

Research Article

Donation of Homegardens to Household Income Generation in Ginir District, Southeast Ethiopia

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Abstract

Home-garden agroforestry and its woody species component have great roles to play in the livelihood improvement and household income and supplementary food for smallholder farmers. However, there is limited quantitative empirical evidence on the contribution of multilayer fruit tree or Coffee based homegarden agroforestry practices. Therefore, this study was initiated to assess or examine home-garden and its components (perennial woody species, livestock and annual crops) agroforestry practices and its contribution of household income for sustaining livelihood at Ginir District. Data was collected through a combination of focus group discussions, key informant interviews, household survey and field inventories. A total of 70 respondents from three kebeles were interviewed and data were analyzed by using descriptive statistics and econometric analysis. The results revealed that the status of fruit based or Coffee based homegarden agroforestry in the study area varies with land holding size and wealth status. *Persea Americana*, *Mangifera indica*, *Coffee*, *Catha edulis* *Psidium huajaval* (zayituna), *Annona senegalensis* (gishita), and *citrus species* were fruit trees and cash plants which major woody species types of plants species components grown in the system in the study area. The overall contribution of household annual mean incomes from the existed agroforestry practices of the study areas were 84%, 8.1%, 5.33% from homegarden, parkland, farm boundary plantation and the rest from others respectively. The existed home garden agroforestry was the majors and principal mean income of the study area HHs and according to homegardens components 7%, 85% and 8.41 were from livestock's, woody species, and crops respectively. Additional accordingly the wealth category or status mean annual income from homegarden woody species component poor, medium and rich households was 72.3%, 88% and 91.4% from the total income respectively. Further studies of examining of the market value chain, areas of intervention along the chain and economic value of the home garden agroforestry components are needed to fully understand the contribution of home-garden agroforestry. It can be concluded that homegardens and its woody species components are important to rural people for food and cash income generation.

Keywords

Home-garden Agroforestry, Woody Species, Component, Household Income

1. Introduction

Agriculture is the dominant subsistence and economic sources for Ethiopia. About 85% of the Ethiopian population

depends directly on agricultural practice [1]. With increasing population, there is an increase in extensive forest clearing for

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agricultural use, overgrazing, exploitation of forest for fuel wood, fodder and construction [2]. The increase in population resulting in losses of woody species diversity, decrease of size of land holding and increase of number of landless farm families in rural areas [3]. Ethiopian home gardens agroforestry have two-fold functions: some products are mainly for home consumption, while others for income generation. Among the existing agroforestry practices, the most commonly used and essential in Ethiopia to reduce livelihood problem is homegarden agroforestry practice [3]. Indigenous fruit trees are the primary source of income for most of rural households in Southern Africa [4]. Hence, integration of fruit or economically important trees with annual crops (agro forestry components) is intended to maximize the land use efficiency to generate supplemental income to medium level farmers [5]. Depending upon the climate and other environmental characteristics, there may be peak and slack seasons for harvesting the various products, but generally there is something to harvest daily from most homegardens [6]. Hence homegardens are among the best solutions of household food security and income generation to smallholder farmers due to their diversity [7, 8].

The main aim of this research is intended to fill information gaps and assess the donations of Agroforestry practices especially HG agroforestry practice and its components to the livelihoods of the smallholder farmer's household's incomes generation. At the end the findings obtained from this study

will be useful in forwarding, humanizing and intensification the local existing HG Agroforestry practice in Ginir District and elsewhere in the country..

2. Materials and Methods

2.1. Description of Study Area

The study was conduct in Ginir district, Bale zone, Oromiya regional state, Ethiopia, which is about 540km from Addis Ababa. It's located within Ethiopia country, Oromia region and Bale zone coordinates: 7°8'N 40°42'E. It is bordered on the West by Gasara District, on the East by Rayitu Districts, on the North by Goro District and on the South by Gololicha District respectively. The specific study areas in the Ginnir district are Canco, Oda roba and Harada tare kebele administrations (KA) s (Figure 1). Agriculture like fruit trees, crops and livestock's are the main and principal source of livelihood strategy of the district. Fruits (like mango, banana, papaya and avocado) and vegetables (cabbage, carrot, pepper, onion, Irish potato) and cash crops such as Coffee, chat...are also grown in the area both for household consumption and most for income generation (by selling).

