Adoption Study of Coffee Production Technologies in South West Ethiopia

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Abstract
The study conducted in five districts of Jimma Zone vis-à-vis Limmu Kosa, Gomma, Gera, Mana and Seka chokorsa among where Jimma Agricultural research center has been popularized and disseminated improved technologies of coffee production such as, varieties, agronomic practices, protection and other management options. The level of adoption of coffee production technologies, obstacles for wide adoption of technologies are not yet conducted and there is no genuine information. Both primary and secondary data were used to generate the required information. Three-stage sampling technique was used to generate primary data from 141 smallholder farmers. Respondents were selected by simple random method. The collected data was analyzed using descriptive statistics such as frequency, mean, maximum, minimum and cross tabulation by using SPSS software package. The finding showed that small holder farmers have garden coffee, forest coffee and semi forest coffee which are 32.62%, 15%, 14% and 38.8 % of them have combination of the three coffee farm type respectively. Further, this study showed that selection/CBD resistance, Hybrid and specialty coffee varieties are adopted in the study areas which are 39.86%, 6.52%, 12.32% and 41.3% of the farmers have combination of the three coffee varieties respectively. However, level of adoption of hybrid and specialty coffee varieties are very low. The adoption levels of coffee production technologies were also identified and majority of the technologies are adopted. The chi-square result showed that Economic condition (inflation consequences) and market problems are moderately and significant obstacle for the innovative activities of coffee production technologies to the area studied. The study further showed that CWD, CBD and CBB are a major and series disease that has been out breaking in coffee farm of the study areas. The study suggests policies that will mitigate/eliminate CWD, CBD and CBB and coffee researchers/breeders should play a great role in innovating varieties free of the above stated diseases and that can copy with the impacts of climate change. Further, Extension service should be more and more strengthened so as to expose farmers to modern farming techniques and improved technologies. In this case, stumping of old coffee and using compost is not well practiced and need awareness creation.
Keywords: Adoption, Coffee Wilt disease, Coffee Berry Disease, Coffee Berry Borer and inflation

1. Introduction
Agriculture is the basis of the Ethiopian economy. It accounts about 50 percent of the GDP and 90 percent of the total export revenue and employs 85 percent of the country's labor force. It also provides 70 percent of raw materials requirement of the country's industries (MEDAC, 1999). From the Agricultural sector coffee is now the most important export commodity crop originated in the high land forest areas of south- west Ethiopia. It is the nucleus of the Ethiopia economy accounting 60% of the country's export. About 1.2 million coffee farmers with their 15 million households directly or indirectly depend on coffee for their livelihoods (Oxfam International, 2002). New agricultural technology plays catalytic role in agricultural development. In view of this, different improved agricultural technologies were also extended to farmers through agricultural research centers under Ethiopian Institute of Agricultural research (EIAR).

Jimma Agricultural Research Center is found under Ethiopian Institute of Agricultural Research and established around 50 years ago; Excellency by Coffee research, as well as, it is coordinating coffee research as a national level. It has also a great role in innovation, adaptation, scaling up and dissemination of different agricultural technologies to the end users. Particularly, Coffee is the major commodity which has been under taking in Jimma agricultural Research center (JARC).Different coffee production technologies including varieties, agronomic practices, protection, processing practices and managements were extended to the farmers and other stakeholders throughout the country since four decades ago(Adamsu, Zakarias and Tsegay, 2002 and 1992).However, despite the needs to expand wide spread of coffee production technologies, no studies were conducted to assess the level of adoption and identify obstacles for wide adoption of the technologies in south west Ethiopia. Taking these gaps in to consideration, the research was conducted in Jimma Zone, south west of Ethiopia.

