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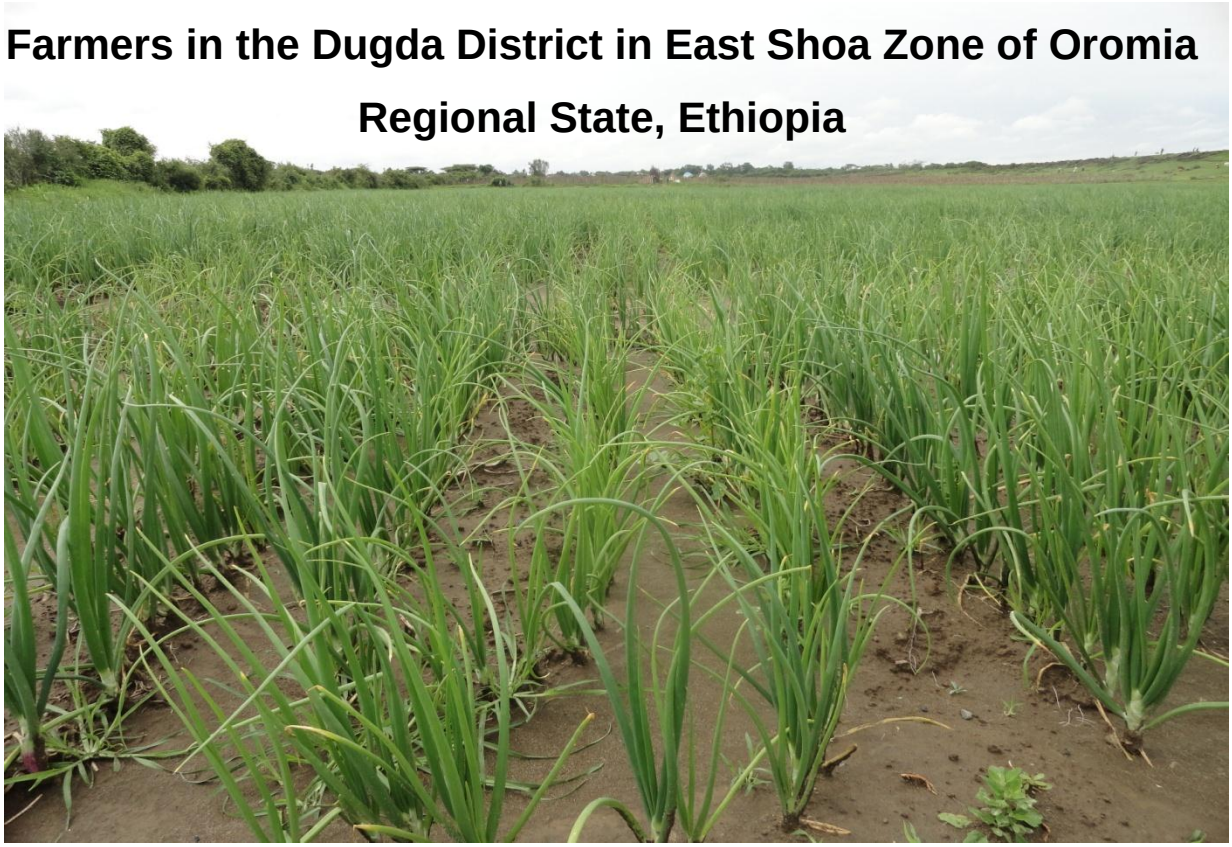
Adoption of Onion Production Package by Smallholder Farmers in the Dugda District in East Shoa Zone of Oromia Regional State, Ethiopia



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DEDICATION

This research work is dedicated to my father Mr. Yewendwesen Bikila and my mother Ms. Gete Ayele, who supported me in all my life to reach this level of success.

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LIST OF ABBREVIATIONS

CSA	Central Statistics Agency
DADO	Dugda Agriculture Development Office
EARI	Ethiopian Agricultural Research Institute
ESE	Ethiopian Seed Enterprise
IDO	International Development Organization
KG	Kilogram
MARI	Melkasa Agricultural Research Institute
PA	Peasant Association

ABSTRACT

This research describes about Adoption of Onion Production Package by Smallholder Farmers in the Dugda District in East Shoa Zone of Oromia Regional State, Ethiopia. This package has been promoted by Ethiopian Agricultural Research Institute (EARI) through Melkasa Agricultural Research Institute (MARI) in collaboration with the Dugda District Agriculture Development Office (DADO). The EARI through MARI has conducted several on-farm demonstrations in collaboration with the DADO in order to promote onion production package in Dugda district since 1996. The package includes farm inputs such as improved onion seed, fertilizer and chemicals with full agronomic practices. In 2002, EARI reported that the average onion yield in the study area ranged between 17 and 20 tons per hectare, while the potential yield of improved onion was 40 tons per ha. This was mainly related to low adoption of onion production package. The objective of this research was to assess the reasons for low adoption of the recommended onion production package by farmers in the study area. The following three research questions were formulated to aid in achieving the objectives the study: 1) Are farmers willing to adopt the recommended package for onion production? 2) Do farmers have the knowledge to use new technology packages of onion? 3) Do farmers have the ability to use improved onion production package? To find answers to the research questions, primary and secondary data collection was employed in the study area. Primary data were collected using structured questionnaires through individual interview, key informant interview and also direct observation. A total of 40 onion growing farmers (32 male and 8 female) were selected using random sampling technique for interview. To generate detailed information about the reasons for low adoption of onion production packages, six key informants were interviewed through a checklist with cooperative union leader, water association leader, agronomist, two extension workers and one peasant association leaders. Secondary data were collected through a desk study from different journals, books and internet about onion production package. The result of the study indicated that majority of farmers are used to the onion production package however they applied either above or below the research recommendation. These indicated the presence of the low adoption of onion production package in the study area. The researcher concluded that the reason for low adoption could be attributed to a number of factors: (1) farmers consider price of onion, market availability, yield, and requirement of inputs; (2) the researcher consider only the production or yield per hectare; (3) lack of certified seed supplier; (4) shortage of storage facilities; (5) lack of market outlet and lack of market information (price information); and (6) poor extension contact and credit services. The study underlined the high importance of institutional support in the areas of extension, credit and market to enhance adoption of onion production package. Moreover, it is important to revise the previous research recommendations by research centres.

1 INTRODUCTION

This research report describes the reasons for low adoption of onion production package by smallholder farmers in Dugda District of East Shoa Zone in Oromia Regional State, Ethiopia. The Ethiopian Agricultural Research Institute (EARI) through Melkasa Agricultural Research Institute (MARI) has conducted several on-farm demonstrations in collaboration with Dugda District Agriculture Development Office (DADO) in order to promote onion production package in Dugda district since 1996. The package includes farm inputs such as improved onion seeds, fertilizers and chemicals with full agronomic practices. The agronomic practices of the package are the application of farm inputs based on the research recommendation. These are: seed rate per hectare, frequency and quantity of irrigation, timing and rate of fertilizer and chemical application, spacing between plants and rows, and transplanting time of seedlings. Despite the efforts to promote the agronomic packages for over a decade, yield under farmers' production conditions is still by far lower than the attainable yield of onion under research fields. As cited by Dawit et al (2004), the EARI research progress reports of 2002 indicated that the average onion yield in the study area ranged between 17 and 20 tons per hectare while the attainable yield of improved onion variety under research field is about 40 tons per hectare. It is believed that this yield gap is due to low rates of adoption. Therefore, this research project was aimed at identifying the main reasons for low adoption of onion production package in Dugda District.

The detailed reports of the research are structured as follows: Chapter 2 presents background information about the livelihoods of small holder farmers in the Dugda district, onion production package, the organizations promoting the package and the conceptual framework. Chapter 3 states the research problem definition, objective and research questions. Chapter 4 describes the research strategy and methods. Chapter 5 elaborates the research findings and chapter 6 presents the discussions. Finally, chapter 7 will present conclusions and recommendations from the research findings.

