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Opportunities and Status of Wheat Row Planting in Smallholder Farmers in Elfeta District Oromia Regional State Ethiopia

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ABSTRACT

To enhance wheat yield, adoption and management practices have become a major concern of agricultural extension activities and low produce of wheat is partly due to poor agronomic practices in Ethiopia. Compared to broadcasting system, row planting gives better yield with quality of the seed at harvesting period. The study was conducted to assess the opportunities and status of wheat row planting by farmers. This study was used descriptive research design and employed both quantitative and qualitative approaches. Primary data were collected from 141_sample households which were selected randomly. Additional information was obtained from focus group discussion and key informant interview. The data has been analyzed by using simple descriptive statistics such as mean, percentage and standard deviation. Moreover, inferential statistics like chi-square and t-test were used. The result shows that, education level, family size, farmers experience, seeding rate per hectare, yield per hectare, fertilizer rate per hectare and income of household were positive association with wheat row planting in the study area. Also, non-adopter farmers was not use the existing opportunity such as off-farm income generating activities, contact with extension agents, credit use, membership in cooperatives and improved seed in the study area. Moreover, more than half of smallholders not adopt the wheat row planting system; meaning, still they use broadcasting system of Planting in their farms. Therefore, the study concludes that, Policies and strategies that focus on farmers' education, implementation of well-established extension package are helpful so as to achieve wider adoption of row planting technology of smallholder farmer in the study area.

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Introduction

The Sub-Sahara African (SSA) countries' economy is dominated by persistent agriculture employing more than half of the population. Though, agricultural production and productivity in SSA is found to be low (Amare, 2018). Cereals were the dominant food grains in the crop production of sub-sector. Within agriculture, 50% Growth Domestic Product (GDP) of agricultural output comes from crop production whereas, 47% and 3% are from livestock and forestry respectively. From cereal crops, wheat is second only to rice as a source of calories in the diets of consumers in the developing countries (Mentire and Gecho, 2017).

Ethiopia is basically an agrarian country and agriculture is the pillar for Ethiopian economic growth (Beyene and Dinku, 2017). It accounts for 85% of the working forces, 90% of exports and 50% of the entire gross domestic product in Ethiopia (Willy, 2018). In addition to its contribution in the agricultural sector, the estimates show about 94% of Ethiopian farmers rely on less than 5 hectares of land, of which 55% cultivate less than 2 hectares (Kebede et al., 2017; Mahamoud, 2017). However, most of Ethiopian farmers have been using traditional way of agricultural practices.

Ethiopian wheat ranks second to South Africa in terms of area coverage and production (Mahamoud, 2017). In Ethiopia Wheat is the third important cereal crop with annual production of about 5.31 million tons cultivated on area of 1.78 million hectares (CSA, 2019a). The national average of wheat yield levels are low because highly characterized by rain fed, subsistence oriented, broadcast farming system, low adoption of row planting technology, poor agricultural performance, income variability and high population growth (Abafita et al., 2016; Mentire and Gecho, 2017).

According to CSA (2019b), wheat is predominantly grown in the highlands of Ethiopia, and the two highest wheat-producing areas (Oromia and Amhara) contribute for about 88.5% of the countrywide wheat production. However, wheat is an important cereal crops in Ethiopia's production systems and its yields are relatively low. In Oromia region, wheat is mainly produced and consumed by rural and urban residents. The total production of wheat in the region is estimated 30,933,981.77quintals and its productivity is 31.87 quintals per hectare. This productivity cannot guarantee food security for smallholder farmers in the region as expected.

According to UNCAD (2017), improving the implementation of extension service in agronomic practices and focusing on strategic crops to improve the livelihood of the community is mandatory. The main focus of current agricultural extension activities have been the promotion, adoption and scaling up of wheat row planting practices; and adoption of the practice is considered as the attention for wheat yield increment in the country where the seed rate is reduced and extra space between seedlings is given, have been shown to realize important production increments over broadcasting (Abafita et al., 2016). As a result, manual planting of wheat in row has become one of the agronomic practices of smallholder farmers in the country (Berihunet al., 2014). The traditional planting method, that is broadcasting seed by hand at high seed rates, reduce yield because uneven distribution of the seeds make hand weeding and hoeing difficult, and plant competition with weeds lower wheat growth and tillering capacity (Mentire and Gecho, 2017). Consequently, agricultural production failures are common in Ethiopia (Abonesh et al., 2006; Kalkidan et al., 2016). However, row planting with proper distance between rows and plant density allows for sufficient aeration, moisture, sunlight and nutrient availability leading to proper root system development.

