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Contribution of Non-timber Forest Products to Household Food Security: The Case of Yabelo Woreda, Borana Zone, Ethiopia

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Abstract

Livelihoods of the rural people of Ethiopia depend on agriculture. However, erratic nature of rain and prevalence of drought in the country make agricultural production a challenge. To counter this problem, use of the available forest resource for non-timber forest products production is the most promising option. Nevertheless, no systematic and rigorous analysis on contribution of the product to income and food security to households was made. This study, therefore, was conducted in the Yabello Woreda of Borana Zone, with the objectives of identifying determinants of household food security in the study area, to assess contribution of non-timber forest products to household food security, and to analyze the challenges in getting contribution from non-timber forest products to the rural household food security. The required data set for the study were gathered primarily through survey method from 160 randomly selected sample households both from non-timber forest products participants and non-participants (80 each). A purposive sampling procedure was used to select 2 PAs. Structured interview was used as data collection method. Supplementary, secondary data were collected from various sources. Household calorie consumption method of data collection was followed to determine food security status of sampled households. The data were analyzed using descriptive statistics like mean, standard deviation, percentage and frequency distribution. Univariate analysis such as t-test and Chi-square (χ^2) tests were also used to compare characteristics of non-timber forest products participants and non-participants groups. The binary logistic regression model was run to establish whether and to what extent income from non-timber forest products (NTFPs) along with other variables influence food security status of households. Among 12 explanatory variables included in the logistic model, 3 of them were significant at less than 5 percent probability levels. In general, the empirical analysis, like many other similar studies, confirms that non-timber forest products production would have positive impact on income and food security of beneficiary households. Thus, the concerned GOs and NGOs should join hands to support the improvements of such non-timber forest products production.

Key words: Food security, non-timber forest products, logit model

1. Introduction

Non-timber forest products from forest and forest lands are important sources of livelihood in many rural areas of Ethiopia (Mulugeta *et.al*., 2003). The economic values of these products in some circumstances can overweigh the other form of land use alternatives. For example, the income of many rural households in western parts of Ethiopia is supported through the non-timber products collection of species and honey from the forest.

Non-timber forest products (NTFPs) constitute an important source of livelihood for millions of people across the world. In India alone it is estimated that over 50 million people are dependent on NTFPs for their subsistence and cash income (Shanker *et al*., 2004). Forest-based activities in developing countries, which are mostly in NTFPs area, provide an equivalent of 17 million full-time jobs in the formal sector and another 30 million in the informal sector, as well as 13-35% of all rural non-farm employment (Duong, 2008).

NTFPs were for long overshadowed by timber products and has received increased policy and research attention only in the last few decades. This policy and research attention was based on three propositions (Arnold and Ruiz-Perez, 2001): The first was that NTFPs contribute significantly to the livelihood and welfare for households living in and adjacent to forest. Secondly exploitation of NTFPs has ecologically less destructive than timber harvesting and other forest uses, and the third point was that NTFPs production and development by giving a foundation for sustainable economic development could reduce tropical deforestation. These propositions encouraged researchers to put much effort on the determination of monetary values of NTFPs as well as their contribution to overall livelihoods.

Shanker and Peters (2004) argue that the contribution of NTFPs based livelihoods have more potential in agro-forestry cultivation system than through natural forest exploitation. Intensive production and management of NTFPs in anthropogenic vegetation type and semi domestication better contribute to the livelihoods and welfare of people dependent on the forest due to their higher productivity. However, these propositions are still subject to policy debate. So addressing these policy issues requires an improved understanding of how households interact with forest resources and their behavior to collect NTFPs from forested landscape.

For the past three decades, there has been a growing awareness of the importance of NTFPs especially for food and medicinal uses. This growing awareness is not only for the role they play in the subsistence economy, but also for their potential and real contribution to the economies of many developing countries (FAO, 2006). Similarly, NTFPs are important forest products especially in dry land areas where they form alternative sources of livelihoods. They also contribute to poverty alleviation through generation of income providing food and improved nutrition, medicine and foreign exchange earnings (Chikamai and Kagombe, 2002). Research done in six communities in Tanzania found that farmers were deriving up to 58% of their cash income from the sale of honey, wild fruits and vegetables (CIFOR, 2006).