2 BACKGROUND INFORMATION

2.1 Smallholder farmers in the Dugda District

Dugda district is one of the 12 districts found in Eastern Shoa zone in the Oromia regional state. The district is located 132 km south of the capital, Addis Ababa and has an altitude ranging from 1500 to 2300m above sea level. Dugda district has a land size of 146,800 ha and a population of 144,910 (CSA, 2007). Due to its potential for irrigation and fishing activities, the district was relatively densely populated compared to other semi-arid areas in the country. The soil type in the district consists of sandy loam (67%) and Sandy clay (33%) (DADO, 2010). The soil type and temperature of the area is suited for onion cultivation. Although the district is characterized by an erratic rainfall with high variation between and within years, this is not a constraint for onion production in areas with a reliable irrigation system. Awash and Meki river and Lake Ziway remain the major irrigation water sources in the area. According to the District Agricultural Development office (DADO) report of 2010, the irrigated area covers 6,876 ha which is about 38.2% of the total potential irrigation land of 18,000 ha. In 2010, irrigated land used for onion production was about 4,302 ha (DADO report, 2010). The average potential irrigation land at farmer's level is estimated to be around 0.8 ha in the district.

The livelihood of smallholder farmers' in the district mostly depends on horticultural production. They produce a significant amount of horticultural crops, particularly vegetables. Onion, tomato, pepper and cabbage are the most widely grown vegetable crops in the area by using irrigation. Crop-livestock mixed farming system is a common practice in the study area.

2.2 Onion production package and the organizations involved.

Onion (*Allium cepa*) is a main bulb crop in Ethiopia. Onion was introduced to the agricultural community of Ethiopia in the early 1970s (Mihiretu, 2008). It was newly introduced and rapidly becoming acceptable by producers and consumers. Currently, it is widely grown by small-holder farmers and commercial growers throughout the year for local use and export market. Onion is valued for its distinctive pungency and form essential ingredients for flavouring varieties of dishes, sauces, soup, sandwiches, snacks as onion rings etc. It is preferred by growers over the local shallot because of its high yield potential per unit area, availability of desirable cultivars for various uses, ease of propagation by seed, high domestic (bulb and seed) and export (bulb, cut flowers) markets in fresh and processed forms (Awas *et al*., 2010). Onion contributes significantly to the national economy, apart from overcoming local demands. According to the World Bank report of (2004), in the year 2001 the crop shared one fourth of the vegetable export quantities and stood third following green beans and peas contributing about 20% of the total vegetable export value which is about 244,000 US dollar of export earnings. In addition to the dry bulbs, onion cut flowers also constitute significant proportion of foreign export values. This indicates that Ethiopia has high potential to benefit from onion production.

Apart from the above-mentioned significance, onion is currently produced in central, northern and eastern part of the country. However, the bulk of production comes from the central rift valley of the country. Hence, Dugda district is one of the potential vegetable producing districts in central rift valley. The high irrigation potential gave farmers to grow different types of vegetables. Onion is one of the major vegetable crops produced in the area both by small-holder and large scale farmers and state farms mainly for market purpose. However, the production is still low as compared to the potential of the study area. To overcome this some efforts have been made by both research and extension services to promote improved onion varieties with a recommended production package.

The EARI through MARI so far released different improved onion varieties such as Bombey and Adama Red which have been commonly used in the study area. Improved onion varieties are distributed to farmers together with the recommended agronomic practices through extension agents working under the DADO.

Onion production package in this study is used to refer to advice about the application of the required inputs based on the research recommendation such as seed rate per hectare, frequency and quantity of irrigation, timing and rate of fertilizer and chemical application, spacing between plants and between rows and transplanting time of seedlings. The advice is given by extension agents working under the DADO and by cooperative union. The advice is given by extension workers in the following way: by using model farmers who have applied the package and are scaling up to other onion grower farmers, organizing farmers experience exchange program to motivate other onion growers and home to home visit.

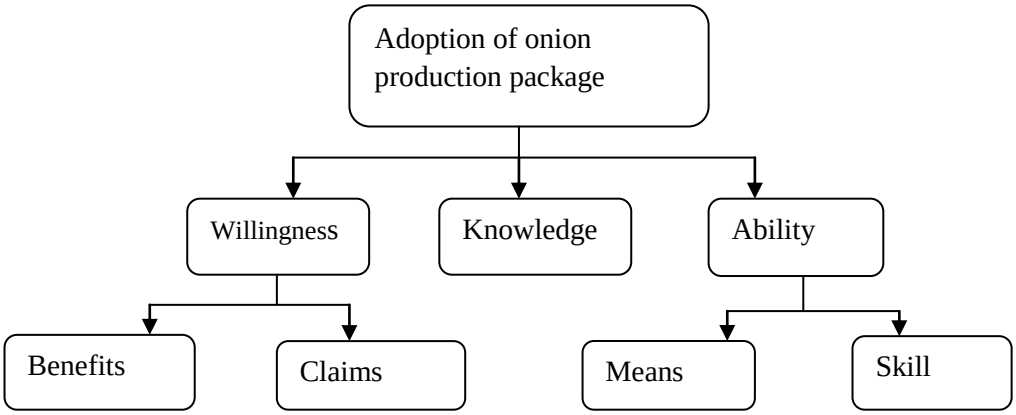
2.3 Conceptual framework and adoption theory

Many authors have defined the term adoption in different ways and at different times. Rogers (1962) defined the adoption process as the mental process by which an individual passes from first hearing of an innovation or technology to a final adoption. Dasgupta (1989) defines adoption as a continue use by individuals or groups of the recommended idea or practice over a reasonably long period of time. According to Feder et al (1985), adoption may be defined as the integration of an innovation into farmers' normal farming activities over an extended period of time.

The researcher also noted that adoption is not a permanent behaviour. This implies that an individual may decide to discontinue the use of an innovation for a variety of personal, institutional and social reasons one of which might be the availability of another practice that is better in farmers' field condition. For this research, adoption is used as the farmers who are using the recommended onion production package such as seed rate per hectare, frequency and quantity of irrigation, timing and rate of fertilizer and chemical application, spacing between plants and between rows, and transplanting time of seedlings on their own farmland. In this study fully adopter refers to the farmers who have applied the recommended onion production packages on their own irrigated land while the farmers who applied some parts of the package are said to be partially adopter.

According to Byerlee and Hesse de Polanco (1986) as cited in Abera (2008), adoption depends on the characteristics of innovations which include profitability, riskiness, initial capital requirement, complexity and availability. In this research adoption depends on three factors: willingness, knowledge and ability of the farmers.

Figure 1: Conceptual framework



Adapted from Leewis (2004, p.65)

Willingness is defined as a farmer to adopt an innovation inserted depends on the ratio between claims and benefits of the innovation to apply. Claims in this case mean, the farmers need to consider the requirement of innovation in order to apply them on their farm. These include labour requirement, working capital, water application, diseases resistant ability as compared to the traditional cultivation. According to the benefits mentioned above, the farmers consider the net income of the onion per hectare as compared to traditional onion cultivation. According to Asante *et al.* (2011), increasing the yield of the farmer by a unit increases the likelihood of his/her willingness to adopt the innovation.

Ploeg (1991), as cited in Leeuwis (2004), claim includes the required production inputs while the benefits include possible technical and socio-economic effects of the innovation for farmers such as yield expectations, impact on quality and income effects.

Knowledge means the farmers need to know the agronomic practices of the innovation such as seed rate per hectare, the time of seedling and transplanting, spacing, frequency and quantity of watering, pesticide application and frequency, timing and quantity of fertilizer. Rahm & Huffmann (1984) as reported in Kaguongo et. al. (2012) said that farmers' education and experience play a crucial role in technology adoption. According to Paudel and Matsuoka (2008), a farmer who has more years of education is more likely to adopt improved technology than those who have never been to school. The more educated farmers head is expected to be more efficient to understand and use new technologies in a shorter period of time than uneducated people.

