

Adoption and Impact of Coffee Production Technologies in the Case of Western Ethiopia

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Abstract

Although Jimma Agricultural Research Center has been disseminating and popularizing lots of coffee production technologies to the farmers, the level of adoption and its impact was not well known and till not output delivered in this regard. Having understood this gap, the study has been conducted in order to identify and know the level of adoption as well as prevailing impacts of these technologies in the livelihood of farmers in Western part of Ethiopia (N=133) purposively in three Districts based on its potential of coffee production. Generally, study result shows that adoption level of coffee production technologies in three districts is in good progress. The mean yield components of each coffee variety identified and the source of coffee technologies assessed. Also types of coffee farms were detected such as garden coffee, semi-forest coffee and forest coffee from which farmers who have both garden and semi forest coffee took the largest proportion. Moreover, coffee agronomic management practices have been largely adopted in all districts. Climate change, adversely affecting coffee production and productivity in the study area. Adopting coffee production technologies have made a tremendous contribution in the saving, children access to formal school, and generally livelihood of majority of farmers. Coffee price over the last 10 years has been dynamic. Most of the farmers have been using both family and hired labor for coffee production. Women participation in coffee farming and production was not that much relatively from men and children. Further extension effort need to be exerted in order to upgrade the adoption level of coffee production technologies. Besides, climate change mitigating strategies, drought and pest resistant coffee varieties have to be released.

Keywords: Adoption, Impact, Coffee, Technology, climate change, Extension

I. INTRODUCTION

Coffee is one of the most important commodities in the international agricultural trade, representing a significant source of income to several countries of Africa, Asia and Latin America. Despite its importance, the value of coffee produced from Africa, including Ethiopia has declined considerably over the years due to lack of sustainability and poor competitiveness of the sub-sector at the national and international markets. For example, Africa's production fell by 18.5% and its share of world production fell accordingly and down by 1.5% for the crop year 2008/9 and 2009/10. This is primarily ascribed various problems, including in adequate access to improved production and processing technologies, together with deficient services, poor market access, and lack of incentives(ICO, 2009).

Ethiopia is a leading Arabica Coffee producer in Africa, ranking the fifth largest Arabica Coffee producer and tenth in Coffee export worldwide. Its total Coffee production and export respectively increased by 107% and 226% for the crop year 2009/10 and 2010/11 (ICO, 2011). In Ethiopia Coffee had been and still contributes to the lion's share in its national economy being the leading source of foreign exchange earnings. Besides, the livelihood of a quarter of Ethiopian population directly or indirectly depends on different processes of production and marketing along the Coffee value chain (Girma et al., 2008).

Jimma Agricultural Research Center as a mandate and center of excellence for coordinating coffee Research projects to be implemented nationwide, has generated and released a lot of improved coffee production technologies and packages over the last four Decades and also has been disseminating, popularizing and extending these technologies to the end users, farmers. However the level and extent of adoption of these technologies and its impact on the livelihood of farmers in a range of coffee production areas not well known. Considering this gap this work tried to analyze, assessed and viewed Adoption of Coffee technologies and its impact in Western coffee growing areas of Ethiopia.

A. Objectives of the Study

1. General Objectives:

- To identify the level of adoption of released coffee technologies
- To study prevailing impacts of using coffee technologies on farmers income and livelihood patterns

2. Specific Objectives:

- To identify future desirable intervention areas
- To identify farmers attitudes with regard to coffee production and productivity.

II. RESEARCH METHODOLOGY

A. Description of the Study Areas

Gimbi is a district in western Ethiopia and it is located in the West Welega Zone of the Oromia Region, it has a latitude and longitude of 9°10'N 35°50'E / 9.167°N with an elevation between 1845 and 1930 meters above sea level. Coffee is an important cash crop of this district. Over 5,000 hectares are planted with this crop. The total population for this district is 74,623 in 14,925 households, of whom 36,708 were men and 37,915 were women. The majority of the inhabitants observed Protestantism with 65.37% as their religion, while 28.76% observed Ethiopian Orthodox Christianity and 4.12% were Muslim.