1.1 Objectives
The aim of the study to explore the adoption of coffee production technologies and addressing the following specific objectives:
 ➤ To measure the level of adoption of released coffee technologies

> ➤ To identify obstacles of wider adoption of the technologies
> ➤ To identify future desirable intervention areas and farmers interests with regard to coffee
>   production

2. RESEARCH METHODOLOGY

2.1. Description of the study area

The proposed study was conducted in five sub-districts in Jimma Zone in 2014 in Mana 22 km Northeast, Seka chekorsa 20 km in Southeast, Gera 70 km south west ,Limmu Kosa 70km north west, and Goma 35km north east from Jimma town . Jimma Town is the capital of the zone that is 345 km far away from Addis Ababa, capital city of Ethiopia. The study areas were selected from potential coffee producing area. Jimma Zone is one of the 20 administrative zones in Oromia Regional State, is divided under 18 administrative districts with 2.5 million populations from which 94% are rural inhabitants. The Zone covers total areas of   19,300km^2 that receive reliably good rains ranging from 1,200–2,800 mm per annum.From the total land of the zone, coffee land covers 274423hectare among this 94597 hectares are currently on production(Jimma Zone Agricultural Bureau report,2015). The zone has large areas of potentially cultivable and irrigable lands. In 1999/2000 about 45% of the total zonal area was arable (of which 30% was under cultivation); 14% grazing and 27% forest land (including bushes and shrubs). The zone is classified in to three agro-climatic zones: kolla (14.9% - highland); woina dega (64.6% - mid highland); dega (20.5% - lowland). High forest, woodland, riverine, shrub and bush, and man-made forests are all found in the zone .Subsistence farming is the dominant form of livelihood in the area where only 15% of the population is in non-farm related jobs. The area has suitable agro-ecological potential with the lowest drought risk rating in the country. Cereals (maize, teff - *eragrostistef,* sorghum and barley), pulses (beans and peas), *cash crops* (coffee and khat-*cathaedulis),* and root crops *(ensetventricosum-*false banana and potato) are the major crops produced in the area. Different fruits and vegetables are also commonly grown where home-gardening by small holder families was observed to increase household income and food security.

2. 2. Sampling Techniques

Three-stage sampling techniques were employed. At the first stage, five districts were selected purposively by the criteria of area coverage and major coffee producing areas of Jimma zone. In this backdrop, all the selected districts are among the place where Jimma Agricultural research center has been popularized and disseminated improved technologies of coffee production viz, varieties, agronomic practices, protection and other management options of coffee production. Kebles/ peasant associations and respondents were selected randomly at second and third stage respectively. Finally total of 141 respondents were prepared for the face to face interview.

2.3. Data collection methods

Both primary and secondary data were used for this study. Primary data related to personal, socioeconomic, technology-specific variables and other relevant data were collected. Secondary information from published and unpublished documents and reports from relevant organizations were gathered to supplement primary data. Primary data were collected using quantitative approach by means of household survey. The qualitative method of data collection was also employed. It consisted of in-depth open-ended interviews, direct observations and written documents. The interview method was mainly emphasized. Group discussion and individual interviews were held to have reactions of the farmers concerning their detail experiences and their perceptions of the technology and their priority problem. Discussions with districts experts of the agricultural office and key informants were also conducted.

2.4. Data analysis and summarizing methods

The collected data were analyzed using descriptive statistics such as frequency, mean, maximum, minimum and cross tabulation by using SPSS package. Further, the results were summarized by charts, graphs and tables.