Ability is defined as the skill and means of farmers to adopt improved onion production. Based on this definition, ''means'' describes the farmers' capital that required implementing the innovation on their own land such as access to credit, irrigated land size, working capital, and labour. Mihiretu (2008) showed that labour availability influences the adoption of improved onion production. Furthermore, skill is defined as the need of farmers' to apply the innovation practically such as seed rate per hectare, the time of seedling and transplanting, spacing between plants and rows, frequency and quantity of watering, frequency, timing and quantity of fertilizer and pesticide application. Mihiretu (2008) argue that farming experience influence the adoption of onion production packages. This is because farming experience can lead farmers to develop the necessary skills to adopt these packages.

Farming system is a decision making unit comprising the farm farmers, cropping and livestock system that transform land, capital and labour into useful products that can be consumed or sold. According to Ploeg (1991), as cited in Leeuwis (2004) farming system is distinguished in technical, economic and social domain which is used to all farming practices.

Farm farmers' take decision on the adoption of the improved onion production package based on claims and benefits of the innovation and when it fits within the knowledge and practices of existing farming system. For this research, farming system model will be used for identifying the detail information behind the low adoption of onion production package as pointed in the conceptual framework.

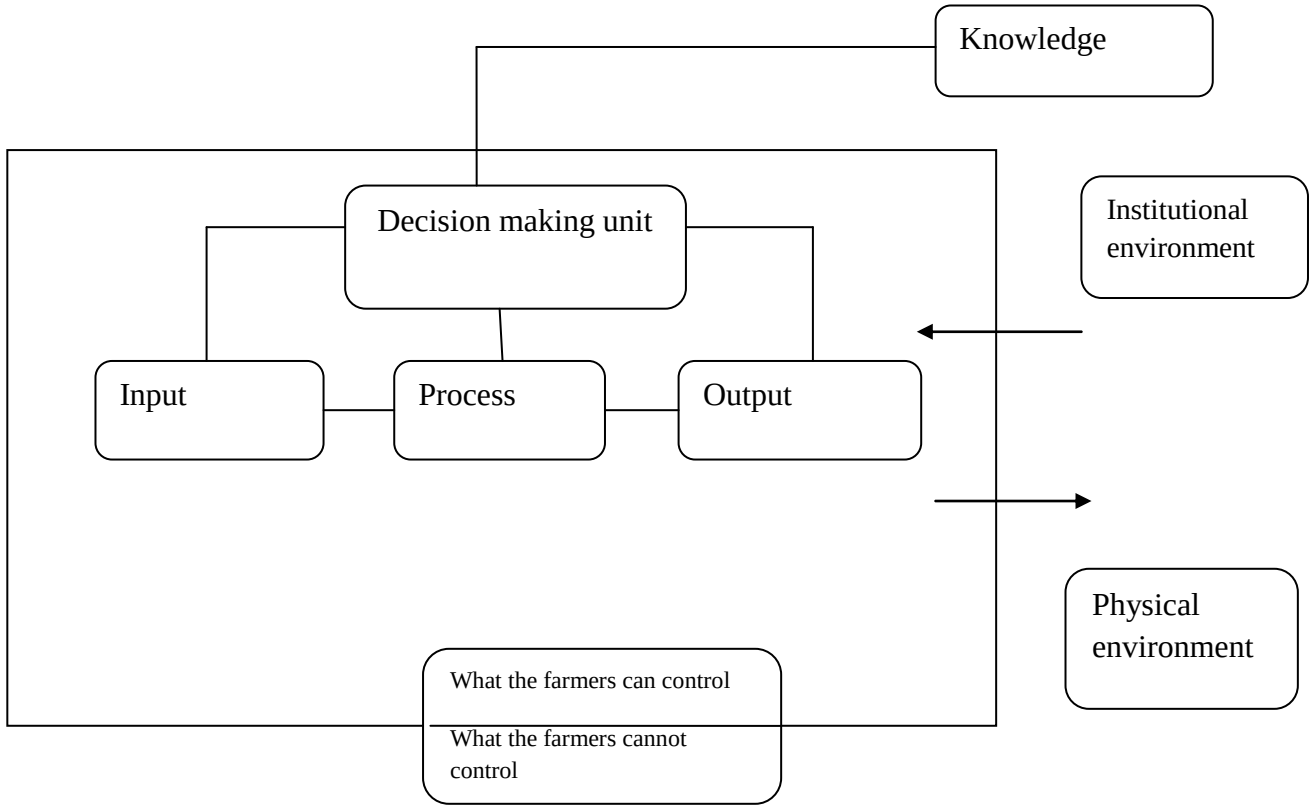
The relationship between farming system and the conceptual framework is the farmers' decision making unit to use the onion production package depends on three factors: which are inputs, process and outputs of the package and it is also affected by institutional and physical factors. Again these three factors are determined by the willingness, knowledge and ability of farmers to adopt the package. From these perspectives the farmers decision making are interdependence as shown in (fig.2). The farming system model is illustrated as briefly as the following: willingness is the basic fundamental one to farmers decisions that to involve or accept in the onion production package. It determines the benefit and claims of the package. Benefit is determining the output of the package this indicates that the farmers consider the net income of the onion per hectare from onion cultivation. Claims is determining the availability and requirement of inputs and this indicates that the farmers needs to consider labour requirement, working capital, water application, diseases resistant ability of the package.

The other most important is knowledge of farmers to involve onion production package. This considers the process of the package to apply on farmer's own irrigated farm land. It considers the application of inputs and the agronomic practices. Farmers' ability determines the means and skill of farmers to adopt the package. This considers the requirement of initial capital to purchase inputs and requires skill to apply the package as recommend level.

The farmer decision making unit is also affects the institutional environment these includes access to credit, availability of input supplier or provider and access to extension. Physical environment also affects the decision of farmers to adopt the package. This includes the availability of irrigation water, type of soil and the suitability of temperature. Therefore, farming system model and the conceptual framework is interlinked.

The farming system in Figure 2 shows that the farmers' decision making unit determines the inputs, process and outputs. Input includes land, water, fertilizer and chemicals to be used for onion production, the process includes the agronomic and management practices of onion production and the output also includes the production of onion and net cash income. The farmers' decision making unit is influenced by the physical and institutional environment such as rainfall, temperature soil and water, and extension services, access to credit and market price. Fleke and Zegeye (2006) showed that "access to credit is positively affected on adoption of improved agriculture technologies". Paudel and Matsuoka (2008) also showed that farmers' access to credit increases the farmers' ability to buy improved seeds as well as other inputs. Extension service is one of the institutional approaches that used to transfer knowledge and practice about the adoption of the onion production package to farmers. Doss (2003) reported that the major reasons for not adopting farm-level technology in East Africa were (1) farmers' lack of awareness of the improved technologies (2) lack of information regarding potential benefits accruing from them and (3) the unavailability of improved technologies.

Figure 2: Systematic representation of Farming system



Source: Dixon & Gulliver, 2001

3 RESEARCH PROBLEM DEFINITION

Since 1996, different improved varieties of onion production package have been introduced into the farming system by different institutions in the study area (DADO), 2010). Melkassa Agricultural Research Institute (MARI), which is a national coordinator of horticulture research, conducted several demonstrations in collaboration with the District Agriculture Development Office to promote the application of recommended onion production packages to smallholder farmers in the area. Besides these agricultural practices, they also facilitated and provided inputs such as seed, fertilizer and pesticides for the farmers directly and through cooperative bureau. The farmers benefited from these facilities because of the accessibility of inputs and free transportation cost. In addition, the presence of large scale producers in the area enabled farmers to gain experience on the onion production package.

Despite such intervention, productivity of onion at smallholder farmers' level remained low. The potential yield of improved onion is reported to be 40 tons per ha (EARI, 2002, as cited by Dawit et al., 2004) while the average yield per ha at farmers level in the area ranges between 17 to 20 tons. This implies about 50% yield gap between the potential and the actual productivity of onion at farmers' level.

3.1 Research problem

It is not clear why some farmers are not adopting the recommended onion packages. So far, the reasons for the low adoption of the recommended onion packages have not been systematically investigated.