In the study district, row planting wheat had been introduced and practiced in since 2014 (Elfeta District Agricultural Development office, 2019), because, recommended row planting of wheat tolerates for sufficient aeration, moisture, sunlight and nutrient accessibility leading to proper root system development. However, there is practically a limitation in adoption of these technologies and new techniques by small farms whereas; the row planting technique is seen as good agronomic practice by agricultural policy makers and extension personnel (Eyab, 2016; Vandercasteelenet al., 2013).

Efforts have being underway by Minister of Agriculture on row planting technology of wheat crop in 2012 all over the regions. In spite of these efforts, productivity gains are not as such adequate and introduced technologies are not widely accepted by farmers in different parts of the county as expected (Asefa et al., 2018; Dinku and Beyene, 2019). The same thing is similarly true for the study area. This indicates that there are different factors directly or indirectly determining the practices of technologies that believed to bring change in smallholder farmers' productivity. To enhance wheat yield, adoption and scaling up of improved farming practices have become a major concern of agricultural extension activities in the study area. One of the major focuses of agricultural extension activities in recent years is adopting wheat row planting. However, agricultural productivity depends partly on successful implementation of improved farming practices as well as on efficient use of resources in the production process. Low production of wheat is partly due to poor agronomic practices. Some of yield improving agronomic practices are crop rotation and row planting. Proper sequence of crops on specific farm can improve soil fertility, suppress weeds and plant diseases and thereby improve yield. Row planting at reduced seed rate can reduce plant competition and for better branching out. But the reasons why farmers do not accept the wheat row planting practice is not yet well understood. Compared to the traditional broadcasting system, row planting gives better yield with quality of the seed at harvesting period (Amare, 2018; Joachim et al., 2013). Recent studies carried out in Ethiopia confirm that yields are very responsive to this improved technology (Biftu et al., 2016).

However, there is lack of empirical study on the assessing opportunities and practices of wheat row planting by smallholder farmers. Therefore, the main objective of this study is to assess the opportunities and practices of wheat row planting practices of smallholders. Generally the initiation of this study was focus on as the area have potentials for wheat production but row planting technology was rarely exists in the area. Those farmers as adopters for the wheat production practices had got enough production from their farm gates. But most of the farmers still they do not use and practices row planting technology in the area. Therefore, this study, attempt to fill these gaps by providing further evidence on the opportunities and status of wheat row planting by smallholder farmers.

Research Methodology

Description of the Study Area

The study was conducted in Elfeta district, West Shoa Zone, Oromia Region which is geographically located between 8^0 - 9^0 North latitude and 37^0-38^0 East longitude. The district is one of the twenty two rural districts in West Shoa Zone and lies about 68 Km North of Ambo town. The district town, Bake is located on the Addis Ababa to the North West of 112km far. The district is bounded by Jeldu in the East, Dandi and Ambo in South, Ambo district in the West and Chobi in the Northern direction. In general, the altitude ranges from 1900 to 3100 meters above sea level (CSA, 2011; EDADO, 2019).

Agriculture and Rural development office of the district reported that the topography of the area to be categorized as 65% plain, 15% rugged and the remaining 20% is mountainous. The agro- climatic feature of the district is tropical as 45%, 40% and 15 are Dega, Weyinadega and Kola respectively. Mean annual temperature ranges from 11-23ºc of the area. The study area has bimodal rainfall distribution. Consequently, it has two rainy seasons Belg and Kiremt. Belg is the short season that lasts between March and May. Kiremt season, which is the longest rainy season, continues between June and September. Rain that occurs during the winter season is very favorable for agricultural activities especially for wheat production (Elfeta District Agricultural development office, 2020).

Elfeta district has 15 rural and 2 Kebele administrations. The urban Kebele administrations are located in Bake and Gute towns (Elfeta District

Agricultural development office, 2019). The woreda has 75,902 total populations from which 37,649 are male and 38,253 are female (CSA, 2008). The total figure of households' is 8, 704 of which 8,067 male and 637 female headed (EDADO, 2020).