3. Result and Discussion

Fig: 1.Sampled Households' characteristics and Demography
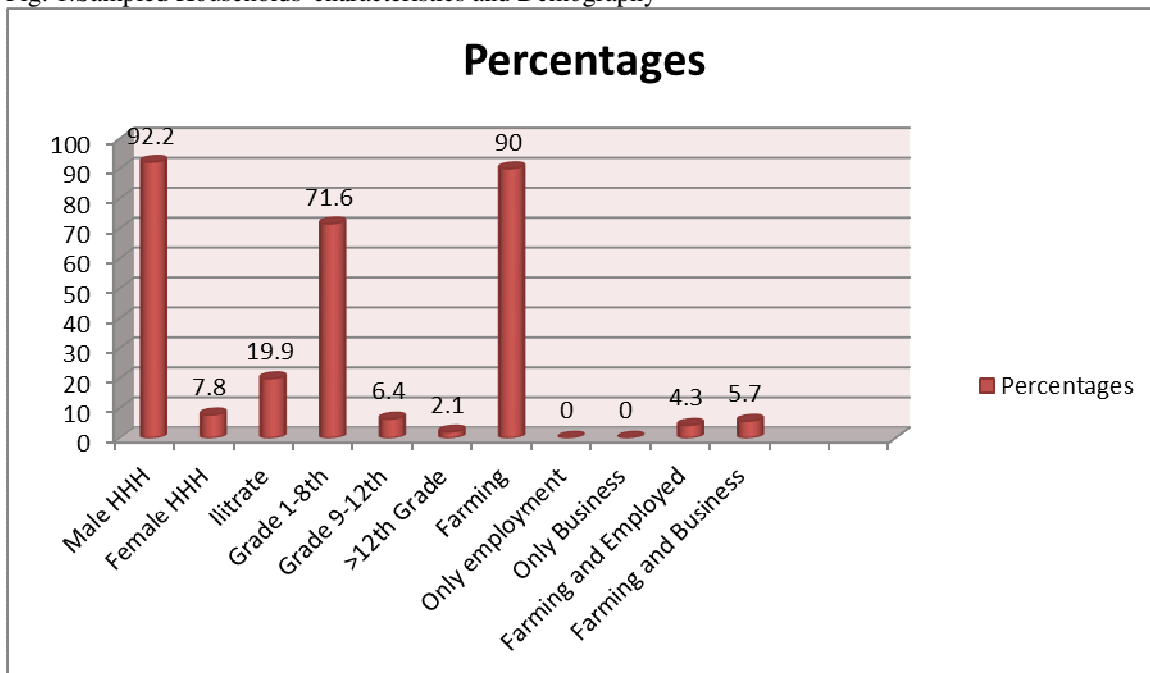
The study consists of organized composition of the five districts ' respondents of a total of 141.The respondents are a combination of both male and female household head which are 92.2% and7.8%respectively. The average age of the respondents is 45 years and the minimum and maximum age is 21 and 72 respectively. The education levels of the respondents are categorized as illiterate, grade 1-8th, grade 9-12th and > 12 which are 19.9%, 71.6%, 6.4% and 2.1% respectively. *Majority of our respondents are between grade one up to grade eight which may support the hypothesis of the literacy level have positive impact on the adoption of new technologies. The finding of this study is consistent with many of the previously conducted studies. For example, Itana, 1985; Chilot et al., 1996; Kansana, 1996; Asfaw et al., 1997; Mwanga et al., 1998 and Tesfaye et al., 2001 have reported positive and significant relationship of education with adoption.* Major occupation of the respondents are farming which accounts 90%, farming and employed as well as farming and own business 4.3% and 5.7% respectively are the farmer's other optional income generating activities.

Fig 2. Description of type of coffee farm of the Households
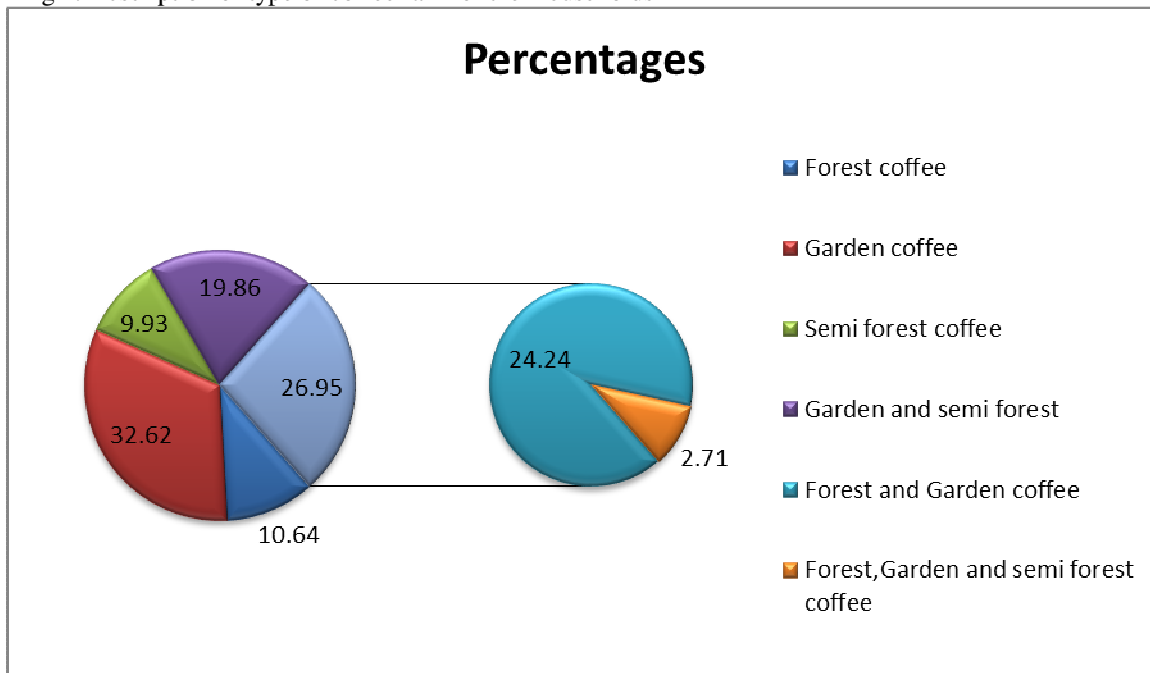
According to evidence obtained from policy analysis and Economic research team forum organized by