3.2 Research objective

The objective of this research is to assess reasons for low adoption of the recommended onion production package by farmers in the Dugda district of Ethiopia.

3.2.1 Main research question

What are the reasons for the low adoption of improved onion production package by farmers in the Dugda district?

3.2.1.1 Sub research question

Based on the above main research question the following sub research question were formulates;

1) Are farmers willing to adopt recommended package for onion production?
2) Do farmers have the knowledge to use onion production package?
3) Do farmers have the ability to use improved onion production package?

4 RESEARCH STRATEGY AND METHODS

For this study, survey was used as a research strategy. The reason for using the survey approach was used to generate data that gives comprehensive and detailed information about the adoption of onion production package and to identify the reasons for low adoption of onion production package.

4.1 Methods of data collection

Both primary and secondary data were used for this study. Secondary data was collected through a desk study from different journals, books and internet about onion production package. In addition to this, the characteristics of the study area were collected from the District Agriculture Development Office. Primary data was collected using different methods such as individual interview, key informant interview and direct observation.

For this research purposive and random sampling techniques were employed to select Peasant Associations (PAs) and sample respondents. Two PAs namely, Bekele-Girisa and Tuchi-Danble PAs were selected purposively from 18 onion grower PAs found in the district. The selection was based on their access to past extension support provided by research centres, DARD and other institutions involved in the introduction of improved onion production packages. Then list of farmers in the PAs were obtained from the PA offices and identified irrigated onion grower farmers in collaboration with extension expert of the respective PAs. Finally, total sample size of 40 sample farmers, who are growers of new variety of onion was randomly selected.

Primary data was collected using structured questionnaires for individual interview. It was appropriate to measure the knowledge of individual respondents as the questions were the same for every individual. The structured questionnaires were pre-tested to check whether the questionnaires were appropriate or not. It was also done to check their logical sequence, their clarity and simplicity of the language. For this purpose 2 persons were selected from non-respondent farmers to fill the questionnaire for the pre-test. Corrections were made to the questionnaire according to the feedback from non-respondent farmers and the final questionnaires were answered by the sample respondents.

Before data collection the researcher communicated with the District Agriculture Development Office manager and explained the objectives of this research, why the research was to be carried out in that district and what the researcher wanted to do. During the interview, the researcher introduced herself and explained the objectives of the study to the interviewee. The interview was carried out based on the sampling technique. Then the researcher led the overall process and discussion with the concerned individuals.

The key informant interview was conducted to generate general understanding of the reason behind low adoption of recommended onion production package. Moreover, to generate detailed information about onion production package in the study area. This interview employed a total of six key informants through a checklist with cooperative union leader, water association leader, agronomy expert and two extension workers from Agriculture Development Office at District level and leader of Peasant Associations (PAs). The prepared check list allowed the researcher to be flexible in getting detailed information by probing on the knowledge of onion production package. From this different meaning and understanding about the expected the knowledge from the onion production could be explored.

Observation: during the data collection time, the living condition of sample farmers and farms, crops and livestock production activities were observed.

Farmers' interview: A total of 40 farmers were interviewed from onion farm grower. From the total sample farmers, 8 female headed farmers were included in the gender sensitivity of the research.

4.2 Methods of data processing

Both quantitative assessment and descriptive analysis techniques were used for data analysis. The data from the farmers' interview was analyzed through Microsoft EXCEL and SPSS. The study used descriptive statistical methods such as frequency, percentage and mean for analyzing the data based on the conceptual framework used for answering the main and sub research question.

5 RESEARCH FINDINGS

5.1 Onion production per hectare

According to the survey finding, (30%) of the respondents obtained the range between 1-5 ton per hectare of onion yield while (2.5%) of them obtained 11-15 ton/ha of onion yield. Majority of farmers (32.5%) gained the yield ranges from 16-20 ton/hectare. Similarly (27.5 %) of the respondents obtained the onion yield from 21-25 ton/hectare. Whereas (5%) of them obtained between 26-30 ton/hectare and 2.5% of the respondents also gained the ranges between 31-35 ton/ hectare of onion yield. In addition, the average onion farming experience of sample farmers was 3.3 with the yield obtained from 1 to 5 tonnes. On an average the sample farmers had 5 years of experience in onion farming with 16 to 20 tons of onion production. The average years of onion farming experience was 6.5 that also produced from 20 to 30 tons (Table 1).

According to the Dugda District Agriculture Development Office (DADO, 2010) report, the traditional onion grower produced 256,135 quintal of onion from 1,892 ha of irrigated land (1.3 ha per household). Based on this information the traditional onion grower farmers produced 135 quintal of onion per ha. Most of the time, they produced onion once in a year due to shortage of capital and inputs such as fertilizer, chemicals and seeds. The same source stated that, low quality and small bulb size of onion are produced by traditional onion growers.

Table 1: Ranges of onion yield per hectare

Yield range per hectare (ton/ha)	Frequency of person	Average onion farming experience (in year)	Valid percent
1-5	12	3.3	30.0
6-10	0	0	0.0
11-15	1	2	2.5
16-20	13	5	32.5
21-25	11	5.4	27.5
26-30	2	6.5	5.0
31-35	1	4	2.5

*1 ton = 10 quintals = 1000Kg
Source: Field result, August 2012

The survey result showed in Table 2, the majority of the respondents (65%) produced onion twice a year while the rest of the farmers (32.5%) produced once in a year. Few of them (2.5%) respondents produced three times per year.

Table 2: Frequency of onion cultivation per year

Onion cultivation	Frequency	Valid percent
Once per year	13	32.5
Twice a year	26	65.0
Three times per year	1	2.5
Total	40	100.0

Source: Field result, August 2012

5.2 Incomes from onion production

The survey result showed that the average price of onion per Kg was 4.7 ETH Birr (€1 = 22 ETH Birr) as presented in Table 3. The average income that the respondents (30%) received from onion production per one harvest season in 2011/12 was between 4700-23500 ETH Birr. Similarly, the respondents (2.5%) obtained 51700-70500 ETH Birr while the rest (32.5%) of them obtained 75,200-94000 ETH Birr. Other farmers (27.5%) gained 98,700-

117,500 ETH Birr. Moreover (5%) and (2.5%) of farmers also received income from onion yield was 122,200-141,000 and 145,700-164,500 ETH Birr respectively. However, this price was lower as compared to the main market centre like Addis Ababa which normally ranges between 10-12 ETH Birr per kg.

Table 3: Price of onion per kilo-gram (Kg)

Onion price *	N	Minimum	Maximum	Mean
Price of onion per kg	40	4.00	8.00	4.715

Source: Field result, August 2012

5.3 Labour requirement and gender division of labour for onion production

The survey result showed that 80% of the respondent faced family labour shortage during onion production while the rest (20%) did not experience the problem. Most of the time men and boys are engaged on onion production activities than women and girls. Table 4 shows that, (82.5%) of male participate in land preparation than women and (17.5%) of boys participate in land preparation than girls. On the other hand, women participate in certain onion production activities such as bed preparation for seedling, weeding, transplanting, cultivation and storing the onion product. Moreover, girls participate in certain onion production activities than boys. The outcome therefore shows an indication that onion production is by large an activity dominated by males and boys than women and girls.