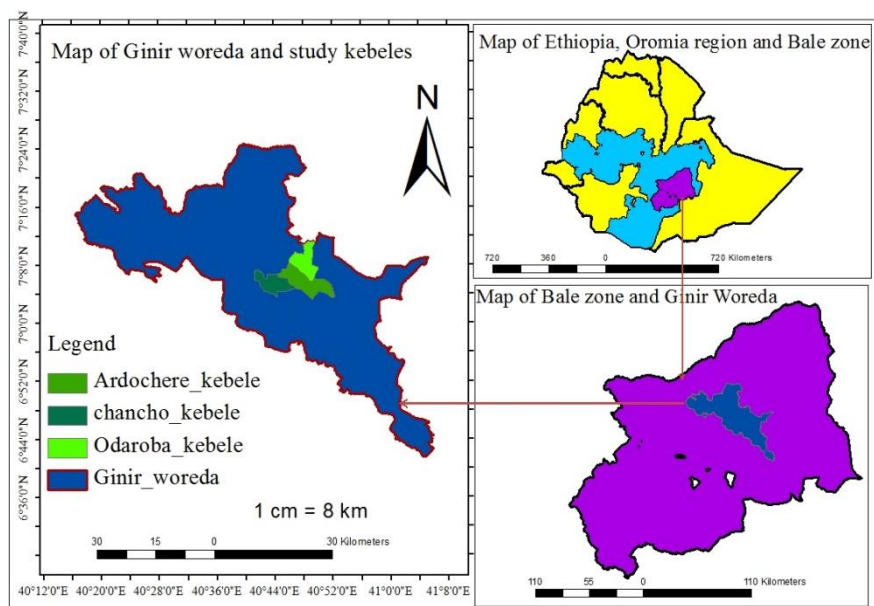


Figure 1. Map of the study Sites.

2.2. Methods

2.2.1. Site Selection

Ginir district' was selected purposively among the districts

of the zone due to the presence of agroforestry practices. Reconnaissance survey was made with agricultural officer and DA of different Kebeles to obtain good insights. Accordingly, three kebeles, namely, Canco, Oda roba and Arada tare were identified and selected purposefully based on the presence of extensive agroforestry practice, better accessibil-

ity among the Kebeles' in the district.

2.2.2. Selection of Key Informant

Key informants (KI) in this study refer to persons who are knowledgeable about agroforestry practices and its contributions. To select KI snow method is employed [9]. At least five farmers were asked to identify and given names of seven key informants as defined above. Then the identified KIs were ranked the most frequently appeared eight persons were assigned as KIs in Kebele. A total of $8 \times 3 = 24$ KIs were selected and used to categorize households into three wealth categories, and to provide general information on the type of agroforestry practices, components and their uses. This information is later use for developing a questionnaire for verification.

2.2.3. Selection Household for Questionnaire Survey

In this study, a household (HH) is defined as a basic unit of production and consumption, made up from the persons who manage common landholdings and live under one central decision-maker, the household head [10]. To characterize HHs in each Kebele into different social classes, wealth ranking was carried out by adapted the technique used by [11]. Farm size, number of cattle, "Ikubi" farmers contributing per week/month, money deposited in the bank, number of beehives (apiculture), plantation of Eucalyptus, area of irrigated land, number and areas of coffee and chat used as criteria for classification of HHs into different wealth categories. To do this, list of names of all the HH heads in the kebeles taken from the local extension office and cross-checked with the KIs. Then, the KIs were grouped them in to poor, medium and rich categories based on the criteria set. After the KIs arranged the HHs into three wealth categories, from the study sites a total of 70 (17%) samples HHs were selected randomly. From total samples HHs (Canco is 30, Arada Tare is 22 and Oda Roba is 18HHs in PAs) and in wealth categories (poor is 15, medium is 43 and rich is 12HHs).