Elfeta District Agricultural Development Office (2020) reported that, the main economic activity in the study area is farming and the major agricultural crops include wheat, maize, teff, barley, bean, pea, enset, sorghum, coffee, potato, tomato, onion, cabbage, banana, and others. The livestock population in the District includes cows, oxen, goat, sheep, horse, mule, and chickens. The agricultural production system of the district has characterized by means of mixed types. Thus, crop production and livestock. Crop production is one among the most agricultural activities and is especially of rain fed and traditional.

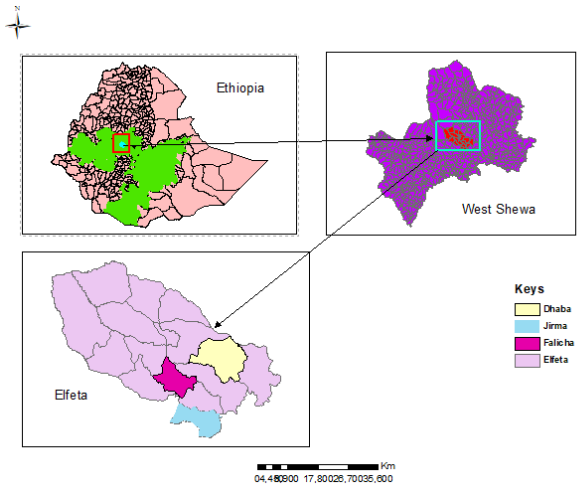

Figure 1. Map of the study area (Elfeta district)
Source: Ethiopian Mapping Agency, 2020

The foremost annual crops developing are wheat, barley, teff, and maize; from cereals, horse beans, discipline peas; from pulses linseed and rapeseed from oil seeds. From cereal crops wheat, barley, teff, and maize are dominantly growing in the district. Livestock such as cows, oxen, goat, sheep, horse, mule, and poultry are important source of livelihoods in the area (EDADO, 2020). Among the cereal crop grown in the district, wheat is widely known and the important cereal crop and currently covers gorgeous share of agricultural land. Among the 22 districts in the West Shoa zone, the district is the one from the well-known areas of wheat producing district. It is also the primary staple food and cash crops for smallholder farmers in the district. Crop production sub system in the district is both rain fed and irrigated. The rain fed crop production is dominated by cereals such as sorghum and teff whereas the irrigation crop farming.

A descriptive survey design and mixed research approach were adopted, because it involves both quantitative and qualitative research approaches.

The study were conducted both probability and non-probability sampling techniques. The study adopted purposive sampling with; simple random and stratified sampling. First, the district was selected purposively because of wheat production potential and the existing low adoption of wheat row planting. Secondly, wheat producing kebeles were identified. Out of 15 kebeles in the district, 12 kebeles were dominant wheat producers, while 3 of the kebeles were selected purposively because of high wheat production potential and the low technology adoption. To select sample respondents from the three Kebeles Administrations, first the household heads in the three Kebeles Administrations were identified and stratified in to two strata which is adopter and non-adopter categories. Then the sample respondents from each stratum were selected by using Random sampling technique.

Since a number of household heads in the three Kebeles Administrations is not proportional, probability proportional to sample size were used to determine the number of respondents from each stratum. Then, Random sampling technique was used to draw 141 respondents from each stratum. The total sample 70 household heads were adopter and the remaining about 71 household heads were non-adopter. The sample size for collecting data through household survey was determined by using the sample size determination formula developed by Yemane (1967).

$$\text{The formula is } n = \frac{N}{1+N(e)2} = \frac{1445}{1+1445(0.08)2} = 141$$

Where n was the sample size for the study, N was the population of interest which was 1445; e was the precision level which is 0.08 in this study.

In addition to 141 sampled households, key informants farmers, Development agents and Agricultural Extension services were selected purposively from each kebeles. One (1) Key informants farmers was selected from each 'kebeles' with a total of three (3). From Three sample 'kebeles' one Agricultural Extension expertise from Agricultural office, three Development agents from individual in the study sites and totally Seven(7) key informants were selected. A total of three Focus Group Discussions were conducted and there was one FGD for each kebeles.

In order to accomplish the study primary and secondary source of data were developed in this research. For this study primary data were collected on one-to-one interview using both scheduled and semi structured interview schedule. This focused on collecting the data of socio-economic and demographic characteristics of the respondents from the selected households by using semi structured interview schedule and focus group discussions (FGDs) in response to the research objective. The secondary data sources were collected from published materials, such as books, journals; scientific research works books, unpublished documents from district agricultural offices and other related sources to supplement primary data.