According to Gardei (2006), the majority of farming communities in South West Ethiopia are forest dependant. The forest is the major source of their livelihood and subsistence by providing them a variety of NTFPs. According to the study more than 65 percent of the households who were involved in NTFPs did earn more than one thousand Birr in a year from the production of NTFPs alone, while around half of the people use the forest to generate cash income. For many Ethiopians, the money earned from collecting, selling or processing NTFPs provide an indispensable contribution to household income and food security. Income from NTFPs enables rural households to purchase consumable goods and pay for basic expenses. The most important NTFPs that generate substantial income to rural household and foreign currencies in Ethiopia are wild coffee, honey, and natural gums and resins.

Similarly, Mulugeta *et al*. (2003) also explained that the average annual cash income generated per household from collection and sale of oleo-gum resin was estimated to be US$ 80.00. This income contributes to 32.6% of annual household subsistence, and ranks second after livestock in the overall household livelihood contributions to rural households in Ethiopia.

The considerable contributions of NTFPs to rural household livelihoods and the overall national economy have been documented from different parts of Ethiopia and there is a growing wealth of information available. However, most of the information concentrates on wetland resources and southwestern moist forest areas. All in all, there are still a lot of studies needed from various localized areas to have a reliable national statistics on the contributions of NTFPs in Ethiopia. One of the geographic areas in Ethiopia that is understudied is the Borana Eco-Region. Owing to its diverse ecosystem and rich biodiversity, the region has a rich NTFPs but the role that these forest resources play in the rural livelihoods is little documented (Pol, 2002). Recently, in this area several development efforts are undertaken to reconcile economic development with biodiversity conservation. A better grasp of how and why local people use the resources around them is deemed critical to the long term realization of both objectives. Therefore, the focus of this study is to provide information on the role of NTFPs for rural livelihoods and food security.

2. Definition and Concept of NTFPs

The term ‘forest product’ almost immediately brings to mind wood and wood-based products, but there are equally important non-wood products that are collected from the forests. These include all botanicals and other natural products extracted from the forest other than timber, known as Non-Timber Forest Products (NTFPs). NTFPs are components of the forest system that exist in nature and are generally not cultivated. Non-timber forest products (NTFPs) are plants or plant parts that have a perceived economic or consumption value sufficient

to encourage their collection and removal from the forest. It can also be referred to as all the resources or products that may be extracted from forest ecosystem and are utilized within the household or are marketed or have social, cultural or religious significance (FAO, 2005). These include plants and plant materials used for food, fuel, storage and fodder, medicine, cottage and wrapping materials, biochemical, as well as animals, birds, feather, reptiles and fishes. NTFPs which are harvested from within and on the edges of natural and disturbed forest, may be all or part of a living or dead plant, lichens, fungi, or other forest organisms. It therefore, represents a diversity of potential products sought after by a wide variety of people on a continuum of scales and intensities (FAO, 2005).

Many households in rural and forested areas around the world depend heavily on NTFPs for survival. World Bank (2001) estimates that one out of four of the world's poor depend directly or indirectly on forests for their livelihood. During the last decade, there has been a dramatic increase in interest and research of NTFPs (Shillington, 2002). This is due to the increasing recognition of the fact that NTFPs can provide important community needs for improved rural livelihood, contribute to household food security and nutrition, help to generate additional employment and income, offer opportunities for NTFP based enterprises, contribute to foreign exchange earnings, and support biodiversity and other conservation objectives (FAO, 2006). Many local people use varieties of wild plants in traditional ways for their daily requirements as well as primary health care. Some 80 percent of the population of the developing world use NTFPs for health and nutritional needs (WHO, 2000).

A large proportion of rural people use NTFP worldwide. Researchers have identified NTFPs as key resources in a strategy to overcome difficulties in time of uncertainty that can be pursued by workers who find themselves without jobs, and by individuals whose employment opportunities are chronically limited by age, gender and disability. The independent nature of the activity is also suitable for people who do not fit comfortably within the demands of contemporary wage labour.