2.2.4. Data Collection

The means of data collection and sampling measures were design according to the planned objectives this study. Multi-stage approach used to describe the existing AFPs in the district from selected PAs. First, household survey data was used to identify the major AFPs. Second, transect walk and field observation were carry out to describe the major AFPs qualitatively. Informal survey with key informants, assessment and collection of secondary data from government offices are carry out to support the primary data. Information collected at informal interview level was used to develop questionnaires to verify the information was collect during the discussion with KI, and a pre test of the questionnaire on five farmers were carry out to verify the quality of the questionnaire in terms of its clarity and understandability to the

respondents, to avoid redundant questions and also to know how much time it needs to complete a questionnaire. Formal survey data collection was conduct on the sample households with the structured questionnaires in each selected Kebele. For better communication with the respondents, questionnaires were translate into the local language (Afan Oromo) and presented to them, to evaluate clearly their understandings and knowledge. This assessment included major benefits of AFPs, which, in turn, use to estimate the contribution of AFPs in income generation and its sources. Socioeconomic data, including age, land holding size, livestock ownership, family size, number of active labor (age between 15 to 64) from household members and extension support, was collected through the household questionnaire survey. The response they gave were qualitatively described and used to supplement response of farmers obtained through the household questionnaire survey. Enumerators with agriculture and forestry background were involved from Sinana Agriculture Research Center. Training was provided before they started enumeration respondents.

2.2.5. Data Analysis

Both qualitative and quantitative data were collected and analyzed. The qualitative data were collected and analyzed partially during the process of data collection, to be able immediately to identify gaps was filled through subsequent data collection. The quantitative data are first summarized, tallied and coded and processed, and was analyzed by means of Statistical Package for Social Sciences (SPSS) version 16 software and with Microsoft Excel. By means of descriptive statistics, the mean, range, frequencies, percentages, minimum as well as maximum values of variables were calculate.

3. Result and Discussion

3.1. Demographic Characteristics of the Respondents

Different studies show that the demographic characteristics of an individual have a significant influence on practices and challenges of agro forestry management often depending on the gender, age, sex, family size, marital status, wealth status, level of education and the main occupation of the individuals in the study. Taking this into consideration the respondents were shown to indicate the general demographic conditions of the respondents under the selected kebele. The total numbers of households in the study site is 1220 and from the total 420 HHs were involved in agroforestry practices. The households' heads included in the study areas are characterize as 93% male and the rest 7% female headed; Age wise more than 85% of the households were within the range of 18-55 years and more than 95% sampled households were dependent in agriculture in terms of their main occupation and income sources and the rest depend on both agriculture and other services. In the sam-

pled number of household member, size varies from 1 to 16 in the study area. Among the sampled households 57.14% having 3 to 7 family members and 40% sampled households had more than 7 family members (appendix Table 3).

The average landholding size of the households headed at

the three studies PAs was 1.86 ha but landholding size of the study area range from maximum (4.50 ha) to minimum (0.05ha) and there was significant difference in mean landholding size (in ha) among the wealth categories (F-test; $P < 0.05$; Table 1).

Table 1. (Mean \pm std, minimum, and maximum) of landholding in ha of the selected HHs ($n=70$) related to wealth status at the study sites.

Wealth status	Mean \pm std	N	Minimum	Maximum
Poor	0.53 ^a \pm 0.25	15	0.05	1.00
Medium	2.01 ^b \pm 0.54	43	1.02	3.10
Rich	3.01 ^a \pm 0.64	12	2.00	4.50
Overall mean	1.86 \pm 0.94			
P 0.05				

** Different letters following vertical mean values indicate significant difference ($P < 0.05$) among wealth categories

3.2. Characterizing and Description of Major Agroforestry Practices

There are different agroforestry practices (AFPs) in the study areas. The household survey result showed that homegardens (HG) followed, scattered tree planting in farm or park land (PL), farm boundary planting (FB) and some small-scale woodlots were different types of traditional agroforestry practices found in the study areas. This result was similar as [12-15].

3.2.1. The Homegardens

Homegarden locally known as ‘*Qonna hodo*’ in oromic language indicates the farming of land close to the residential home area. The homegardens of the study areas characterized by the unique combination of two main native perennials, Fruit trees/ shrubs and Coffee (Coffee arabica) which grow in association with food crops, various trees and livestock in a multilayer story agro forestry system similar study done at SNNPRs Ethiopia by [16]. Fruit trees like *Mangifera indica*, *Persea americana*, *Psidium huajaval* (zayituna), *Annona senegalensis* (gishita), coffee, chat, citrus fruits and vegetables crops are dominantly found plants in homegardens. According to this study result size area of HG in average 0.56 ha with minimum and maximum size of 0.05 and 1 ha respectively. The homegarden of the study area were characterizing as multi-layered components. The upper layer consists of *Alibiza gumfera* and *Cordia africana*, fruits like mango, avocado and citrus species. In the next lower layer banana, papaya and coffee was recorded. The lower layer consist s food crops maize, spices, tubers, such as potatoes and carrot. The cash plant species of the homegarden in-

cludes coffee, chats, banana and papaya.