Ethiopian commodity exchange authority in 2008, smallholder farmers, with 1-2 hectares of land, produce most of the coffee in Ethiopia. According to this source, forest coffee accounts for about 10 percent, semi forest coffee for about 35 percent, garden coffee for about 35 percent, and plantation for about 15 percent (5% government, 15% private) of total coffee production in Ethiopia. The result of this study also showed that an almost similar idea which indicates, garden coffee is the major coffee farm of the respondents. Next to Garden coffee the households have been planting coffee at forest and semi forest (Figure above).

Fig 3. Adoption level of improved coffee varieties of the sampled Households
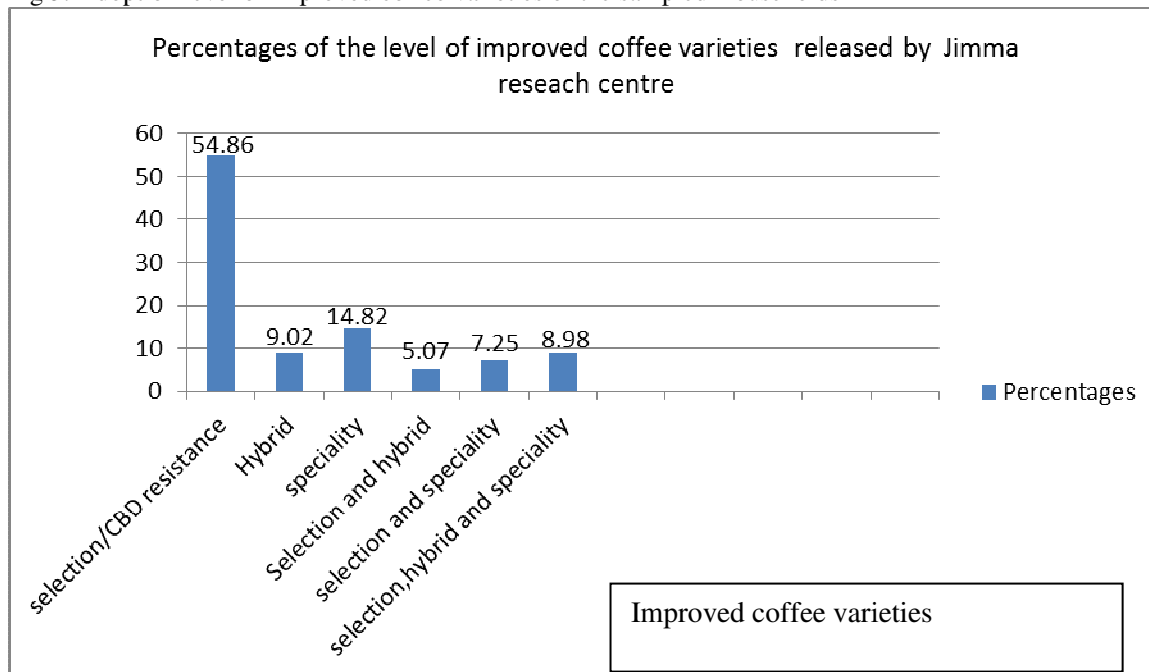
As indicated on the above figure, majority of sampled household has been using selection/CBD resistant variety. The adoption level of Selection/CBD resistant variety is high as compared to other which is 54.86%. CBD resistant variety and specialty coffee takes 9.02% and 14.82% level of adoption near the sampled households. The finding this study also showed level of adoption of hybrid and specialty coffee varieties are very low.