Haru is one of the 180 districts in the Oromiya Region of Ethiopia. Also, Coffee is an important cash crop of the district and over 50 square kilometers are planted with this crop. This district has an estimated total population of 74,657, of whom 38,375 are men and 36,282 are women; 5,988 or 8.02% of its population are urban dwellers, which is less than the Zone average of 10.9%. With an estimated area of 448.75 square kilometers, Haru has an estimated population density of 166.4 people per square kilometer, which is greater than the Zone average of 91.7.

The largest ethnic groups reported in Haru were the Oromo (99.26%). Oromiffa was spoken as a first language by 99.61%. The majority of the inhabitants observed Ethiopian Orthodox Christianity, with 54.33% reporting that as their religion, while 40.21% were Protestant, 2.95% were Muslim, and 1.81% observed traditional beliefs.

Anfillo is one of the districts in the Oromiya Region of Ethiopia. It is part of the Kelem Welega Zone, Anfillo is bordered on the southwest by the Gambela Region, on the north by Jimma Gidami, on the northeast by Yemalogi Welele, and on the east by Sayo. The major town in Anfillo is Mugi. Similarly, coffee is an important cash crop of this woreda. Over 50 square kilometers are planted with this crop.

Total population for this district of 55,847 in 10,254 households, of whom 28,312 were men and 27,535 were women; 4,908 or 8.79% of its population were urban dwellers. The three largest ethnic groups reported in Anfillo were the Oromo (89.66%), the Amhara (4.6%), and the Mao people (4.46%). Oromiffa was spoken as a first language by 95.41%, 2.92% Amharic, and 0.64% speak Mao one of the northern group of Omotic languages; the remaining 1.03% spoke all other primary languages reported. The majority of the inhabitants observed Ethiopian Orthodox Christianity, with 58.47% reporting that as their religion, while 31.4% were Protestant, and 9.7% Muslim.

B. Sampling Techniques

Multi-stage sampling techniques were employed. Firstly districts purposively selected based on its high potential of coffee production relatively from the rest of other districts available. Secondly, peasant association in the districts and respondents have been also considered on the basis of randomized method of selection

C. Method of Data Collection

Well structured and formal questionnaire were drafted and pre-tested and checked out its consistency, reliability, fitness and unbiasedness circumstances. Both primary and secondary types of data have been collected. Secondary data taken from agricultural offices of each districts as complementary data where as primary data captured direct face to face interview in formal and structured questionnaire along with group discussion.

D. Method of Data Analysis

The data collected from the respective districts were arranged and coded then after data entry template well prepared so that entry was accomplished genuinely. After data entry, data cleaning undertaken and followed by analysis using descriptive Statistics such as frequency, percentage, cross tabulation, mean, standard deviation etc.

III. RESULT AND DISCUSSION

Table 1. Respondents self perceptions of as adopted or not, improved coffee production technologies.

Response	Woreda /Districts			Freq.	%
	Anfillo	Gimbi	Haru		
Yes	48	15	43	106	79.70
No	6	5	16	27	20.30
Total	54	20	59	133	100

Source own survey result (January, 2014) The table showed in general from the study areas of three Districts and out of one hundred thirty three respondents/133/ one hundred six respondents have adopted improved coffee technologies where as twenty seven did not adopt the technologies. In other words, 79.7% adopted the technologies on the contrary, 20.3% couldn't adopt it. Talking and simplifying specifically each District, in Anfillo 48 farmers out of 54 have adopted and utilized coffee technologies, while only 6 farmers couldn't not be able to adopt the technologies. In Gimbi District also out of 20 respondents 15 were adopters and 5 farmers' non adopters. Similarly, in Haru District from 59 farmers 43 adopters and 16 non- adopters.

Table 2. Adopted coffee varieties, year and yield

Varieties	Freq.	%	Yield Q/Ha	Year of plantation
74110	47	35.3	24.05	1977
74112	1	.8	14.00	1979
Farmers Unknown/unidentified varieties supplied by CIP	44	33.1	14.06	1978
744	2	1.5	25.50	1978
75227	1	.8	15	1999
7454	3	2.3	20	1991
7440	1	.8	20.00	1983
741	4	3.0	18.50	1989
na	11	8.3	12.00	1991
Na	18	13.5	19.41	1982
Total	133	100.0		

Source own survey result (January, 2014) Note: na=not available/missing

Na= not applicable

CIP= not coffee varieties rather coffee types/technologies provided by CIP project.