Data entries were started after the actual data collection and manual editing was completed. Once the process of data entry accomplished, cleaning of the data were started. Data cleaning and editing focuses on checking whether the assigned value for each case is legitimate, on the logical consistency and structure of cases. Simple descriptive statistics such as mean, percentage, standard deviations, frequency and inferential statistics like chi-square and t-test were used to assess the opportunities and practices of wheat row planting system for farmers'.

Table 1. Total Sample respondents in Adoption wheat row planting in Elfeta district

S/ No	Actors	Sample selected	Participants
1	Sample respondents farm households	141	Adopter and Non- adopter
2	key informants,		More knowledgeable from different Position
2.1.	Development agents	3	For each kebeles
2.2.	Agricultural Extension services	1	From Agricultural office 7
2.3.	Model farmers	3	For each kebeles
3	Focus Group Discussions	2 group (3) (24 person)	Model farmers, Adopter and non-adopter
Total	141 respondents, 7 key informants + 3 FDG		

Source; Developed by researcher. (2020).

Table 2. Study villages and farmers adoption category

Study villages and farmers adoption category					
Adoption category		Kebele			Total
		Dhaba	Jirma	Falicha	
NON-ADOPTER	F	27	27	17	71
	%	38.0%	38.0%	23.9%	100.0%
ADOPTER	F	36	13	21	70
	%	51.4%	18.6%	30.0%	100.0%
Total	F	63	40	38	141
	%	44.7%	28.4%	27.0%	100.0%

Source: Field Survey, 2020

Table 3. Age of household head of the respondents

Variables	Adopters		Non-adopters		T	P
	Mean	SD	Mean	SD	0.088	0.171
Age of household head	4.557	1.116	4.521	1.371		

Source: Field Survey, 2020

Table 4. Sex of the respondents

Variables	Responses	Adopters		Non-adopters		Total		$\chi 2$	P
		No.	%	No.	%	No.	%		
Sex of household head	Female	7	10	9	12.7	16	11.3	0.251	0.792
	Male	63	90	62	87.3	125	88.7		

Source: Field Survey, 2020

Results and Discussion

As revealed from Table 2, 141 respondents were responded as they were non-adopter and adopter farmers in number in the study area. The result revealed that, more than half of the household were non-adopters and majority of them were from Dhaba kebele. Therefore, wheat row planting technology was still not practiced as expected in the study area.

Demographic Characteristics of The Respondents

As revealed from Table 3, the age was hypothesized adoption of technologies negatively. Consequently, an age of household can determine the agricultural production specifically wheat row planting technology adoption in study area. The age difference between adopters and non-adopters was determined to be insignificant in a t-test. The researchers hypothesized that as farmers get older, their interest in new technology declines and they become more risk conservative about implementing new technology. The standard deviation (SD) of the adopter's age indicates that the majority of the adopters were in their middle years of maturity.

As indicated in the Table 4 showed that male-headed households in study area were observed that higher tendency than female-headed households in wheat row planting practice. In the study area male farmers were found to be more wheat row planting technologies than women households. Due to many socio-cultural values and norms male have freedom of mobility and participation have better access to information in various meetings and subsequently. The study also depicted that majority of female household were found in non-adopter farmers which indicates that they are less capable due to resource poor and less potential for production in adopting their agriculture specifically wheat row planting as compared to male household counterparts. This implies that majority of rural female household heads are poor and they only work for self-sufficiency.

Education attainment of the household is the utmost critical for technology adoption. It increases the ability of farmers to use adoption of wheat row planting technology. The result of the study shows that, 55(39.0%) and 86(61.0%) of the respondents were cannot read and write and others from both non-adopters and adopters in the study area. This result implies that, education attainment and farmers adoption of wheat row planting clearly indicated the importance of education in understanding agricultural production as the limiting factor of their productivity and overall farming community's livelihood. The result of Chi-2-test ($x2=27.932$, $P=0.000$) confirms the statistically association between adopter and non-adopter wheat row planting in terms of educational status at $P<0.01$ probability level, implying the presence of significant

relation of farmers education with adoption of use of wheat row planting. The results from FGD and the Key Informant Interviews indicated that recently basic adult education to farmers at FTC level is given by Development Agents and extension worker, which help improving farmer's ability to read and write. Better education attainment of farmers can increase adoption of a technology. This finding agrees with the finding reported by Paulos et al., (2004): Damota et al, (2022) who depicted as educational could increase the ability to obtain, process and utilize agriculture related information and innovations in a better way.