Catha edulis is a stimulated major cash crop which its products harvested 2-3 times a year for sale. Cattle, donkey, sheep and goats are domestic animals also integral parts of the homegardens that are managing by farmers. The food crops are the major components in most of the homegardens in the study area with various types of woody species, and primarily aimed to meeting households food needs and highly income generation alike study result of [17-19]. Homegardens of the area is considering as food and cash crop-based plants as described by [20].

3.2.2. Parklands

Intercropping different annual crops under scattered trees is the most common form of parklands agroforestry practice of the study area. In the study sites, a number of scattered indigenous tree species like *Croton macrostachyus*, *Cordia africana*, *Juneprous porcera* and *Acacia* species where found in study areas. This shows that these retained tree/shrub species while converting natural forest to agriculture are the most preferred species by respondent households. Farmers realized that woody species in the parklands generally occur in low density based on site condition and species requirement to minimize competition over annual crops. It provides services like soil fertility improvement, fuel wood, construction wood, and animal feeds as like study done with [21].

3.2.3. Boundary Practices

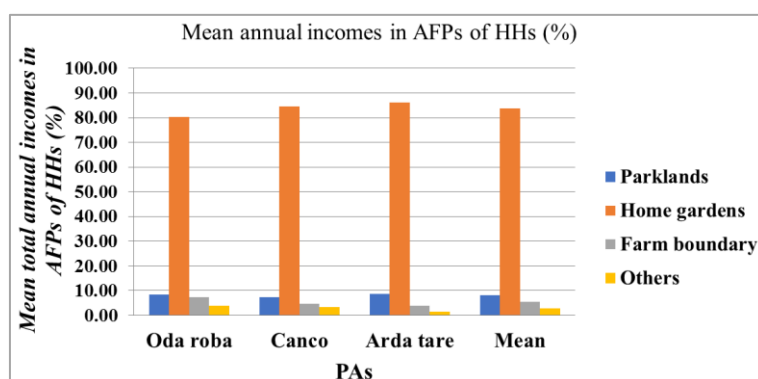
Respondents farmers in the study areas accustomed to plant different woody tree and shrub species along the boundary of their farms to protect their agricultural crops while simultaneously obtaining fuel wood, cash income, lumber, medicinal value, construction wood, fence service

and fodder for animals as like study done with [22, 23]. The majors and important plant species planted in farm boundary by the farmers at the study areas were *Eucalyptus* species, *Jatropha acerifolia*, *Rosa abyssinica*, *Schinus molle*, *Vernonia amygdalina*, *Justicia schimperiana*, *Carissa edulis*, *Euphorbia tirucalli* and *Rubus ellipticus*.

3.3. Mean Annual Incomes and Its Sources of HHs Contributions in Agroforestry Practices (AFPs)

The most common and important specie types or sources of

vitamins in average in all study PAs were woody fruit trees/shrubs which contributed the highest and major sources of mean annual incomes of study HHs such as *Mangifera indica* (mango), *Persea americana* (Avocado), *Psidium huajaval* (zayituna), *Annona senegalensis* (gishita), *Chat*, *Coffee* and others *citrus species* of woody tree/shrub fruits. Some vegetables (carrot and different cabbages) also the sources of incomes and vitamins in study areas and according to their contribution homegardens were the major sources about 83% and the rests from parklands, farm boundary and others agroforestry practices (Figure 2).



**Other= Small-scale woodlots plantation.

Figure 2. Mean total annual incomes and of HHs contributions in agroforestry practices (AFPs) according to respondents in % in study areas.