This table showed us a sort of coffee varieties and which varieties have been adopted by farmers, year of adoption and average yield obtained at their farm level. As it was indicated above table the most considerably adopted coffee varieties or technologies are 74110 released and popularized from Jimma Agricultural Research Center and coffee types, varieties or technologies given and made accessed by CIP project that is unspecified and well known by farmers. On yield component the maximum average yield was obtained from the coffee varieties 74110&744 from the available and adopted technologies and accounts 24.03 q per hectare and 25.5q/ha respectively.

Table 3. Sources of coffee production technologies:

Source	Freq.	Percent
Research center	2	1.5
Agri. Office	104	78.2
Farmers exchange	6	3.8
Research & Agri Office	11	7.5
Others	2	1.5
Agri Office & farmers exchange	4	2.3
na	1	.8
Na	3	1.5
Total	133	100.0

Source own survey result (January, 2014) As has been seen from the table 78.2% source of coffee production technologies either directly or indirectly was Agricultural Offices. even though , the huge rate for agricultural offices, it could be able to be understood that agricultural offices got those technologies in one way or another is from Research Centers, this situation made the proportion or contribution of JARC as low as very much.

Table .4.Type of coffee farm

Type of coffee farm	Freq.	Percent
Forest	4	3.0
Garden	32	24.1
Semi-forest	41	30.8
Garden & semi-forest	54	40.6
Forest, garden and semi forest coffee	2	1.5
Total	133	100.0

Source own survey result (January, 2014) In the study areas it was tried to be identified coffee production system has been based on three categories forest, semi-forest and garden coffee production. As showed on the table, 40.6% of farmers has had both garden and semi-forest coffee and producing coffee under these categories' and 30.8% only have semi-forest coffee where as 24.1% of farmers are garden coffee producers. Moreover, those who have the three production system are not more than 1.5% and also forest coffee producers were 4%.