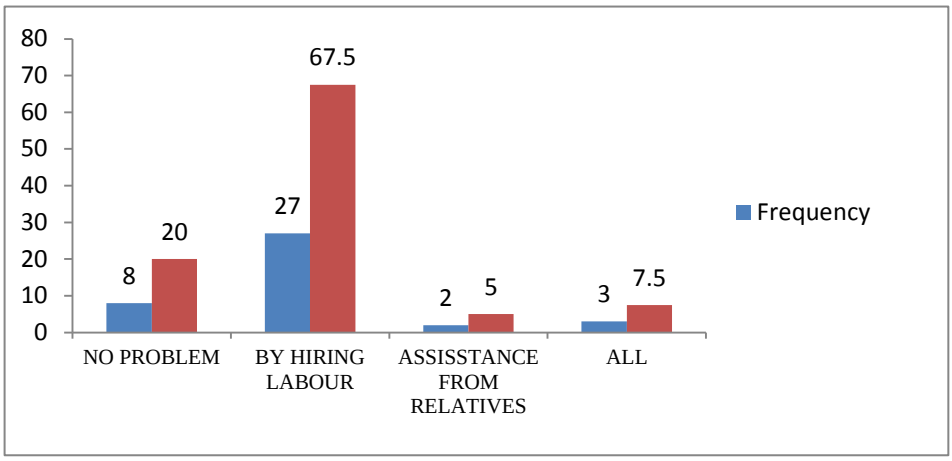
Table 4: Harvard matrix on gender division of labour to onion production

Onion production activities	Family Labour			
	Male	Women	Girls	Boys
Land preparation	82.5	0	0	17.5
Bed preparation for seedling	42.5	25	0	32.5
Seeding	57.5	0	0	42.5
Watering for seedling	20	0	0	80
Weeding for seedling	22.5	7.5	12.5	57.5
Transplanting	35	30	10	25
Fertilizer application	70	0	0	30
Cultivation	45	32.5	0	22.5
Transporting the product	28	0	0	72
Storing the product	35	45	0	20

Source: Field result, August 2012

According to the result, the majority of the respondents (67.5%) used hired labour while the minority of the respondents (5%) received assistance from their relatives to solve the labour shortage. And few respondents (7.5%) use both hired and assistance from relatives to overcome their labour shortage problem (Fig. 3).

Figure 3: Respondents strategies used to overcome labour shortage problems on onion production



Source: Field result, August 2012

5.4 Availability of input

The survey result indicated that in Table 5, the majority of respondents (57.5%) had a seed shortage problem. Similarly, (15%) and (22.5%) of the respondents had problems associated with the high cost of inputs and storage problems. The rest of 5% respondents explained that they had no problems associated with onion production package. Additionally, the key informant interview showed that, the absence of fungus resistant onion variety seeds was one of the major problems in the study area. The current varieties (such as Bombey and Adama red) are highly susceptible to diseases especially when planted in the wet season.

Table 5: Farmers problem in relation to onion production package

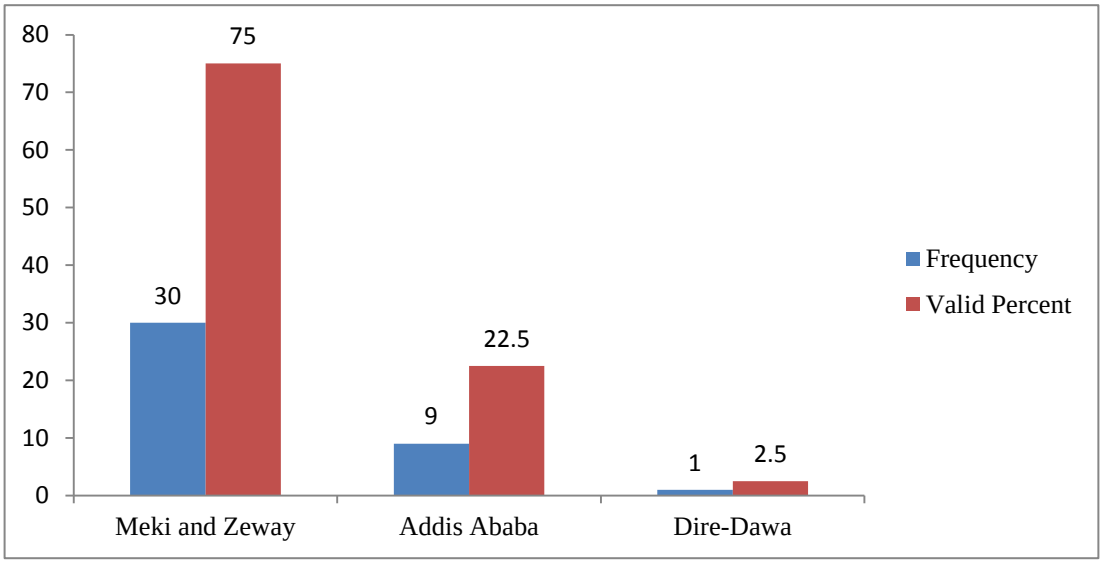
Problem with onion production package	Frequency	Valid Percent
No problem	2	5.0
Shortage of seed	23	57.5
High cost of inputs	6	15.0
Storage problem	9	22.5
Total	40	100.0

Source: Field result, August 2012

5.5 Market access

According to the result of the study (75%) of the respondents supplied their produce to local markets (Meki and Zeway) and the rest of the farmers (22.5% and 2.5%) supplied to the main market centre which is located in Addis Ababa and Dire-Dewa market centres respectively (Fig. 4).

Figure 4: Farmers accessibility of market to sell onion production



Source: Field result, August 2012

According to the key informant interview, it was difficult to supply their products directly to the central market (i.e. Addis Ababa and Dire-Dewa) because of high transportation cost and market being controlled by few onion traders.

Key informant interviews showed also that the respondent was faced with lack of reliable sources of price information, exploitation by middlemen and traders due to their poor bargaining power which results in low selling price. The major sources of price information for farmers were middle men, neighbour farmers and traders.

5.6 Irrigation land for onion production

The average irrigated land holding of the respondents were 1.2 ha. Out of which, the average irrigated land used for onion production was 0.86ha. On the other hand, farmers used additional rented irrigated land for onion production of 0.45ha (Table 6). This indicates that the majority of the respondents used their irrigated land for onion production.

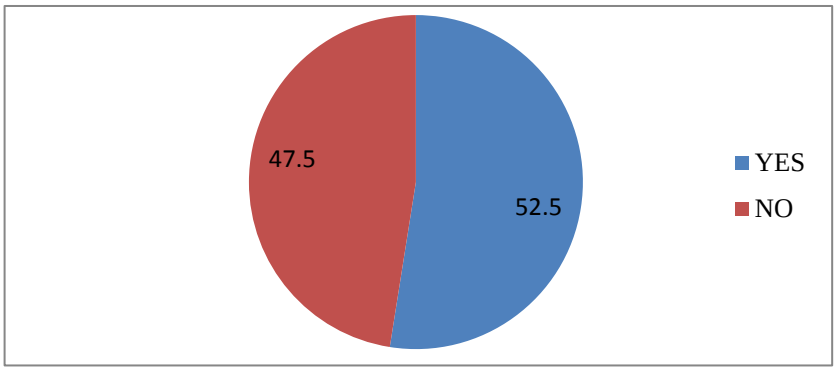
Table 6: Average irrigation land size used by the respondents

Amount of land under irrigation	N	Minimum	Maximum	Mean
Hectare of land under irrigation	40	0.25	3.00	1.2062
Irrigated land used for onion production	40	0.25	2.00	0.8687
Rented land for onion production	40	0.00	2.00	0.4500

Source: Field result, August 2012

According to Fig. 5 more than half of the respondents (52.5%) have rented irrigated land from non-grower farmers. The reason why farmers used the rented land explained by them were to get extra yield in addition to their own irrigated land. However, the rest of the respondents (47.5%) produced onion on their own irrigated land.