3.4. Majors Benefits, Types and Its Use Sources Category of Agroforestry and Its Practices

The majors' common and important woody species identified at study KAs and agroforestry practices have a wide range of benefits. Based on the respondents, fourteen different majors' benefits of agroforestry were identified and listed. Such as fuel wood, timber, construction, shade, food, cash generation, farm tools, medicine, fodders and charcoal were identified (Table 2). This result like as the study outputs of [18, 24]. All the assessed and identified woody species provide more than one benefits/uses. The type of majors benefits and its proportion uses of woody species agroforestry components were almost the same and similar among KAs but it

has significant different use of proportion among agroforestry practices for a given benefits types at the study areas. Example about 41% from the total fuel-wood requirement and get from their own land use type comes from homegarden agroforestry practice woody component, about 70% income, and 51% food for their home consumption get from HG. This result like as the study result and reported from Java, it was found that homegardens provided 15-20% of the total fuel-wood requirements of the local households [25] reported that Javanese homegardens provided more than 40% of the whole energy requirement of the local farming communities. Shade, cash generation and foods benefits of HHs were get almost from homegardens which shown agroforestry (homegarden) provides the major livelihood contribution of the study area households.

Table 2. Different mean uses or benefits categories of woody species components within and among agroforestry practices in the study areas according to respondent in %.

Use categories		Share of AFPs in %			Lists of trees/ shrubs woody species used (**)
		HG	PL	FB	
1	Fuel wood	41.3	30.7	28	1, 2, 3, 4, 5, 6, 7, 12, 14, 16, 17

Use categories		Share of AFPs in %			Lists of trees/ shrubs woody species used (**)
		HG	PL	FB	
2	Timber	22.4	40.6	37	3, 4, 6, 7, 9, 13
3	Construction	41	27.6	31.4	5, 7, 8, 10, 11, 12, 16, 17
4	Shade	48	29	23	1, 2, 3, 6, 14, 16, 17
5	Cash generation	70	12	18	3, 5, 6, 7, 8, 9, 12, 13, 15, 16, 17, 18
6	Food	51.6	34.4	14	6, 10, 16, 17, 19
7	Farm tools	42.4	32	25.6	3, 4, 8
8	Medicinal uses	54	14	32	2, 4, 11, 19
9	Fencing	40	24	36	1, 4, 10, 15, 18
10	Charcoal making	21.4	62	16.6	1, 2, 4, 6, 10, 14
11	Soil fertility	32.4	53	14.6	1, 3, 15, 17
12	Fumigation	38	32	30	4, 8, 12, 19
13	Fodder	41	28	31	1, 6, 8, 10, 14
14	Bee keeping	62	21	17	4, 5, 6, 10, 12, 15, 16

**Legend: 1. Acacia species, 2. Albizia gummifera, 3. Cordia africana, 4. Croton macrostachyus, 5. Eucalyptus camaldulensis, 6. Ficus sur 7. Junipures procera, 8. Olea africana, 9. podocarpus falcatus, 10. Syzygium guineense, 11. Prunus africana, 12. Eucalyptus globules, 13. Cupressus lusitanica, 14. Ficus vasta, 15. Coffee Arabica, 16. Mangifera indica, 17. Persea americana, 18. Catha edulis, 19. Citrus spices

*AFP=Agroforestry practices, HG=Home gardens, PL=parklands, FB=farm boundary,

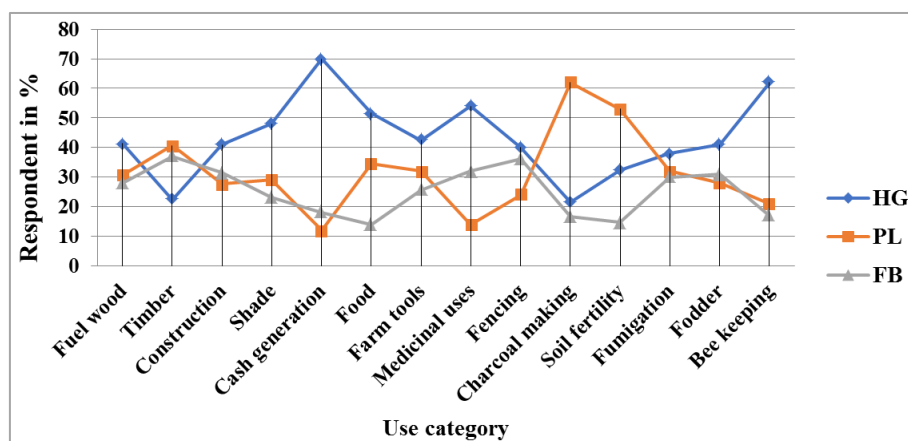


Figure 3. Uses or benefits categories of woody species components among agroforestry practices.