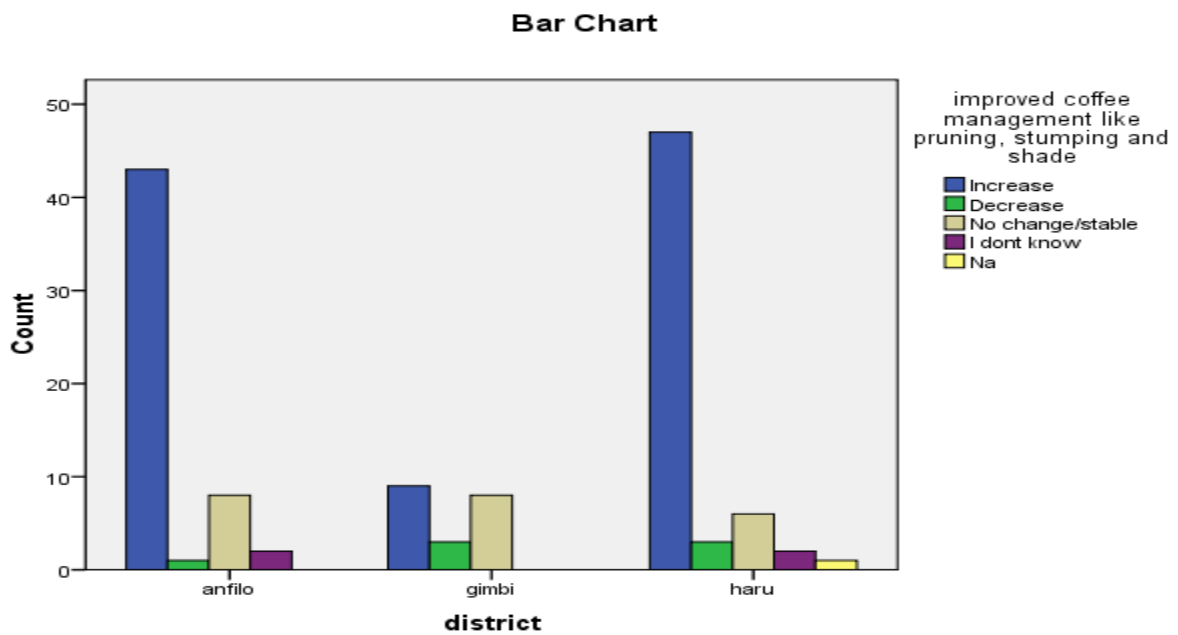


Fig.1 Dynamics of improved coffee mgt like pruning, stumping and coffee shade trees *Source own survey result (January, 2014)* Improved coffee management like pruning, stumping and shade trees in two Districts Haru and Anfilo have been increasingly become adopted and well exercised on farmers' field. In Haru nearly 50 respondents out of 59 have been increasing practices of improved coffee management and similarly, around 45 farmers applied out of 56 respondents. The least practicing was Gimbi not more than 10 farmers have done it. Relatively Haru District has taken the rank in practicing these important improved coffee management parameters .

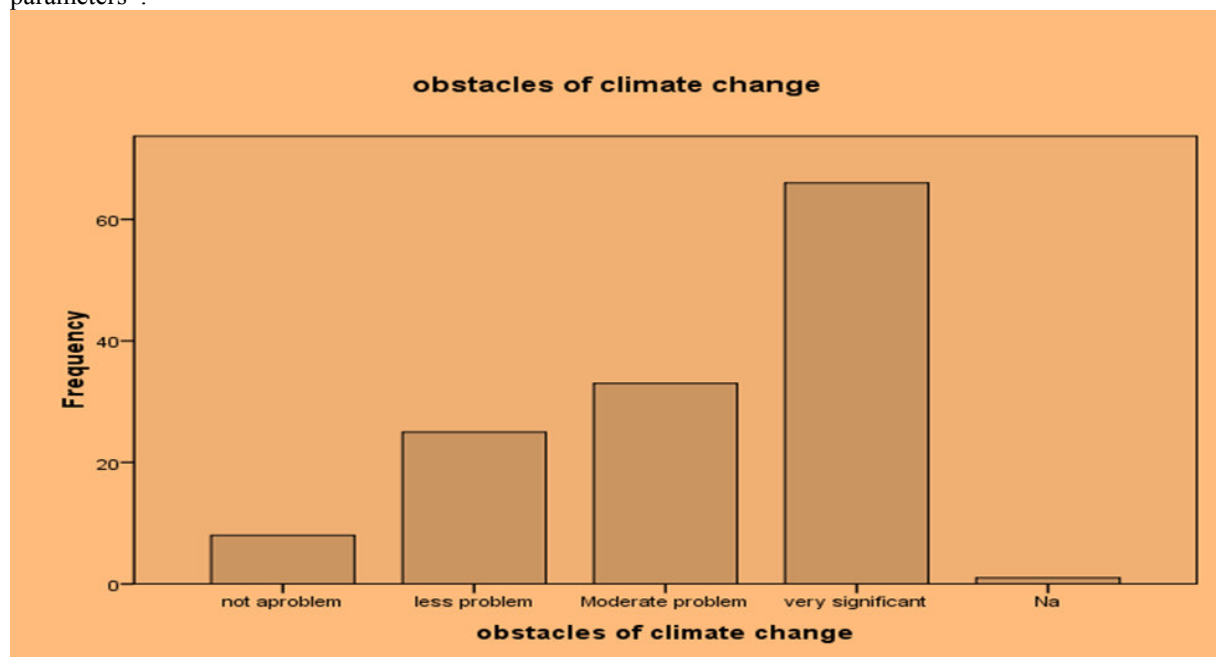


Fig 2. Perception of climate change adverse impacts on coffee production *Source own survey result (January, 2014)* More than 66 respondents out of 133 or around 50% have been very significantly affected by climate change in their coffee production and productivity. 40 respondents expressed that climate change moderate problem upon coffee production and nearly 25 respondents also said it was less problem and 15 farmers responded that climate change couldn't be able to a problem over the past years.