Fig 4. Level of Adopted coffee production technologies of sampled household (N=141)
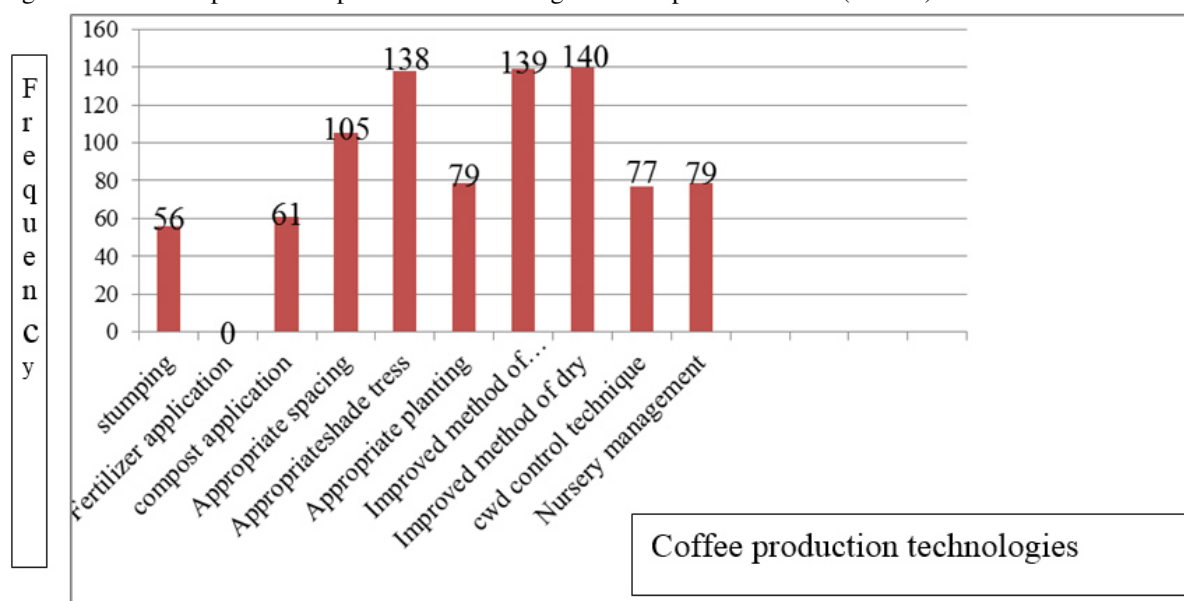
As indicated on the above graph, many of coffee production technologies have been well adopted by sampled households. Nevertheless, some coffee production technologies' adoption level is minimum as compared to others. The culture of old coffee stumping and compost application is less practiced by sampled households. As the evidence of this study shows, application of fertilizer for coffee production is not totally

