent variable is not

Table 6. Summary of linear function.

Variable	Standard error	Regression coefficient	t-calculated	Beta coefficients
Constant	15575.3	-18088	-1.161	
X_1-Farm Size	2861.17	-1007.8	-0.352	-0.06
X_2-Hired Labor	4.35	-1.8	-0.421	-0.01
X_3-Family Labor	69.56	8.5	-0.123	0.02
X_4-Capital Exp.	1.56	8.4	5.422	0.85
X_5-Experience	497.32	115	0.231	0.04

t-tabulated values: 1% = 2.88; 5% = 2.10; 10% = 1.73. Source: Regression Analysis of Field Survey Data.

necessarily constant. The elasticity of production in this case is given by:

$E_i = b_i\bar{X}_i / \bar{Y}$

Where $\bar{X}$ and $\bar{Y}$ are the means of input and output respectively.

The elasticity of land was found to be -0.006, the same goes for hired labor. Both being negative and less than one indicate inelasticity of production with respect to them. Family labor and experience have elasticity of 0.06 and 0.05 respectively again indicating inelastic production though positive. The elasticity of production with respect capital expenditure is 1.46, it is positive and above 1 showing that production is elastic. The sum of elasticity gives 1.44 indicating increasing returns to scale.

Marginal Physical Product (MPP) shows the marginal change in output with respect to a marginal change in input. The partial derivative of the function with respect to each input gives MPP. It gives the maximum level of input used in getting maximum output. For the linear function, the MPP is the same as the regression coefficients. The variable X_3, experience, gives the maximum MPP value. Though family labor and experience (X3 and X5 respectively) show the highest MPP levels, their elasticity are small because they are not easily increased.

Production is said to be efficiently organized under conditions of competition in the input and output markets when the marginal value product is equal to the marginal factor cost for each of the inputs used. That is, for a given level of technology, prices of both input and output, the marginal value productivity is an instrument for judging the efficiency of resource use when related to prices of inputs. The marginal value product of hired labor and land are higher than the input prices which shows that they are over utilized. They are negative so need to be reduced to increase output or shift from current plots being used. Family labor and capital expenditure are being under-utilized; they need to be increased to give higher output hence income. An input is efficiently utilized if its marginal value product is just sufficient to offset its marginal factor (input) cost. The marginal value product and the input price or marginal factor cost is a basic condition that must be satisfied to obtain efficient resource use. The marginal value productivities of resources therefore provide a framework of policy decision on resource adjustment. A positive marginal value productivity shows that output can be increased by using more of that resource while a negative value shows the opposite. The Marginal Value Product (MVP) is the product of the MPP and the price of the output.

$(MPP)P_y = P_{xi}$

P_{xi} = Price of inputs X_1, X_2, X_3, X_4, X_5

P_y = Price of output, Y

The marginal factor cost is the cost of acquiring an additional unit of that input. The average prices paid for inputs were used as proxies for marginal factor cost.

Marginal Returns to Opportunity Cost (MROC) ratio measures efficiency in resource use. A ratio greater than 1 indicates that little of the particular resource is being used under the prevailing price situation. Optimum utilization of resources occurs when the marginal return to opportunity cost ratio is equal to unity. The opportunity costs of the various resources are approximated by their market prices. For land the annual rental value for agricultural use in the study area is taken as an estimate of its opportunity cost; the same applied to family labor. Capital expenditure that is valued in Naira terms, the opportunity cost of N1.00 of capital is taken as N1.00 plus the current annual interest rate (17%) (Table 7).

Conclusion

This study has attempted to examine the source of rural women's poverty, the severity and the efficiency of resource use in their farming activities. It is generally agreed that women are more into food crop farming and that majority of the food eaten in Africa and Nigeria in particular is a result of the activities of these women, yet returns to resources is low. It is recommended that government and other development agents need to identify different rural communities, particularly those which seem to be locked-in like the study area; study

Table 7. Elasticity and productivity ratios/measures.

Item	Elasticity	MPP	MVP				MROC	
			P_{xi} (₦)	P_y/kg (N)	MVP_{xi}	P_x/P_y	Opp/Cost	MROC
X_1-Land	-0.06	-1007.8	100/ha	20	-20,156	5.0	100	-201.56
X_2-Hired Labor	-0.06	-1.82	200/day	20	-36.52	10.0	200	-36.4
X_3-Family Labor	0.06	8.5	200/day	20	170	10.0	200	0.85
X_4-Capital Exp.	1.46	8.4	629/month	20	168	31.45	1.17	143.59
X_5-Experience	0.05	115						

Source: Computed From Regression Analysis of Field Data.

them and develop particular programs or projects in response to their particular problems. Poverty and productivity need to be attacked simultaneously because they are intertwined and affect each other. Such projects should involve the beneficiaries at every stage while its implementation should be closely monitored and evaluated on a regular basis. If measures are taken as recommended, the efficiency of the women will be increased; income will improve and poverty reduced.

Conflict of Interests

The authors have not declared any conflict of interests.

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APPENDIX 1. Comparative time use of both men and women.

Time	Wake up		Sleep		Leisure		Farming		Trading		Food processing		Child care		Prayer		Cooking		Eating		Fishing		Others	
AM/PM	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H	W	H
5-6am	4(40)	5(50)											2(20)		2(20)	3(30)	2(20)			1(10)		1(10)		
6-7am		1(10)					3(30)	2(40)	1(10)	1(10)			3(30)		3(30)	1(10)				2(20)		2(20)		1(10)
7-8am							2(20)	3(30)	2(20)	1(10)							2(20)		1(10)		2(20)		1(10)	6(10)
8-9am							5(50)	5(50)	3(30)	2(20)	1(10)										1(10)	3(30)		
9-10am							5(50)	5(50)	3(30)	2(20)	1(10)										1(10)	3(30)	1(10)	
10-11am							5(50)	5(50)	3(30)	2(20)	1(10)										1(10)	3(30)	1(10)	
11-12pm							5(50)	5(50)	3(30)	2(20)	1(10)										1(10)	3(30)		
12-1pm							5(50)	5(50)	3(30)	2(20)	1(10)										1(10)	3(30)		
1-2pm							5(50)	5(50)	3(30)	2(20)	1(10)										1(10)	3(30)		
2-3pm							5(50)	5(50)	3(30)	2(20)	1(10)										1(10)	3(30)		
3-4pm							5(50)	5(50)	3(30)	2(20)	1(10)										1(10)			3(30)
4-5pm					2(20)	3(30)	5(50)	2(20)			1(10)						2(20)							5(50)
5-6pm					2(20)	5(50)							3(30)				5(50)		3(30)				1(10)	2(40)
6-7pm					3(30)	6(60)							1(10)				3(30)		3(30)	4(40)				
7-8pm			1(10)		1(10)								1(10)				1(10)			9(90)			5(50)	1(10)
8-9pm			1(10)	6(60)	2(20)	1(10)											4(40)						3(30)	3(30)
9-10pm			10(100)	10(100)																				
10-11pm			10(100)	10(100)																				
11-12am			10(100)	10(100)																				
12-1am			10(100)	10(100)																				
1-2am			10(100)	10(100)																				
2-3am			10(100)	10(100)																				
3-4am		1(10)	10(100)	9(90)																				
4-5am	5(60)	4(40)	4(40)	6(60)																				
Number	10	10	10																					
Per cent	100	100	100																					

Source: Author's Computation.

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