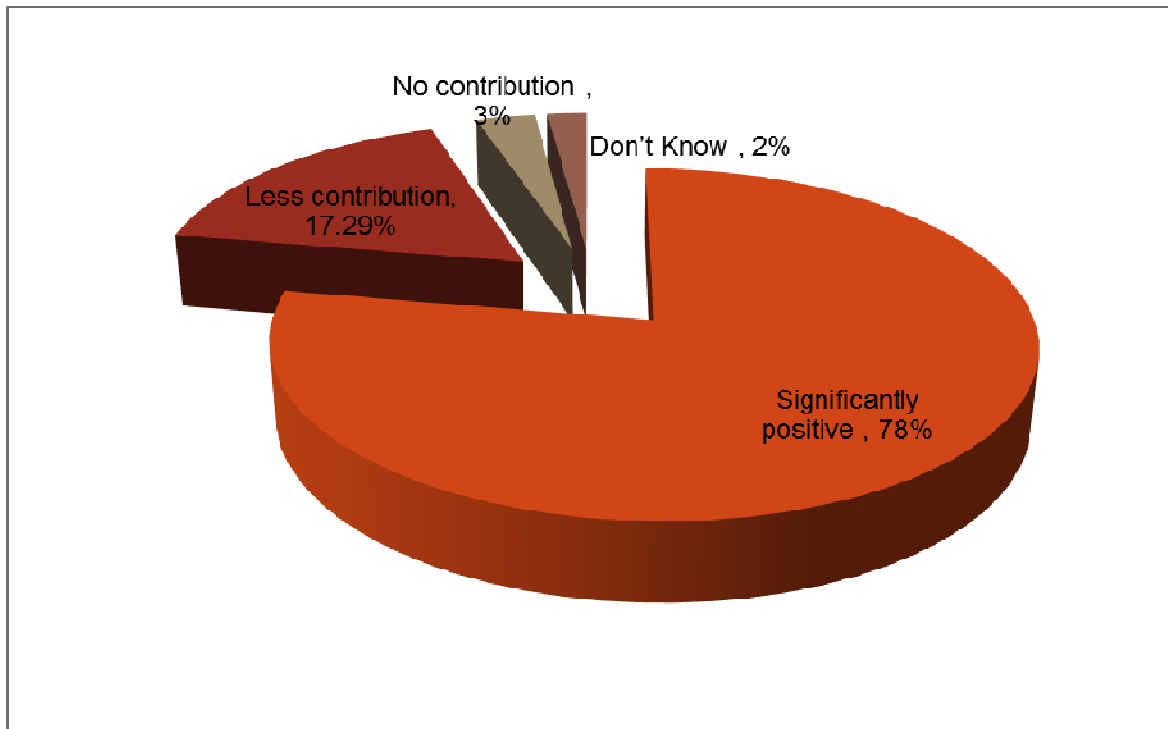


Fig 3. Contribution of using coffee technology to the livelihood of farmers for the last 20 years.

Source own survey result (January, 2014) The graph showed the contribution of coffee technologies to the livelihood of farmer's over the last 20 years. As indicated above about 78% of the respondents or farmers Livelihood has been positively impacted from using coffee technologies. 17.29% less contribution and 3% no contribution obtained from coffee technologies.

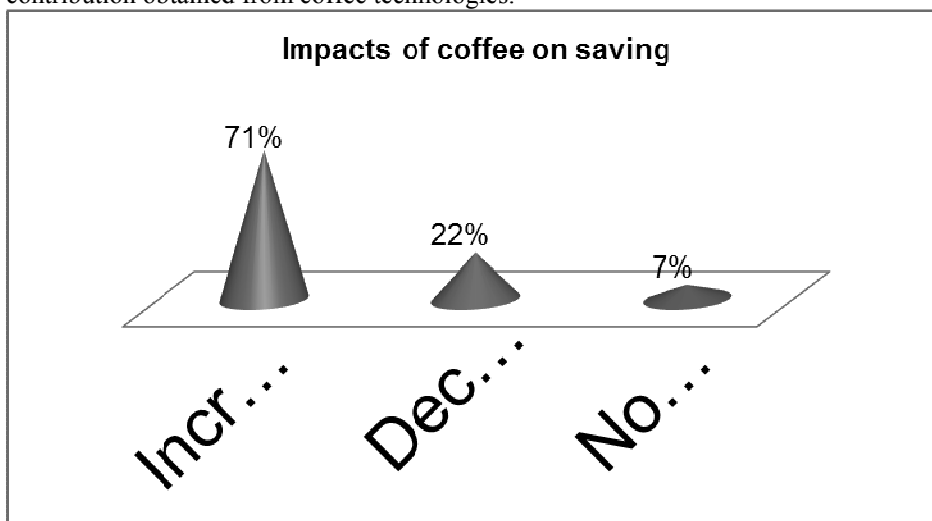


Fig 4. Impact in terms of saving parameter

Source own survey result (January, 2014) This graph showed how much improved coffee technologies made contribution on farmers saving that means 71% of farmers or respondents saving culture improved on account of using coffee technologies. As coffee is a cash crop farmers could be able to increasingly opening saving account and started saving and deposit money in the bank. 22% less likely impacted and 7% no impact at all from improved coffee production technologies .