accepted by a single of sampled households of the study areas.
Fig 5.Source of information of coffee seed/seedling
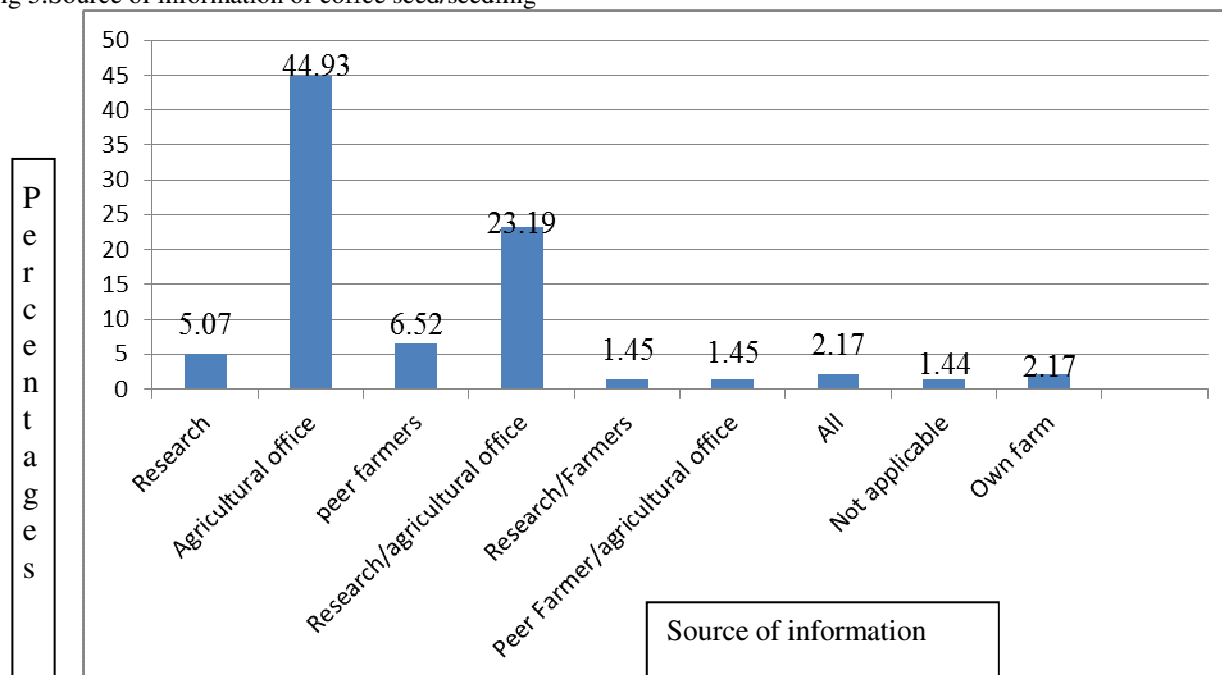
As it can be seen from the above graph, the sample households have been getting improved coffee seed/seedling from government organizations, fellow farmers and from their own source. The finding of this study showed as, major source of coffee seed/seedling is from district agricultural offices. However, the usual source of improved coffee seed is from Agricultural Research (Jimma Research center).This contradiction of statement is emerged from lack of awareness of respondents as district agricultural offices have been getting coffee seed from research center. In a nut shell, the percentages of source of seed from peer farmers and own source of sampled households is low. It can be concluded from the study as the culture of coffee seed preparation by the farmers is not much practiced in the study areas this on the other hand probably be the causes of imbalance of demand and supply of the technology among farmers.

Table 1. Sampled household to access to coffee production technologies

Access parameters	Frequency		P-Value
	Yes	No	
At right time	61	78	0.149
Quantity needed	50	89	0.001
Quality needed	51	88	0.002
At right Price	47	92	0.000
At right place	60	79	0.107

Access to agricultural technologies play a great role in increment of adoption level. The more the farmer's access to agricultural technologies, the more they probably adopt. As indicated on the above table, sampled households have no access to coffee production technologies at right price. Access to quality and quantity needed of coffee production technologies is also reported as a problem to the study areas.

Fig 6.Household knowledge on incidence of pest and disease in coffee farm. (N=141)

Knowledge on incidence of pest and disease
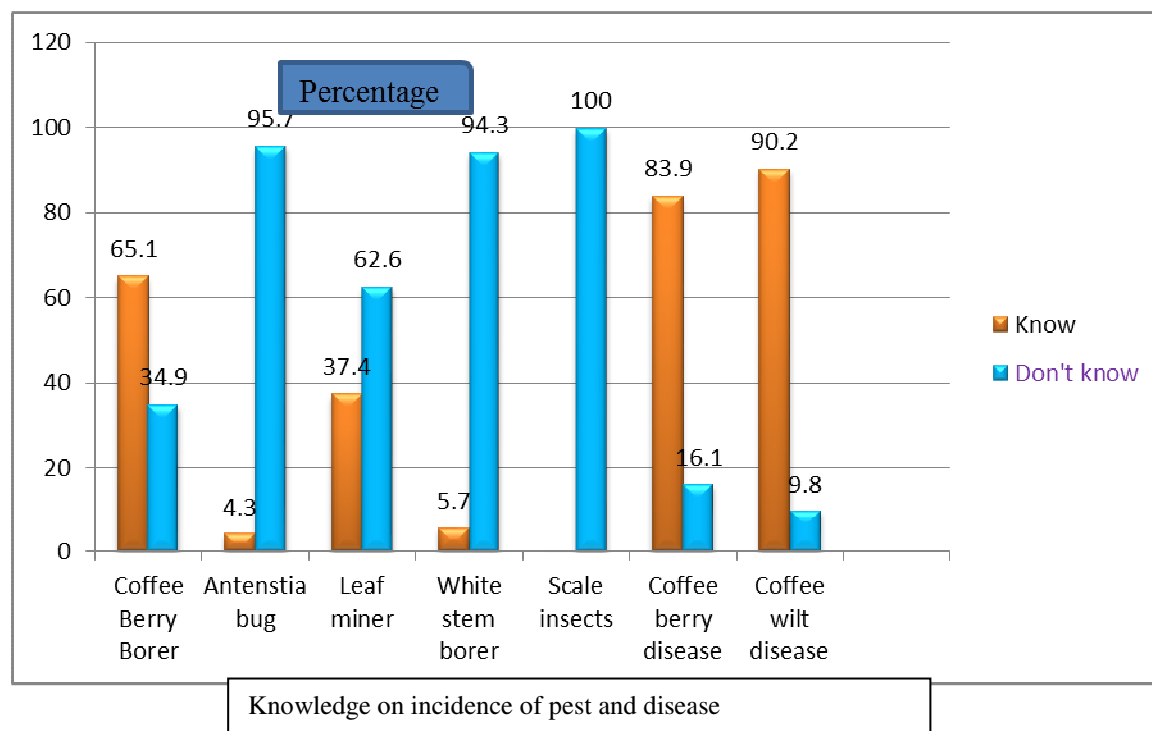
Sampled households were also interviewed on their knowledge of incidence of pests and disease occurrence in their coffee farm. As mentioned on the above graph, coffee berry borer, coffee berry disease and coffee wilt diseases are the major and most known coffee disease types which have been out breaking in coffee farm of the sampled households. Around 37.4% of respondents responded as leaf miner is also other disease that is appearing in their coffee farm. However antenstia bug, scale insects and white stem borer types of pests are not much known to the areas.