3.5. Contribution of Home Garden Agroforestry and Its Components to Household Income

Farmers in the study area integrate woody fruits, cash crop plants, vegetables, annual crops and livestock's in agro forestry practices components were identified in the study areas. This household survey indicated that around 85% of the mean annual total incomes HHs generated from the sales of

woody species components products of agroforestry practices and homegardens were the major homes of those woody. This study revealed similar trends but less high contributed of homegardens than the study done in Indonesia and Nicaragua, the report showed that homegardens contributed 21.1% and 35% of their total income respectively [26]. The remaining households mean annual income from others agro forestry practices components (such as annual crops, live stocks and others sources). According to the results of this study shown there were different contributions or annual incomes and its

sources of HHs of study areas were identified from some components of agroforestry practices common to the study areas were:

1. Woody species components which included in study (such as *Mango*, *Coffee arabica*, *Chat*, *Avocado*, other some fruits and non fruits woody species). Its mean contributed or accounted about 85% from annual mean total incomes of HHs of the study sites as compared to others income sources in all PAs and HHs wealth category. Indigenous/exotic woody fruit trees/shrubs species in Homegardens are the primary source of income and used as a coping strategy for hunger in the years of famine for Depending upon the climate and other environmental characteristics, there may be peak and slack seasons for harvesting the various products, but generally there is something to harvest daily from most homegardens [6] due to Agroforestry homegardens are highly diverse in species composition, thereby delivering multiple products and services essential for food security, sustaining livelihoods and wellbeing of rural households in Ethiopia [27-29]. And also there is some variation among wealth category of HHs in the study sites (such as 72% in poor and 91% in rich HHs because rich HHs have sufficient lands to incorporated and planted different fruits woody species on their own lands (Figure 4).
2. Livestock productions which included in study like milk, butter, eggs and others sales. Its mean contributed or accounted about 7% from annual mean total incomes of HHs of the study areas as compared to others income sources and agroforestry components in all PAs and HHs wealth category. And also there is some variation among wealth category of HHs in the study sites (such as 3% in rich and 11% in poor HHs because rich HHs have sufficient lands to incorporated and planted different fruits woody species on their own lands and less managements than permanents woody species plants (Figure 4).
3. Annual crops and others productions which most common and included crops in study likes maize, wheat, barley, teff, sorghum and others. Its mean contributed or accounted about 8% from annual mean total incomes of HHs of the study areas as compared to others income sources and agroforestry components in all PAs and HHs wealth category because in general from total annual production harvested by the farmers about 80% were used for foods (domestic consumptions), as seeds sources to sow their lands and others purposes (i.e only about 20% of the total crops production or harvested was sales to local markets in low prices). Its mean amount of annual contribution income share percentage varies among PAs which value range from 3-13% among PA's (Figure 3). And also there is some variation among wealth category of HHs in the study areas (such as 5% in rich and 17% in poor HHs because rich HHs have sufficient lands to incorporated and planted different fruits woody species on their own lands then cultivated annual crops year to year (Figure 4).

In general perennial woody species plants were the major and high finical incomes and foods sources of the most HHs of the study areas because the production and harvesting were sustainably through out of the years (minimum harvested two times or 6-7months per year); fruit tree/shrub species plants were permanents and also farmers used supplemental irrigation.