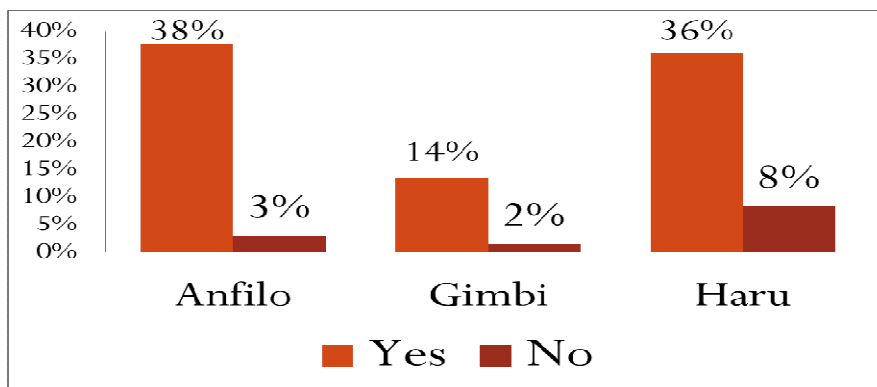


Fig 5. Over the last five years coffee production positively impacted on children school attendance

Source own survey result (January, 2014) Using improved coffee production technologies has positively impacted its own share on farmers' children that they were able to send their children to school as far as they could meet their pre-requests or whatever inputs required for education and cover the all expenses from income obtained from coffee sale. From the graph above, in Anfilo district 38% impacted and 3% no impact while in Haru 36 made positive impact and 8% none change, in Gimbi District also, 14% brought change on children education and 2% no significant change made.

Count	Health status change after using coffee technology		
Districts	yes	no	Total
District Anfilo	50	4	54
Gimbi	19	1	20
Haru	49	10	59
Total	118	15	133

Table 5. Relative contribution of coffee production on health status

Source own survey result (January, 2014) Farmers' health status changed positively after using improved coffee technologies. As has been seen on the table above 118 out of 133 respondents or in percentage 88.7% have been positively changed their health status as they frequently go to health clinic and made regular check up to their surrounding available health stations.

how do you explain coffee price over the last 10 years?



Fig 6. Coffee price over the last 10 years

Source own survey result (January, 2014) The graph explained coffee price over the last 10 years have been becoming dynamic or not stable because of national and global market fluctuation.

Table.6.Source of labor for coffee production

		Frequency	Percent	Valid Percent
Valid	family labor	62	46.6	46.6
	hired	3	2.3	2.3
	both	68	51.1	51.1
	Total	133	100.0	100.0

Majority of farmers used their family as source of labor for coffee production rather than hired labor. 46.6% respondents or farmers using family labor where as 51.1% also have been using both family and hired labor.