Figure 5: Responses of farmers whether they have rented land or not by 2011/2012 production year



Source: Field result, August 2012

5.7 Means of farmers for onion production

The result of this survey indicated that the majority of respondents (72.5%) faced with a shortage of money or capital in onion production while the rest (25%) of them faced with shortage of irrigable land. whereas shortage of inputs was the problem in the study area as explained by 22.5 % of the respondents (Table 7)

Table 7: Farmers problems with related to resources

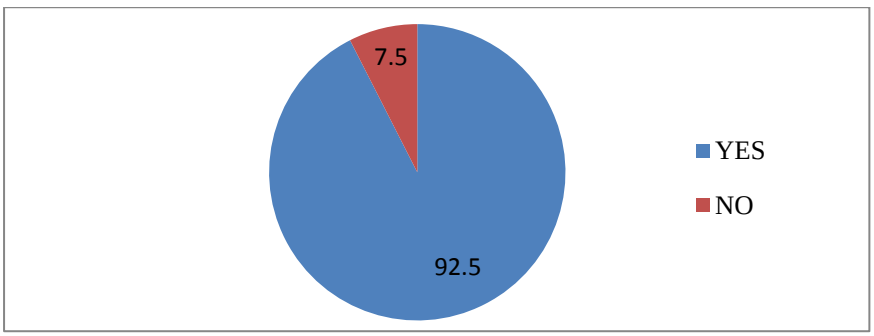
Problems with onion production package	Frequency	Valid Percent
Shortage of money or capital	21	72.5
Shortage of irrigated land	10	25.0
Shortage of input	9	22.5
Total	40	100.0

Source: Field result, August 2012

5.9 Knowledge and skill of farmers

The survey data showed that, out of the total respondents, (92.5%) of the respondents were aware of the recommended agronomic practices of onion production package, while the minority (7.5%) of them were not aware of the recommended agronomic practices of the onion production package.

Figure 6: Farmers knowledge about the required agronomic practices of onion production package



Source: Field result, August 2012

5.9.1 Seeding rate per hectare

Table 8 presents the seeding rate of onion used by farmers. As farmers responded that, (5%) of the farmers used 3kg/ha of onion seed whereas others (5%) and (2.5%) of them used 4kg and 5kg/ha of onion seed respectively. Moreover, 15% of the farmers used 8kg/ha and (2.5%) of farmers also used 9kg/ha. Similarly, 30% and 35% of the farmers used 10kg/ha and 12kg/ha respectively. The rest of the respondents (5%) used 15kg/ha of onion seed (Table 8).

Table 8: Trends of farmers on application of onion seed rate per hectare

Seed rate per hectare(kg/ha)	Frequency	Valid percent
3	2	5.0
4	2	5.0
5	1	2.5
8	6	15.0
9	1	2.5
10	12	30.0
12	14	35.0
15	2	5.0
Total	40	100.0

Source: Field result, August 2012

Farmers were asked about the source of inputs (such as fertilizers, seed, and chemicals) for onion production. From the total of respondents, half of them (50%) purchased their inputs from the market while (32.5%) obtained from cooperative union. The rest of the farmers (17.5%) purchased from the District Agriculture Development Office (Table 9).

Table 9: Farmers' responses about sources of onion package

Source of inputs	Frequency	Valid Percent
From agriculture office	7	17.5
From cooperative union	13	32.5
Market	20	50.0
Total	40	100.0

Source: Field result, August 2012

5.9.2 Time and rate of fertilizer Application

Out of 40 respondents, (57.5%) of them responded that the rate of fertilizer applied during the 2011/12 production year was above 200 kg/ha. of DAP. Others (30%) of the respondents used the standard DAP fertilizer (200 kg/ha.). the rest of the farmers (12.5%) used below 200 kg/ha (Table 10).

On the other hand, the majority of the farmers (95%) applied above 100 kg/ha of UREA. 2.5% of the respondents used the standard UREA fertilizer and the rest of the farmers (2.5%) applied below 100kg/ha. of UREA (Table 11). Moreover, the data showed that there was a yield gap among farmers who applied above and below the recommended amount of fertilizers.

During the key informant interview, different reasons were mentioned for the use of such higher fertilizer rates. In the first place, they claimed that intensive use of fertilizer higher than the recommended rate is required to obtain a better yield which would most probably lead to higher profit.

Table 10: Amount of DAP fertilizer application and yield difference

Yield range per hectare (ton/ha)	DAP fertilizer application per hectare					
	Below recommendation (<200kg)		Recommendation level		Above recommendation (>200)	
1-5	3		5		4	
6-10	0		0		0	
11-15	0		0		1	
16-20	1	12.5%	4	30%	8	57.5%
21-25	1		3		7	
26-30	0		0		2	
31-35	0		0		1	
Total	40					

Source: Field result, August 2012

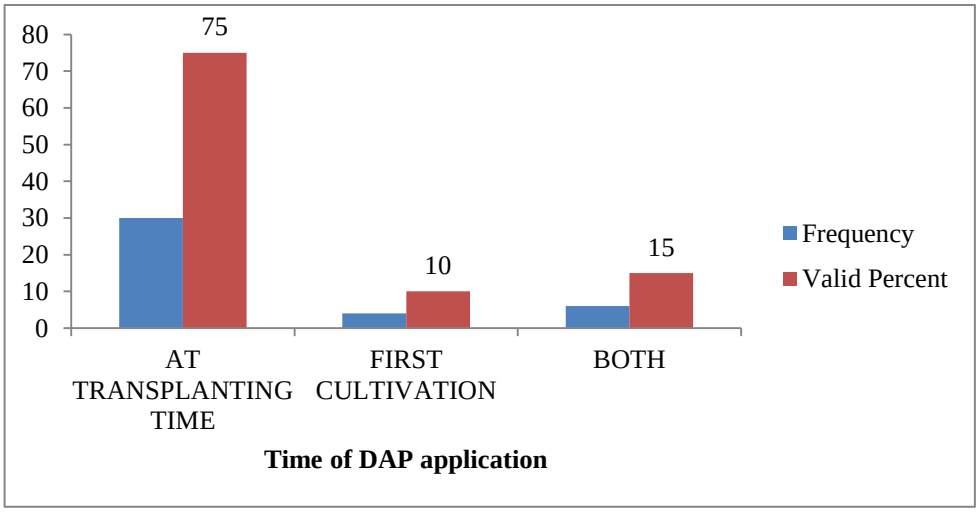
Table 11: Amount of Urea fertilizer application and yield difference

Yield range per hectare (ton/ha)	Urea fertilizer application per hectare					
	Below recommendation (<100kg)		Recommendation level		Above recommendation (>100)	
1-5	1		1		10	
6-10	0		0		0	
11-15	0		0		1	
16-20	0	2.5%	0	2.5%	13	95%
21-25	0		0		11	
26-30	0		0		2	
31-35	0		0		1	
Total	40					

Source: Field result, August 2012

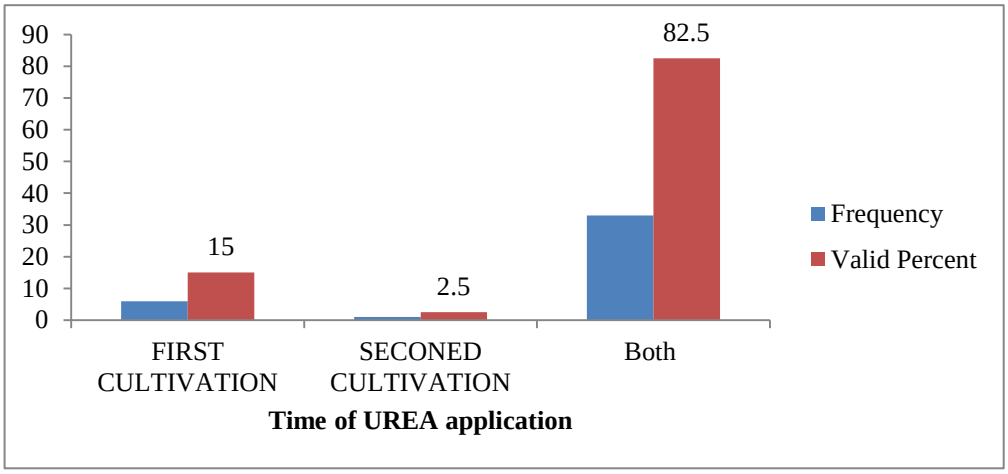
As Figure 7 indicated, (75%) of farmers applied DAP fertilizer at the time of transplanting. Whereas few of the farmers (10%) disclosed that application is done at first cultivation and the rest of them (15%) applied both at first cultivation and transplanting time.
Out of 40 respondents, (82.5%) applied UREA both at first and second cultivation. The rest of the respondents (15%) also stated that their time of application was in the first cultivation. Other farmers (2.5%) used at second cultivation (Fig. 8).