The primary requirements to work with NTFPs are knowledge of products, their uses and locations, and the time, energy and mobility to access (Pierce *et al*., 2002). Moreover, Shillington (2002) also stated that many international development agenda promote NTFPs as tools for sustainable development. The promotion of gender equity materializes through NTFPs' ability to improve the economic situation of households by incorporating women as key actors, since they recognized as the main extractors, processors, and marketers. So NTFPs are viewed as a potential means to better the livelihood strategies of rural populations while simultaneously sustaining the biodiversity of forested areas.

3. Food Security Definitions and Concepts

Food security is a concept that evolved over time. There are many definitions of food security (Hoddinnot, 2001**)**. The most widely used definition of food security is given as '…access by all people at all times to enough food for an active, healthy life…'.The essential elements are the availability of food and the ability to acquire it (World Bank, 2002).

In a broader way, Maxwell (2001) defines food security, as '…a country and people are food secure when their food system operates in such a way as to remove that there will not be enough to eat. In particular, food security will be achieved when the poor and vulnerable, particularly women and children and those living in marginal areas have secure access to the food they want.

Attaining food self-sufficiency alone does not necessarily imply the achievement of food security. Many countries those used to be considered as self sufficient in food were found to be food insecure because they lack either an efficient food system or the capacity to the level of food entitlement. This indicates that attaining macro level food self-sufficiency does not ensure the achievement of household food security (Getahun, 2003).

Therefore, food security strategy has to address household-level food production through investment in food production and storage.

The concept of household food security is a more recent development and the bulk of literature dated from 1980s equating national food security with food self-sufficiency is a problem that needs to be clearly understood. Food self-sufficiency is essential but not sufficient vehicles for solving household level malnutrition and household food insecurity problems (Rukuni, 2002). Hoddinott (2001) indicates that household food security mainly conditioned by factors, which are related to the process of acquisition, household procurement strategies and socio economic condition of the society. With regard to this, the key elements that are critical to household food security are availability and stable access. The former is further influenced by the different sources of food and handling patterns which facilitate the time dimension of food availability in the household.

4. Research Methodology

4.1. The study area

Yabello Woreda is situated in Borena zone of Oromia region some 570 km south of Addis Ababa. The Woreda consists of 23 Peasant Associations (PAs). The total land area of the Woreda is estimated to be about 5909 km^2 of which 31 km^2 is cultivated, 338 km^2 is covered with forest, 681km^2 is bush and shrubs, and 4900km^2 is wood land (WBISPP, 2003). The altitude of the area ranges from 1000 to 1700 meters above sea level. The mean annual temperature ranges from 19℃ to 24℃ and a prominent feature of the ecosystem is the erratic and variable nature of the rainfall, with most areas receiving between 238 mm and 896mm annually, with a high coefficient of variability ranging from 18% to 69%.

The total population of the Woreda is 91,679 (male 45487 and female 46192). The dominant ethnic group is Oromo (CSA Population Projection 2010).

Livestock production is the major components of the farming system in the study area and contributes to the subsistence requirement of the population, among other, in terms of milk, and milk products and meat, particularly from small ruminants. According to the district Agricultural and Rural Development Office (2010), the Woreda's total population of livestock is estimated to be 413,766. Among this, cattle population accounts for 56.3% followed by goat 23.9% and the remaining was 19.8%. The proportion of sheep and camel are 14.3% and 5.5% respectively.

In general, the Woreda is designated as famine prone and frequent crop failure is a common problem usually leading to food shortage. Drought induced food insecurity has been a common recurrent phenomena exacerbating the vulnerability of resource poor rural households in the area to be food insecure.

4.2. Sampling technique and sample size

This study used multi-stage sampling technique in which both purposive and random sampling techniques were applied. At the first stage, out of 13 Woredas of Borana zone, Yabello Woreda was selected purposively based on the production of non timber forest products and the researcher's personal knowledge of the area. In the second stage, out of the total of 23 kebele administrations of the Woreda two kebales were purposively selected based on their potential of producing non timber forest products. In the third stage, the households in the areas were categorized into two strata, i.e., NTFPs participants and non-participants. Then, 160 sample households, 80 from each category were selected randomly using probability proportional to the size of the population of each kebele from which the sample households were drawn.