Bar Chart

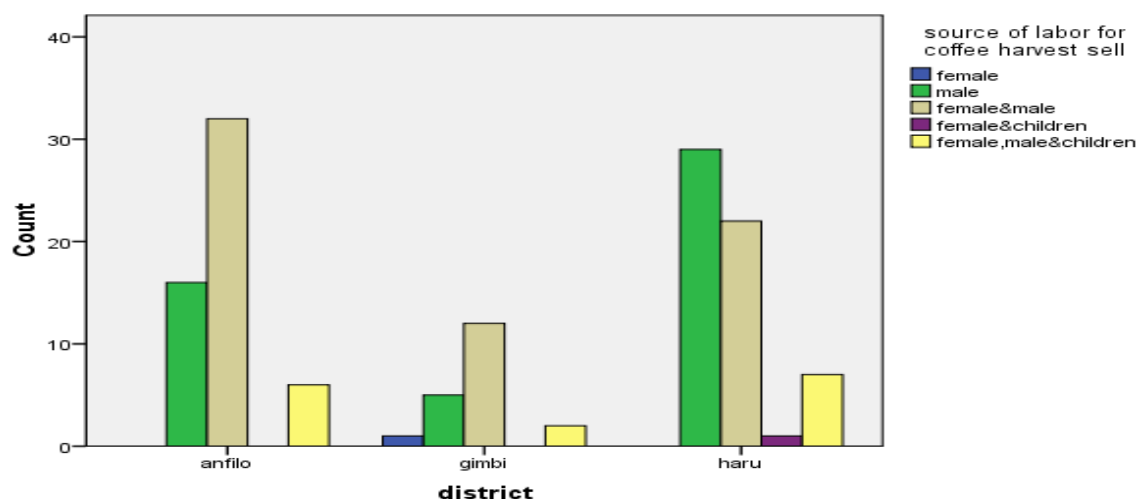


Fig 7.Participation of female, male and children in coffee selling

Source own survey result (January, 2014) Women and children participation in coffee selling in all Districts are very lower. On the contrary men are involved highly in this activity than women and children.

Table 7. Farming background information **Source own survey result (January, 2014)**

	Minimum	Maximum	Mean	Std. Deviation
uncultivated land in ha	.00	2.00	.0519	.20240
total area of your land in ha	.25	12.00	1.9629	1.80531
cultivated land in ha	.00	4.00	.6715	.74452
coffee farm in ha	.00	5.00	1.1497	1.02275
forest in ha	.00	4.00	.0897	.50475

Valid N (list wise)

This table showed that relatively high variability or deviations from the mean is existing in hectare coverage of forest and on the contrary, lower deviation or variance available on coffee farm of hectares.

Table 8. Obstacle of economic condition (inflation) in adopting technologies.

obstacles of economic conditions inflation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	.8	.8	.8
	<i>not a problem</i>	35	26.3	26.3	27.1
	<i>less problem</i>	35	26.3	26.3	53.4
	<i>moderate problem</i>	23	17.3	17.3	70.7
	<i>very significant</i>	38	28.6	28.6	99.2
	<i>Na</i>	1	.8	.8	100.0
	Total	133	100.0	100.0	

Here the table above showed 28.6% said that they were very significantly affected in adopting technologies because of economic inflation. 17.3% moderately affected, 26.3% of respondents said less problem where as the rest 26.3% also said not a problem.

Table 9. Obstacles of in appropriate technology

Obstacles of inappropriate technology					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<i>not a problem</i>	94	70.7	70.7	70.7
	<i>less problem</i>	21	15.8	15.8	86.5
	<i>moderate</i>	13	9.8	9.8	96.2
	<i>very significant</i>	4	3.0	3.0	99.2
	<i>Na</i>	1	.8	.8	100.0
	<i>Total</i>	133	100.0	100.0	

Source own survey result January, 2014

Similarly, this table also enabled to understand that technologies disseminated to the farmers appropriate in turn, not mostly be able to negatively influence or not a problem in adopting the technology. As the result could show 70.7% of respondents said inappropriateness of the technology is not a problem.

IV. CONCLUSIONS AND RECOMMENDATIONS

As the study indicated climate change has been becoming harshness problem and adversely impacted in coffee production and productivity. Therefore, improved, sound and drought resistant coffee varieties need to be taken in to consideration to release. Besides, adaptation and mitigation strategies put in place by the respective entities.

In spite of immense improved varieties already released by Jimma Agricultural Research Center over the last 40 years, however, the study showed that these varieties were not extensively well popularized in the study areas so that further focus in disseminating technologies and extension activities should be done and strengthened in the future.

It was showed that Severity of CBD one of the major factors affecting coffee production, considering this, it is highly expected from researchers to generate and release disease resistant coffee varieties.

Women participation in coffee farming as not that much to the expected level, due to this, extension services and technology popularization has to take in to account women to enable them actively engage in coffee farming and to benefit from the sector. Finally, farmers seed exchange among themselves is very poor accounts only 6% which is a very small number so, further efforts ought to be exerted in order to enhance a culture of farmers seed exchange system which is unquestionable solution to overcome the recurrent growing coffee technologies, seed and seedlings demand.

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