Figure 7: Time of DAP applications



Source: Field result, August 2012

Figure 8: Time of Urea application



Source: Field result, August 2012

5.9.3 Transplanting time of seedling

With regards to the transplanting time of seedling (52.5%) of the respondents transplanted their seedlings at the first harvesting time when the seedlings are 60 days old. Besides, 7.5%, 12.5% and 22.5% of the respondents transplanted their seedlings at 45, 50 and 55 days respectively (Table 12).

At the second harvesting time 27.5% of the respondents transplanted their seedlings at 60 days old while 22.5% of them transplanted at 45 days old. The rest of the respondents (7.5%) transplanted their seedlings at 50 days old and similarly, (7.5%) farmers transplanted at 55 days old. However, (13%) of respondents were not used to the second transplanting of onion because they are used to only the first transplanting time (Table 13). On the other hand, at the third harvesting time the respondents (2.5%) transplanted their seedlings at 45 days old while the majority of them (97.5%) did not practice the third transporting time (Table 14).

Table 12: Transplanting time of onion seedlings at first onion harvesting season

Transplanting time (Days)	Frequency	Valid Percent
30	2	5.0
45	3	7.5
50	5	12.5
55	9*	22.5
60	21	52.5
Total	40	100.0

*One respondent applied both in the transplanting time of onion seedling
Source: Field result, August 2012

Table 13: Transplanting time of onion seedling at second harvesting season

Transplanting time (days)	Frequency	Valid Percent
Not applied	13	32.5
30	1	2.5
45	9	22.5
50	3	7.5
55	3*	7.5
60	11	27.5
Total	40	100.0

*One respondents applies both in the transplanting time of onion seedling
Source: Field result, August 2012

Table 14: Transplanting time of onion seedling at third onion harvesting season

Transplanting time (days)	Frequency	Valid Percent
Not applied	39	97.5
45	1*	2.5
Total	40	100.0

*One respondent applies both in the transplanting time of onion seedling
Source: Field result, August 2012

5.9.4 Chemical application

According to the survey results, majority of farmers (25%) applied 12kg/ha. of fungicides chemicals. 17.5% of the farmers used 14kg/ha. while other farmers (12.5%) and (10 %,) also applied 8kg/ha and 10 kg/ha respectively. In addition, 7.5%, 5%, and 2.5%, of the respondents used the 15kg/ha, 7kg/ ha, and 6kg/ha respectively in that order on their onion farm lands. The rest 2.5% of the farmers used 2kg/ha of fungicides. But 10% of the respondents did not use these chemicals on their own farm land (Table 15).

Table 15: Rate of chemical (fungicide) application

Rate of fungicide	Frequency	Valid percent
Not applied	4	10.0
2	1	2.5
6	1	2.5
7	2	5.0
8	5	12.5
9	3	7.5
10	4	10.0
12	10	25.0
14	7	17.5
15	3	7.5
Total	40	100.0

Source: Field result, August, 2012

5.9.5 Frequency of weeding and cultivation

According to the survey results, more than half of the respondent farmers (55%) performed three times cultivation while 35% of respondents performed 4 times cultivation in a production season. The rest of the farmers (7.5%) and (2.5%) responded that they performed two and five times respectively (Table 16). At the same time, weeding was done by farmers during the cultivation time.

Table 16: Cultivation and weeding frequency of onion plant

Cultivation and weeding frequency	Frequency	Valid Percent
Two times	3	7.5
Three times	22	55.0
Four times	14	35.0
Five times	1	2.5
Total	40	100.0

Source: Field result, August 2012

5.9.6 Frequency of irrigation.

In the study area, the improved onion production is practiced under irrigation. The major irrigated water sources are Zeway Lake (75%) and underground water (10%). 15% of the farmers used water from both Zeway lake and underground (Table17).

Based on the key informant information in the area most of the farmers used irrigation water on their own irrigated land 2-3 times per week before transplanting of seedlings then after they used 3-4 days interval after transplanting of the seedlings.

Table 17: Sources of irrigation water for onion production

Source of irrigation water	Frequency	Valid Percent
Zeway lake	30	75.0
Under ground	4	10.0
Both	6	15.0
Total	40	100.0

Source: Field result, August 2012

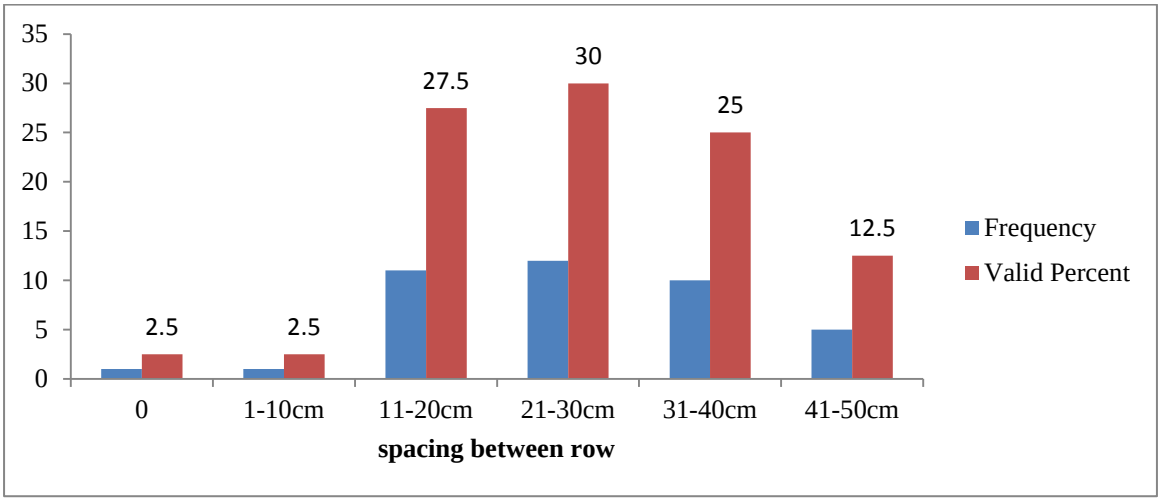
5.9.7 Spacing

The researcher asked the farmers about the applications of spacing when they are transplanting their onion seedlings from seed bed to their field. Based on this (30 %) of farmers responded that they use spacing between rows from 21-30 cm while 27.5% of the farmers used 11-20 cm. 25% and 12.5% of the respondents used from 31-40 cm and 41- 50 cm respectively. Few of the farmers (2.5%) also used 1-10 cm. However, 2.5% of the farmers do not used spacing (Fig.9).

According to the key informant interview, the reasons for not using recommended spacing by farmers was that, spacing required additional labour and capital. On the other hand, they needed to have denser plantation to compensate for death of some seedlings. They also believe that denser plantation would enable to obtain better yield. In addition to this, medium size onion bulb is more marketable than big size onion bulb. Due to these reasons the farmers do not follow the research recommendation.

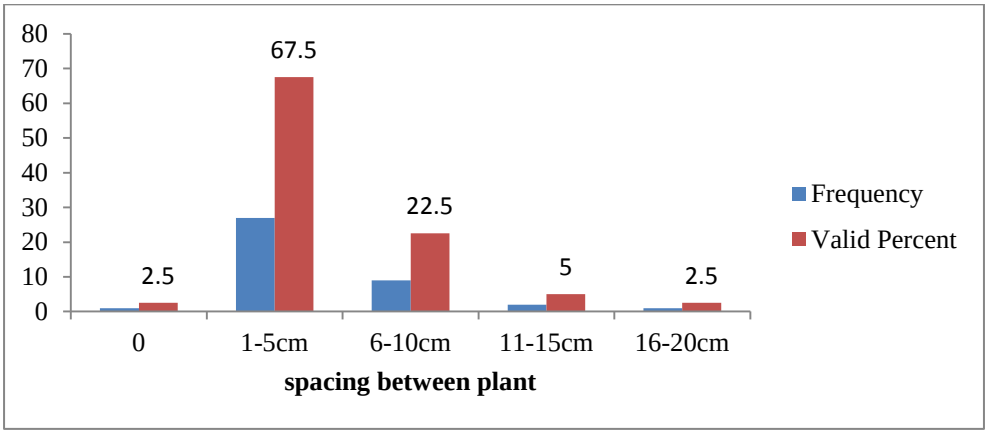
Figure 10 shows spacing of onion seedlings after transplanting between plants. 67.5% of the respondents used 1-5cm while (22.5%) of the farmers used 6-10cm. The rest (5%) and (2.5%) of the farmers used 11-15 cm and 16-20 cm between plants respectively. But (2.5 %) of the respondents do not apply spacing between plants.