The study result depicted that, an average year of farmers experience in extension activities for wheat row planting adopters was larger than that of non-adopters farmers. From the t-test result, Farmers experience in extension activities was found to be statistically significant (Table 6). The result shows that, farmers experience in agricultural extension increase, the likelihood of wheat row planting adoption of smallholders would increase.

Descriptive Statistics for Continuous Variable for the Study

The result revealed that respondent with more family sizes were more involved in adoption of row planting wheat practice than those few family size. Therefore, in this study it was hypothesized that adult equivalents of sample household is positively correlated with the adoption wheat row planting technology. Hence, from the t-test result, family size in adult equivalent was found to be statistically significant between the groups.

The data result depicted that, seeding rate per hectare, yield per hectare, fertilizer rate per hectare and income of household were positively determined the wheat row planting technology adoption and statistically significant at $P<0.01$ (Table 7). This implies that, the non-adopter farmers were not used seeding rate per hectare, yield per hectare and fertilizer rate per hectare in kilogram as recommended in the study area. From the t-test result, income of smallholders in extension activities was found to be statistically significant and positively relationship with wheat row planting adoption in the study area. This finding indicated that, may be the purchasing capacity of non-adopter smallholder farmers in fertilizer was very low for that of low level of their income. Also the finding from data depicted that, the mean average of total number of livestock of non-adopter farmers were lower than that of adopter farmers in the study area. The result from t-test indicated that having many number of livestock between adopters and non-adopters was found to be insignificant. Additionally, the distance of smallholder farmers' home from market in kilometer is hypothesized to be negative. The data result indicates that, the distance from market of small holder farmers home lowers the adoption of wheat row planting in the area. The result from t-test shows that distance in kilometers from the home of smallholder farmers was found to be statistically insignificant (Table 7).

Table 5. Education attainment of Household

Adoption category	Education attainment of Household		Total	$\chi 2$	P
	Cannot Read And Write	Others			
Non-Adopter	43(60.6%)	28(39.4%)	71(100.0%)		
Adopter	12(17.1%)	58(82.9%)	70(100.0%)		
Total	55(39.0%)	86(61.0%)	141(100.0%)	27.932	0.000

Source: Field Survey, 2020

Table 6. Farm Experience of Sample households

Variables	Adopters		Non-adopters		T	P
	Mean	SD	Mean	SD	0.987	0.019
Farm Experience	2.728	1.596	2.478	1.402		

Source: Field Survey, 2020

Table 7. Summary of descriptive statistics for continuous variable for the study

Variables	Adoption	N	Mean	Std. Deviation	F	P
Family size of household head	Non-Adopter	71	4.39	1.92	1.706	0.001
	Adopter	70	5.58	2.41		
Seeding rate per hectare	Non-Adopter	71	183.81	49.83	4.92	0.000
	Adopter	70	140.21	55.19		
Fertilizer rate	Non-Adopter	71	85.87	34.42	3.94	0.000
	Adopter	70	112.28	33.11		
Yield per hectare	Non-Adopter	71	11.15	4.79	7.56	0.000
	Adopter	70	21.48	10.42		
Total number of your livestock	Non-Adopter	71	8.42	5.12	0.93	0.350
	Adopter	70	9.21	4.91		
How much of your total annual income for the year of 2011/12 E.C?	Non-Adopter	71	8270.07	9690.91	4.41	0.000
	Adopter	70	20322.35	20824.56		
How many kilometers in the market far from your home?	Non-Adopter	71	6.81	3.57	-0.98	0.325
	Adopter	70	6.22	3.49		

Source: Field Survey, 2020

Opportunities of Adopting Wheat Row Planting in the Study Area

Land is the most important resources for agricultural activities specifically for application of technologies. The study result indicated that, Average hectares of Landholding Size of the respondent farmers for wheat row planting adopters were higher than that of non-adopters. This indicated that large landholding farmers are more likely to be engaged in adoption of wheat row planting in the study area. From the t-test result, farm size was found to be statistically insignificant between the groups (Table 8). Farm size influences households' choice to adopt or reject new agricultural technologies. Hence, landholding size was hypothesized to have positively and significantly influence on wheat production technology adoption in the study area.