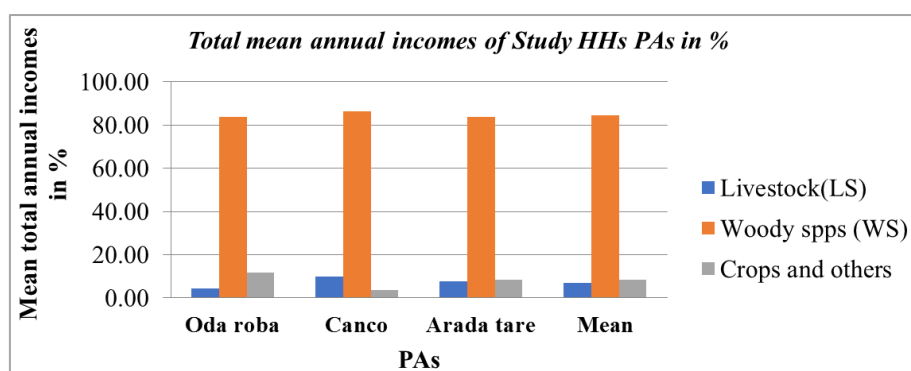
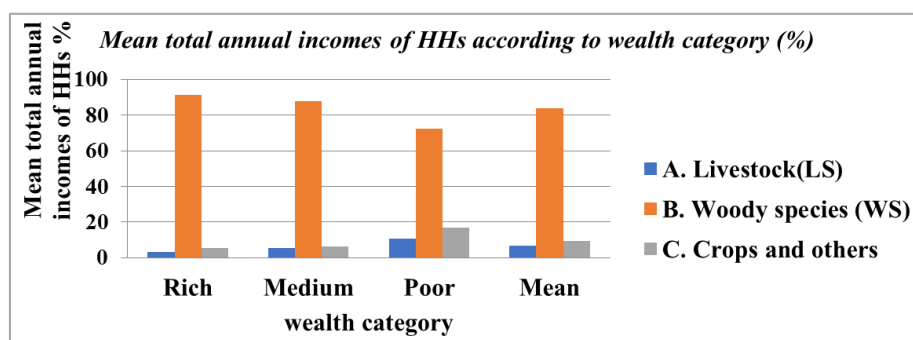


Figure 4. Mean total annual income of HHs (in %) at study Pas.



**Others included vegetables, non-woody fruits (banana, papaya, others)

Figure 5. Mean total annual incomes of HHs (in %) at study sites according to HHs wealth category.

4. Conclusions and Recommendations

The existence of indigenous woody perennials (the basic component of agroforestry practices), commodity crops (coffee and fruit), other types of crops, livestock components integrated together confirm that the HG agroforestry practices and its woody perennial species play a major role in conservation of native woody species which increase HHs income generation for sustaining livelihoods. The role that homegardens play towards income generation is becoming more and more important as population grows and land becomes fragmented. Integration of indigenous/exotic fruits, economically important plants like cash crops tree/shrub woody species in HG AFP components are the leading and primary source of income for most of rural HHs in the study areas may be due to their diversity.

Therefore, based on the findings, the following are recommended.

Woody species which are highly valuable for the farmers and that have no negative effect on the productivity of the crops has to be introduced according to the preferences of the farmers and agro-ecology fitness or adaptation of the species.

It is recommended to encourage the farmers by their extension worker to plant cash crops in the study area for several reasons to generate better income on smaller land areas as compared with food crops and farmers need to focus on high market value

products to secure their livelihood and diversify income.

Abbreviations

AFP	Agro-forestry Practice
DA	Development Agent
FB	Farm Boundary
HH	Household
HG	Home-garden
HGAFP	Home-garden Agro-forestry Practice
KI	Key Informant
PA	Peasant Association
PL	Parkland

Author Contributions

Hirpa Abebe: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing

Zebene Asfaw: Supervision, Validation

Conflicts of Interest

The authors declare no conflicts of interest.

Appendix

Table 3. HHs socio-economic characteristics of the respondents (n=70) at the study site.

Socio-economic characteristics		
Gender	No. of Respondents	%
Male headed	65	92.86
Female headed	5	7.14

Socio-economic characteristics			
Gender		No. of Respondents	%
Age			
	18 – 35	21	30
	36 – 55	36	51.43
	56 – 75	11	15.71
	> 75	2	2.86
Education			
	Illiterate	48	68.57
	Read and write/literate	22	31.43
Family size			
	1 – 2	2	2.86
	3 – 5	18	25.71
	6 – 7	22	31.43
	> 7	28	40
Marital status			
	Single	1	1.43
	Married	69	98.57
Main occupation			
	Agriculture	67	95.71
	Agriculture and others	3	4.29
Wealth status			
	Poor	15	21.43
	Medium	43	61.63
	Rich	12	17.14

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