4.3. Data source and method of data collection

Quantitative and qualitative data were collected from primary and secondary sources. Primary data were collected from 160 sample households drawn from 1234 households residing in A/galchet and Elwaye PAs. The data collected include information on: household characteristics (education, age, family size, sex,), household assets, household income, livestock holdings, land size, and on household food security indicators.

Secondary data relevant to the research work was collected from the NTFPs association; Woreda offices of Pastoral and Rural Development. The information includes the detailed data with regard to agricultural and other development activities of the area.

To generate information at household level, household level survey was undertaken using structured interview schedule. Prior to conducting the interview, pre-test of the interview schedule was undertaken with 15 key informants in the study area and accordingly revision was made and finalized. Five enumerators were recruited based on their proficiency in communicating using Afan Oromo language, educational background, and prior exposure to similar work. Training was given to enumerators on the content of the interview schedule and procedures to be followed in the process of conducting the interview.

Only NTFPs participants were administered with questions related to NTFPs data in order to estimate monetary benefit to NTFPs participants. To determine food security status of the sample households, data were collected on the amount and type of food items consumed by households for 7 days through posing questions to women who were most responsible to prepare food for the family.

Focused group discussions were also carried out with the participant members of sample households in order to generate information on overall management aspect of the product and in the mean time site observation was made to make a note on the way the agro-pastoralists handling the products. In addition the discussions were held with the non-participant members of sample households to gather information on the reasons of not participating in the NTFPs. Furthermore, review of documents from different offices was also carried out.

4.4. Methods of data analysis

The data generated was coded and entered into SPSS software for statistical analysis. Descriptive statistics like mean, standard deviation, frequency distribution, and percentage were used to examine and understand the socio-economic situations of the sample respondents through comparing NTFPs participants and non-participants. The t-test and chi-square were also employed to compare the two groups (NTFPs participants and non-participants) on certain variables.

The food items consumed by sample households' calorie content was computed using calorie conversion table of EHNRI (1968) and household members were also converted to their adult equivalent. Then, the amount of total calories consumed by each sample household was computed and divided by 7 days to get per day calorie consumed by household. This figure was divided to the Adult Equivalent (AE) of respective households and this would give the amount of calorie available per AE for each sampled household. Thus, those households equal or greater than the minimum amount of calorie required (2100kcal) was put under food secured otherwise not food secured (Hoddinott, 2001). The situation of household food security within NTFPs participants and non-participants was also seen independently.

To test the hypotheses, a probabilistic model is specified with food security as a function of series of socioeconomic characteristics. The dependent variable is dummy variable, which takes a value of zero or one depending on whether a household is food secure or not. Here, the main purpose is to determine the probability that an individual with a given set of attribute will fall in food secure or insecure groups.

Linear probability model (LPM), logit or probit models can be used to estimate dependent dichotomous variable. Although linear probability model is the simplest method, it is not logically attractive model in that it has some econometric problems like no normality of the disturbances (U_i), heteroscedastic variances of the disturbances, non-fulfillment of $0 \leq E(Y_i/X_i) \leq 1$and lower value of R^2, as a measure of goodness of fit. Therefore, linear probability model is not appropriate to test the statistical significance of estimated coefficients (Liao, 1994; Gujarati, 1995).

Unlike linear probability model, logit model shall guarantee that the estimated probabilities increase but never steps outside the 0-1 interval and the relationship between probability (P_i) and explanatory variable (X_i) is nonlinear (Gujarati, 1995).

Thus, a logistic model was used to identify the determinants of food security and to assess their relative importance determining the probability of being in food secure.

5. Results and Discussion

5.1. Food security status of the households

Household food security was assessed by analyzing household food calorie consumption within 7 days using data on food type and amount consumed. Gross household food consumption for 7 days was converted into calorie, and divided the calories figure by the number of Adult Equivalent in the household and then the result also divided again to 7 days which resulted in a figure for average calorie consumed per Adult Equivalent per day in a household. Based on the result, households were categorized into food secured and food insecure taking 2100 kcal consumption per Adult Equivalent per day as cut off point (Hoddinott, 2001) which is minimum calories required for AE per day. From the total sample households, 76 households were food secured where as the remaining 84 households was food insecure (see Table 1). The food security situation between NTFPs participants and non-participants was different. The NTFPs participants were in better position than that of non-participants. About 65 % of NTFPs participants were food secured where this was only 30 % for non-participants. The chi-square test indicates that there is significant difference between participants and non-participants with regard to food security situation.