The data from Focus Group Discussion indicated that the landholding size of sample households for wheat row planting of the respondents were the major opportunities for small holder farmers to adopting the wheat row planting in the study area. As they described that as the household have high landholding size on wheat row planting, in line to this the farmers had the opportunities for adopting the wheat row planting in the study area. Even if they narrated that if the landholding size of a household have enough amount in hectare, in that household it is the big opportunity to adopting the wheat row planting in the study area.

The result of the study indicated, more than average of the respondents were engaged in off-farm income generating activities and there was statistically significant difference between adoption category and wheat row planting technology in the study area. The Chi-square analysis result showed that there were significant relationship between participation in off-farm activity and the adoption of wheat row planting technology (Table 9). The data from Focus Group and Key Informant indicated that the participation in off-farm activities of the household for wheat row planting of the respondents were the major opportunities for small holder farmers to adopting wheat row planting in the study area. Focus Group also stated that as the household have high participation in off-farm activities on wheat row planting, in line to this the farmers had the opportunities for adopting the wheat row planting in the study area. This finding is inconsistence with the finding of (Habane, 2017).

The result of the study depicted that, majority of non-adopters had no contact with extension agents and they have less information regarding wheat row planting whereas more than half of adopter farmers have information regarding to wheat row planting due to they have contact with DA in the study area. The chi-square analysis result showed significant relationship of contact of extension agent with the adoption of wheat row planting and statistically significant at $P<0.05$ (Table 10). Focus Group Discussion indicated that contact with extension agents of the household for wheat row planting of the respondents were the major opportunities for small holder farmers to adopting the wheat row planting in the study area. They also stated that as the household have high contact with extension agents have opportunity for adopting on wheat row planting, in line to this those farmers have the opportunities for adopting the wheat row planting in the study area. This finding is consistence with the finding of Gari (2017).

As result shown from Table 11, majority of both non-adopter and adopter farmers were not get access to credit service in the study area. The chi-square analysis result revealed that, access to credit service was statistically significant and positively association with the adoption of wheat row planting in the study area at $P<0.01$**.** The result from Focus Group Discussion indicated that the access to credit for the households for wheat row planting of the respondents were the major opportunities for small holder farmers to adopting wheat row planting in the study area. They also stated that as those households have high access to credit have opportunity for adopting on wheat row planting, in line to this those farmers have the opportunities for adopting the wheat row planting in the study area. This finding is consistence with the finding of Teshome (2017)

Table 8. Landholding of household head

Variables	Adopters		Non-adopters		T	P
	Mean	SD	Mean	SD	0.189	0.850
Landholding of household head	2.95	1.55	2.89	1.62		

Source: Field Survey, 2020

Table 9 Participation in off-farm activities of the household

Variables	Responses	Adopters		Non-adopters		Total		$\chi2$	P
		F.	%	F.	%	F.	%		
Off-farm activity	No	33	48.5	35	51.5	68	48.2	6.145	0.013
	Yes	37	50.7	36	49.3	73	51.8		

Source: Field Survey, 2020

Table 10. Contact with Extension agents

Variables	Responses	Adopters		Non-adopters		Total		$\chi2$	P
		F.	%	F.	%	F.	%		
Contact with Extension agents	No	25	35.7	40	56.3	65	46.1	6.034	0.014
	Yes	45	64.3	31	43.7	76	53.9		

Source: Field survey, 2020

Table 11. Access to credit service

Variables	Responses	Adopters		Non-adopters		Total		$\chi2$	P
		F.	%	F.	%	F.	%		
Access to Credit	No	36	51.4	55	77.5	91	64.5	10.44	0.002
	Yes	34	48.6	16	22.5	50	35.5		

Sources: Field Survey, 2020

Table 12. Members of cooperatives

Variables	Responses	Adopters		Non-adopters		Total		$\chi2$	P
		F.	%	F.	%	F.	%		
Members of cooperatives	No	25	35.7	40	56.3	60	46.1	6.034	0.01
	Yes	45	63.3	31	43.7	76	53.9		

Source: Field survey, 2020

Table 13. Use improved seed

Variables	Responses	Adopters		Non-adopters		Total		$\chi2$	P
		F.	%	F.	%	F.	%		
Use improved seed for wheat row planting	No	27	38.6	48	67.6	75	53.2	11.934	0.001
	Yes	43	61.4	23	32.4	66	46.8		