Table.2 Rate of prevalence pest and disease in coffee farm

	Insignificant		Medium		significant		very significant	
Diseases	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Coffee berry borer	23	27.7	19	22.9	22	26.5	19	22.9
Antenstia bug	-	-	3	75	1	25	-	-
Leaf miner	11	25	10	22.7	17	38.6	6	13.6
Scale insects	4	100	-	-	-	-	-	-
White stem borer	5	55.6	-	-	2	22.2	2	22.2
CBD	26	27.1	18	18.8	20	20.8	32	33.3
CWD	15	12.6	20	16.8	19	16	65	54.6

As indicated on the above table, as compared to others, the rate of prevalence of coffee berry borer, coffee berry disease and coffee wilt diseases are very significant. As showed on the table above, sampled households responded as, coffee wilt disease' and Coffee berry disease ' rate of prevalence is very significant which are 65% and 33.3% respectively.

Table 3. Obstacles to innovative activities of coffee production technologies

Parameters	Not problem		Less		Moderate		Very significant		P-value
	Freq	%	Freq	%	Freq	%	Freq	%	
High cost of technology package	78	55.3	27	19.1	15	10.7	21	14.9	0.000
Lack of credit	87	61.7	27	19.2	9	6.3	18	12.8	0.000
Lack of extension personal on coffee	90	63.6	34	24.3	7	5	10	7.1	0.000
Labor	68	47.5	19	13.7	18	12.9	36	25.9	0.000
Lack of information on technology it self	82	57.6	35	25.2	18	12.9	6	4.3	0.000
Economic condition	17	10.8	36	25.9	52	37.4	36	25.9	0.000
Shortage of technology supply	43	29.5	29	20.9	38	27.3	31	22.3	0.46
Market problems	41	28.6	18	12.9	42	30	40	28.6	0.011
Climate change	50	35	38	27.1	39	27.9	14	10	0.000

Some explanatory variables were introduced in the questionnaire to dig out obstacles to innovative activities of coffee production technologies. In this backdrop, high cost of technologies, lack of extension of personal on coffee, labor, lack of information on technologies and climate change are not a significant obstacle for innovative activities of coffee production technologies to the study areas. However, Economic condition (inflation consequences) and market problems are moderately and significant obstacle for the innovative activities of coffee production technologies to the area studied. Further, shortage of technologies is not significant obstacles to innovative activities of coffee production technologies.

4.Conclusion and Recommendations
4.1 Conclusion
The study revealed that selection /CBD résistance, hybrid and specialty coffee varieties are adopted by the farmer of study areas. However, level of adoption of hybrid and specialty coffee varieties are very low.

Majority of coffee production technologies are well adopted. However, level of adoption of agronomic practices such as stumping, fertilizer application and culture of compost application are low.