Further analysis was made to see the position of sample households with regard to calorie consumption. To this effect, the data on household calorie consumption per Adult Equivalent was categorized taking 2100kcl as a cut of point. Those households more than this value are food secured but with different value and less are food insecure (Table 2). Out of 84 sample households identified as food insecure, kilocalorie (kcal) consumption of 37.5 % falls between 287.39-1500Kcal. If we see the two groups separately, 26.2 % of NTFPs participants and 48.8 % of non-participants were found in this category. In both cases, the major proportion of food insecure households was found to be in this category. Out of food insecure NTFPs participants, 75 % (21 out of 28) were in this category and whereas it was about 70 % (from 56 food insecure non-participants, 39) were in this category. From the Table 18, it is also possible to see that there is also difference within food secured households in terms of calorie consumption. Calorie consumption of 33.8 % sample households of NTFPs participants were found in the fourth category. However, it was only 18.8% for non-participants. This analysis implies that, NTFPs participants who were food secure were in a better position than non-participants in terms of amount of calorie consumption. But, there were no as such difference in amount of calorie consumption for food insecure households of NTFPs participants and non-participants. However, the majority of them were located far from minimum calorie requirement.

5.2. The results of logit model

The model result (Table 3) indicated that coefficients of three variables were significantly different from zero and found to affect food security status of the households in the study area. However, all variables have showed the expected sign. Livestock ownership and income from NTFPs were significant at the 1% level; labour availability was significant at the 5% significance level.

Family labour is the main source of work force for rural community in the study area. The result of the model indicated that the variable had positive relationship with food security of household and it was significant at less than five percent probability level. The marginal effect implied that, keeping other factors constant, the probability of household to become food secure increases by about a factor of 0.2590. Family labour is the key inputs in motivating the household to invest more in agriculture or rural employment that can fetch higher incomes which intern contribute to household food security. This finding is consistent with the result of other studies (Adhikari *et al*., 2004).

In the study area, livestock production is an important source of income. The result indicated that livestock size measured in TLU was positively and significantly associated with food security of households. Agro-pastoralists who had large livestock were better off in food security than those who had few livestock. Livestock products like milk and meat are used for direct consumption. The result is significant at 1% probability level. The result of the model indicated that other things held constant, the marginal effect in favour of being food secure increases by a factor of 0.0862 as the total livestock holding of household increases by one TLU. This finding is consistent with the result of other studies (Abebaw, 2003; Genene, 2006;). The possible explanation is that livestock have many socio-economic benefits to farm households and are perceived as indicators of wealth status. Livestock serves as draft power, manure source, cash income source through sale of animal product and live animals in times of food shortage to buy grains, which ultimately helps farmers not to lose productive assets which will have significant impact on subsequent year production and productivities. The household having larger size of livestock can have better food security status, and therefore the possession of more livestock imply the higher likelihood of food security.

Income from NTFPs builds the capacity of those agro-pastoralists who participate in the products collection. Therefore, from the income, agro-pastoralists able to purchase food crops and at the same time it enables them to purchase agricultural inputs to produce more food crops. The model result indicated that the income from NTFPs has positive relationship with household food security at 1% significance level. The result of the marginal effect indicated that all factors kept constant as income of household increases by one Birr, the probability of household to become food secured will increase by about 0.6299. This is due to the fact that the role NTFPs plays in the total household livelihood strategies; it provides subsistence goods like fuel wood, liana, construction materials, and forest coffee and honey as a source of cash income. They also serve as a safety net function (coping strategy) particularly during shortfalls in agricultural products, which is parallel with research findings by Shackleton and Shackleton (2004) and Byron and Arnold (2001) who showed that dependence on NTFPs increases during period of a shortfall in agriculture production. Similarly, Pattanayak and Sills (2000) reported that commercial NTFPs can be an important natural insurance against unexpected agricultural risk.