Sources: Field Survey, 2020

Table 14. Nature of wheat planting system in the study area

Nature of Wheat Planting on their land in 2011				
	The study area(n=141)		$\chi2$	P
What was the nature of wheat planting in the study area	Adopters	Non-adopters		
Row planting	43(61.4%)	12(16.9%)		
Broadcasting	27(38.6%)	59(83.1%)	55.56	0.000
Total	70(100.0%)	71(100.0%)		

Source: Field Survey, 2020

The data from (Table 12) shows that more than half of the respondents were members of cooperative. The chi-square test showed that there was statistically significant association between adoption of wheat row planting technology and membership in cooperative at P<0.05**.** The result from FGD indicated that farmers who are members of cooperatives likely adopt wheat row planting technology than non-members, and hence this maximizes the opportunities to adopt the technology. This finding is consistence with the finding of Abeje (2018).

The result of the study revealed that, more than half of smallholders farmer were not used improved wheat seed during production season. The results of $\chi2$-test revealed that use of improved seed was statistically significant at P<0.01 level with wheat row planting in the study area (Table 13). The response of the key informants implies that"; the farmers are in debate about row planting technology as a result that the government and the community surrounding are not in a common agreement on the improved seed. In relation with this government collect the needs of the farmers on time, mostly there is delay of supply provision based on the farmers' needs collected earlier or they provide the supply after the season when farmers are not in need about the supply. That is why this row planting technology is not practiced and internalized highly by the farmers in the area. They also indicated that the using improved seed for wheat row planting of the respondents were the major opportunities for small holder farmers to adopting wheat row planting technology in the study area. This finding is consistence with the finding of Wudu (2017).

Status of Wheat Row Planting By Smallholder Farmers

As shown from Table 14, majority of non- adopter farmers was used wheat planting system by broadcasting method than adopter farmers in the area. This indicates that more than half of the smallholder farmers were not adopt the wheat row planting practices and it was statistically significant at P<0.01. According to Ethiopian government plan every farmers have to adopt not only wheat production, but entirely the agricultural farming system in the country. But the smallholder farmers have very little knowledge to adopt the wheat row planting system in the study area. In addition, focus group discussion revealed and confirmed that more than half of the population doesn't adopt the wheat row planting system; still they use broadcasting system of Planting in their farms. Thus, the farmers in that area need to timely training, monitoring and closely approaching in their farms.

As shown from the above table (Table15), most of the smallholder farmers responded that using row planting method increase their household income. This indicated that the smallholder farmers have positive thinking in using this row planting and them now the benefits of adopting wheat row planting technology. Focus group and Key informant interview replied that the wheat row planting has great advantages in increasing the production and productivity as well as for improving the income of households but implementing the wheat row planting technology is challenge in the study area.

Table 15. Positive responses of adoption of sowing in line of wheat production in the study area

Positive responses of adoption of sowing in line of wheat				
What are the positive responses of adoption of sowing in line of wheat you have seen?		Adoption category		Total
		Non-adopter	Adopter	
Increased household income	F	18	32	50
	%	36.0%	64.0%	100.0%
Reduce fertilizer consumption	F	7	8	15
	%	46.7%	53.3%	100.0%
Minimizes seeding rate	F	30	15	45
	%	66.7%	33.3%	100.0%
Seed and fertilizer are placed in the same row	F	16	15	31
	%	51.6%	48.4%	100.0%
Total	F	71	70	141
	%	50.4%	49.6%	100.0%

Source: Field Survey, 2020.

Table 16. Wheat row planting practices and recommended technology in the study area