Access to agricultural technologies play a great role in increment of adoption level. The more the farmer's access to agricultural technologies, the more they probably adopt. The study showed, sampled households have no access to coffee production technologies at right price. Access to quality and quantity needed of coffee production technologies is also reported as a problem to the study areas.

Culture of coffee seed preparation by the farmers is not much practiced in the study areas; this on the other hand probably be the causes of imbalance of demand and supply of the technology among farmers.

High cost of technologies, lack of extension personal on coffee, labor, lack of information on technologies and climate change are significantly not obstacles to innovative activities of coffee production technologies to the study areas. However, Economic condition (inflation consequences) and market problems are moderately and significant obstacles to innovative activities of coffee production technologies to the areas studied

Coffee berry borer, coffee berry disease and coffee wilt diseases are the major and most known coffee disease types which have been out breaking in coffee farm of the sampled households and the rate of prevalence of the diseases are very significant. However farmer's awareness on control measure of the diseases is very limited.

4.2. Recommendations
Wide popularization and dissemination of hybrid, speciality and others coffee varieties released by Jimma Agricultural Research centre should be taken in to consideration by extension section of the research and other stakeholders (District and Zone Agricultural offices).

Adoption level of stumping of old coffee technology and compost application in the coffee production system is very low and should be strengthen through awareness creation by training and practical activities.

More emphases should be given to provision of quality and quantity of improved coffee seed/seedlings so that the interest of farmers can be fulfilled.

To balance the high demand of improved coffee seed by producer and scarcity to supply, the culture of coffee seed preparation by the farmers and private investors should be empowered by the government and other stakeholders.

Disturbance of coffee market in which the price of coffee is volatile at national and international market is playing a role against the household's livelihood. In the season when price of coffee fall down, the farmers start to feel economic crisis and this may probably enforce them not to allocate resources for coffee production

technologies. Further, tax collection season is also identified as a great factor to sale coffee at the time when the price is not announced. This caused to sale at low price and reduced farmers income, consequently, resource allocated for further utilization of the technologies decreased. So that, a solution (subsidy) should be kept by the government in case there is a fall down of coffee price at national and international market. This will encourage the producer to continue the production sustainably. Further, tax collection season should not be before the coffee price is announced and there should be some correction of the season by the government near coffee based livelihood farmers.

CBD, CWD and CBB are identified as the major and dangerous diseases wide spreading in coffee farm of the farmer. This should be a great agenda for the government in which further research is crucial on control measure for sustainability of coffee production.

5. References

Forty years coffee diversity (Adamsu, Zakarias and Tsegay, 2002 and 1992).

A study of coffee and household economy in two districts of Ethiopia. Celia Petty, John Seaman and Nisar Majid with Floor Grootenhuis, Save the Children UK, march, 2004 page 9-10

Itana Ayana, 1985. An Analysis of Factors Affecting the Adoption and Diffusion Patterns of

Package of Agricultural Technologies in Subsistence Agriculture: A Case Study in Two Districts of Ethiopia. M.Sc. Thesis presented to School of Graduate Studies of Addis Ababa University.

Asfaw Negassa, K., Gungal, W., Mwangi, and Beyene Seboka, 1997. Factors Affecting Adoption of Maize Production Technologies in Ethiopia. Ethiopian Journal of Agricultural Economics, Vol. 2: 52-69.

Chilot Yirga, Shampiro, B.I, and Mulat Demeke, 1996. Factors Influencing adoption of new wheat technologies in Wolmera and Addis Alem Areas of Ethiopia. Ethiopian Journal of Agricultural economics. 1:63-83

Tesfaye Zegaye, Girma Taye, D. Tanner, H. Verkuijl, Aklilu Agidie, and W. Mwangi, 2001. Adoption of Improved Bread Wheat Varieties and Inorganic Fertilizer by Small Scale farmers

Tesfaye Zegeye and Shiferew Tesfaye, 2001. Determinants of adoption of maize technologies and inorganic fertilizer in Southern Ethiopia. Research Report No. 39. Ethiopia Agricultural Research Organization (EARO). 54p.

Nkonya, E., T. Schroeder and D. Norman, 1997. Factors affecting adoption of improved maize seed and fertilizer in North Tanzania. *Indian j. Agri.econ.*
48(1):1-12