5.3. NTFPs, household income & food security

Under this section, a brief explanation is given based on the results of pervious sections on NTFPs, household income and food security. Pastoralists and agro-pastoralists who have participated in NTFPs collection increased cash income from the products. The findings of this study indicated that, through participation of NTFPs collection, the pastoralists and agro-pastoralists were able to generate a good amount of income, which contributed significantly to the households' income. This revealed that participation of NTFPs has paramount contribution to household income in the study area.

Besides, participation of NTFPs had positive contribution to household food security through its contribution in production of subsistent foods and building capacity of pastoralists and agro pastoralists to purchase food stables. The result of this study also showed that income from NTFPs collection found to be significantly

determined the probability of household to be food secured or not indicating that the NTFPs contributed to the households' food security through its effects on enhancing household subsistent foods production and trade based entitlements.

6. Conclusion

The livelihood of the households in the study area depend on portfolio of activities in which NTFPs is one of the major role player. The collection of NTFPs is the major cash income source to this rural. The use of these products adds crucial dimension to a diversified livelihood base, thus act as a safety net particularly when there is a short fall in agricultural production to minimize risk and fill the gap of food shortage. NTFPs participants were in a better position in terms of livestock ownership, asset value and participation in credit. Similarly, larger proportions of NTFPs participants were found to be food secured than that of non participants. Generally the major bottlenecks affecting productivity of NTFPs is poor market access and infrastructure. Improving the existing poor market infrastructure will simultaneously solve related problems that limit the development potential of the study area. Unfortunately, forest coverage and forest resources of the study area are declining, which may affect future prospect of sustainable NTFPs and thus livelihoods. In this regard concerted efforts from all actors are needed to reverse the situation through an appropriate forest management strategy.

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Tables

Table 1. Food security status of sample households

Food Security Status	Participant (n=80)		Non-participant (n=80)		Total (n=160)		χ^2-value	p-value
	n	%	n	%	n	%		
Food Secure	52	65	24	30.0	76	47.5	19.649***	0.000
Food Insecure	28	35	56	70.0	84	52.5		
Total	80	100	80	100	160	100		

*** Significant at 1% level

Source: Own Survey (2012)

Table 2. Households' calorie consumption per AE

Kilocalorie Consumption/AE	Participant (n=80)		Non-participant (n=80)		Total (n=160)	
	n	%	n	%	n	%
287.50 -1500	21	26.2	39	48.8	60	37.5
1500.01-2099.99	7	8.8	17	21.2	24	15.0
2100-2500	18	22.5	5	6.2	23	14.4
2500.01-3500	27	33.8	15	18.8	42	26.2
>3500	7	8.8	4	5.0	11	6.9
Total	80	100	80	100	160	100

Source: Own Survey (2012)

Table 3. The Maximum Likelihood estimates of Binary Logit Model (BLM)

VARIABLE	β	S.E.	M.E.	Sig.
SEX	0.298	1.592	0 .0605914	0.852
AGE	0.022	0.063	0.0042929	0.728
EDU	0.972	0.741	0.1915462	0.190
FMLYSIZE	-0.258	0.308	0 -.050922	0.402
LANDCULT	0.370	0.618	0.0729074	0.549
LIVESTOCK	0.438***	0.160	0.0862491	0.006
EXTENTION	0.184	1.076	0.0362425	0.864
CREDIT	2.008	1.872	0.3444914	0.284
NTFPINCO	3.574***	1.079	0.6299799	0.001
PRXFORST	-0.183	0.154	-0.0361549	0.233
LABOUR	1.314**	0.638	0.2590557	0.039
DISTMARKET	-0.090	0.170	-0.0177511	0.596
CONSTANT	-7.376	4.218		0.080

-2 log likelihood 43.278[a]

Nagelkerke R Square 89 % [b]

, *, Indicate significance at 5 %, and 1 % level respectively

a. Based on a 50% probability classification schemes

b. Correctly predicted food-secure households based on a 50% probability classification

Source: Model output