Variables		Adoption category		Total	X2	P
		Non-Adopter	Adopter			
Dou you use recommended wheat row spacing method?	No	68(95.8%	30(42.9%	98(69.5%		
	Yes	3(4.2%	40(57.1%	43(30.5%	46.567	0.000
Total		71(50.4%	43(30.5%	141(100.0%		
Dou you use recommended wheat seed rate used?	No	68(95.8%	31(44.3%	99(70.2%)		
	Yes	3(4.2%	39(55.7%	42(29.8%	44.681	0.000
Total		71(50.4%	43(30.5%	141(100.0%		
Dou you use recommended wheat seeding date used?	No	65(91.5%	35(50.0%	100(70.9%		
	Yes	6(8.5%	35(50%	41(29.1%	29.507	0.000
Total		71(50.4%	70(49.6%	141(100.0%		
Dou you use recommended wheat seedbed preparation?	No	63(88.7%	42(60.0%	105(74.5%		
	Yes	8(11.3%	28(40.0%	36(25.5%	15.305	0.000
Total		71(50.4%	70(49.6%	141(100%		
Did you make early hand weeding of planted wheat?	No	59(83.1%	31(44.3%	90(63.8%		
	Yes	12(16.9%	39(55.7%	51(36.2%	22.999	0.000
Total		71(50.4%	70(49.6%	141(100%		
Row planted wheat is suitable for hand weeding	No	32(45.1%	16(22.9%	48(34.1%		
	Yes	39(54.9%	54(77.1%	93(65.9%	7.838	0.020
Total		71(50.4%	70(49.6%	141(100%		
Have you get training on wheat row planting in the year 2019	No	52(73.2%	34(48.6%	86(61.0%		
	Yes	19(28.6%	36(51.4%	55(39.0%	9.015	0.003
Total		71(50.4%	70(49.6%	141(100%		

Source: Field Survey, 2020.

Wheat row planting practices and recommended technology could use interchangeably. Without different technology application we cannot achieve the challenges of technology transfer. Thus, researchers should dedicate themselves to guiding farmers to agricultural technologies to improve production and productivity. The same as to true in the study area as without the help of different recommended agricultural technology it may challenge to add a spoon of wheat production in the area. The result depicted that most of the smallholder farmers were not use recommended wheat row spacing method, recommended wheat seed rate, recommended wheat seeding date, recommended wheat seedbed preparation, early hand weeding of planted wheat, Row planted wheat is suitable for hand weeding and most of the respondents not get training on wheat row planting in the year 2019 in the study area. This finding indicated that the majority of smallholder farmers were not practice wheat row planting with supporting recommended technology so as to increase their yield. The finding from chi-square result depicted those practices of wheat planting was statistically significant and positively relationship with recommended technology (Table 16).

Focus Group Discussion and Key informant interview replied that regarding the practices of wheat row planting by farmers, row planting wheat through recommended technology increases the production of smallholders but wheat row planting with recommended technology in our Kebele is very low due to unequal recommended technology acceptance of farmers in the area. Farmers who understand the advantage of row planting technology wanted to use recommended agronomic practices but majority of the farmers practice traditional system since they think that row planting take time, need more labor force and more fertilizers. Other farmers observed that row planting technology take time and need more fertilizers so, they prefer to practice the old once which is broadcasting method due to they thought and fear that row planting system may not successful in their environment. Key informant revealed that, comparing the traditional and row

planting methods for wheat production row planting system was better for saves seeds and gives good production. Nevertheless, using row planting system requires recommended input supply like seed, fertilizers and others inputs so that the major problem that hinders the successful implementation of wheat row planting technology was provision of input supply in the area. Broadcasting of wheat planting system was traditional methods which we use in the area so the system is easy to plant and it doesn't takes a time as row planting.

Conclusions and Recommendation

This study sought to assess the opportunities and practices of wheat row planting by small holder farmers in Elfeta district. On the basis of the analysis and the findings of the study, the researcher had drawn the following conclusions and recommendations:

The finding revealed that education level of the household is very important for adoption of wheat row planting technology. Better education attainment of farmers can increase adoption of a technology. As Farming experience in agricultural extension increase, the likelihood of wheat row planting adoption of smallholders would increase. Having more family sizes in the household, increase adoption of row planting wheat practice than those who had few family sizes. The non-adopter farmers were not use seeding rate per hectare, and fertilizer rate per hectare in kilogram as recommended in the study area. Also, income of non-adopter farmers was very low in the study area. Distance from market lowers the adoption of wheat row planting in the area. Non-adopter farmers in the study area was not use the existing opportunity such as off-farm income generating activities, contact with extension agents, credit use, membership in cooperatives and improved seed. The result of the study indicated that more than half of the population doesn't adopt the wheat row planting system; still they use broadcasting system of Planting in their farms. In addition to this, most of the smallholder farmers were not use recommended wheat row spacing method, recommended wheat seed rate, recommended wheat seeding date, recommended wheat seedbed preparation, and early hand weeding of planted wheat.Thefore, the authors recommends policies and strategies that focus on farmers' education, implementation of well-established extension package, linkages of farmers, researchers, development agent, and all stakeholders are helpful so as to achieve wider adoption of row planting technology of smallholder farmer in the study area.

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