Figure 9: Spacing of onion seedling after transplanting between rows



Source: Field result, August 2012

Figure 10: Spacing of onion seedlings after transplanting between plants



Source: Field result, August 2012

5.10 Extension contact

The survey results showed that the majority of the onion growers (82%) had extension activities whereas (17.5%) of the respondents do not receive extension service (Table 18).

Table 18: Farmers contact with Extension service

Response	Frequency	Valid percent
Yes	33	82.5
No	7	17.5
Total	40	100.0

Regarding the extension contact, (32.5%) of the farmers that got extension services from cooperatives and (25%) from NGOs obtained more yield than the farmers (25%) that got access from agriculture development office. The rest of the respondents which accounts (17.5%) do not have contact with extension services but they obtained the minimum yield 1800kg/ha and the maximum yield obtained 32,000kg/ha (see appendix 1).

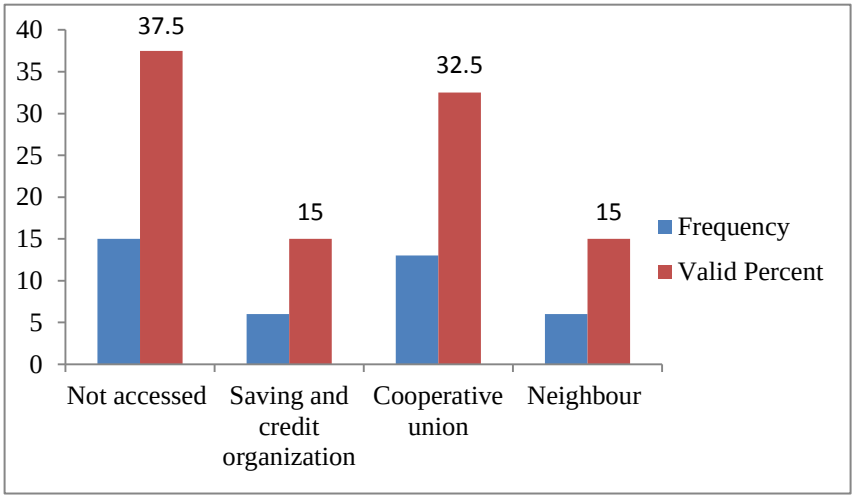
According to key informant information the relationship between cooperative and NGOs are working closely together, because cooperative members are getting capacity building training from NGOs while the cooperatives have a role to facilitate things like to nominate the members of cooperatives in that specific areas. In most cases, cooperative and NGOs (such as VOCA and JAICA) worked jointly to scale up the productivity of farmers in their onion package. On the other hand the researcher was also asked the key informants questions about the exact agronomic practices of onion production package. The result showed that the extension workers disseminated information about the package was seed rate 10-12kg/ha, spacing between plant 10cm and between row 10-20cm, fertilizer application 400kg/ha of DAP and 300kg/ha of UREA , chemical application 12kg / ha , transplanting time of the seedling 45-60 days. Moreover, the extension workers were not getting continuous trainings related to horticulture production and also there was frequently reshuffling between extensions workers, the other reason mentioned by key informants was that, farmers have considered their own benefits regarding to the farm size, yield, bulb size and market prices. They also mentioned that, extension workers directly applied the package manually without getting any training support to close information gaps existed between the farmers.

On the other hand, frequency of extension contact was different among onion growers. The survey result showed that (7.5%) of the respondent had access to contact extension once a week whereas the respondents (25% and 22.5%) had access once and twice a month respectively. The rest of the respondents (22.5% and 5%) had access twice and three times per year in that order (Appendix 1).

5.11 Access to credit

Farmers were interviewed about access to credit, this result showed that (32.5%) respondents had access to credit that received from cooperative while (15%) of the respondents received from saving and credit organizations and the rest of them (15%) received from neighbours (informal credit). Despite this, (37.5%) had no access to credit (Fig. 11).

Figure 11: Sources of credit for onion grower farmers



Source: Field result, August 2012

6 ANALYSIS AND DISCUSSION

This chapter discusses the reasons for low adoption of the recommended onion production package by farmers, in terms of willingness, knowledge and ability of farmers to adopt recommended onion package.

6.1 Willingness of farmers to adopt onion production package

In the study area the respondent farmers commonly produced improved variety of onion. Farmers willing to adopt the recommended package usually considered the production of onion such as yields per hectare, frequency of production in a year and incomes from the production as compared to the requirement of the package applied to their own farm land. This means on the other hand before the respondent farmers adopt the package, they needed to compare the benefit and claims of the onion production package to their own irrigated land.

6.1.1 Benefits of farmers

Income and yields: The benefit of farmers in this study was identified with regards to onion yield production/ha that farmers obtained from their particular lands. As a result it was realized that most of the farmers benefited from the package gained onion yields between the range of research recommendations and above the recommendation range. This result was confirmed with EARI, 2002, as cited by Dawit *et al*. (2004) the average yield per ha at farmers level in the area ranges between 17 to 20 tons.

The study showed that the improved onion package increased farmers' income. The increase income was mainly attributed to high yields and the frequency of cultivation. Due to the availability of irrigated land and irrigation water in the study area, most of the farmers cultivated twice a year. This result confirmed that the farm income and higher yield had a positive relationship with willingness of farmers to adopt innovation (Asante et. al., 2011)

There were income differences between traditional and improved onion growers. Those farmers who used improved onion package were capable of earning more income than the traditional grower farmers. With regards to this, the majority of the traditional farmers shifted their production to use improved onion package due to learning from other farmers who have adopted the technology by analysing their benefits and other services from improved onion packages. The reason was that the traditional farmers obtained lower yield because they do not external use inputs on their farm land.

6.1.2 Claims of farmers

Labour: Onion production is a labour intensive business. A farmer with large working labour force will be in a position to manage the labour-intensive onion production activity. Moreover, large working labour force in a family means, the farmers may not need to hire more additional labour and the money saved in the use of own labour force could be used for purchasing other onion production inputs. This will increase farmers' possibility to adopt onion production packages. However, the survey result showed that 80% of the respondents faced family labour shortage during onion production. This result indicates that the labour shortage is one of the reasons why farmers do not follow the research recommendation.

According to the result of the survey, the majority of the respondent used family labour for onion production activities. However, most of the time men and boys are engaged than women and girls. According to the researcher observations, the activities of farmers such as looking after children were mainly carried out by women and girls. Due to this woman and girls do not fully participate in onion production activities. In the study area, carrying and transporting onion products from the field to storage commonly done by boys and male through using draft animals.

Figure 12 Transplanting onion production though using draft animals

It was identified that hiring labour was the main solution used by the majority of the respondents to solve labour shortages. Other alternative methods that farmers used were assistance from relatives. In the study area, use of hired labour is a common practice and the involvement of farmer's labour is minimal as compared to the huge amount of labour force that onion production activity requires. According to Mihretu (2008) availability of labour increases the adoption of improved onion production. On the other hand, the majority of the respondents hired labour use at the peak of production time such as during land and seedbed preparation, seeding and transplanting time, cultivation and harvesting time. As a result there is no regularity of hiring labour for onion production between activities.

Availability of inputs: In the study area, it was identified that the shortage of seed was the main problems of the growers. The reason that was given by the majority of the farmers was no available certified seed suppliers. But currently most farmers used seeds from those farmers who were producing onion seed in the study area. According to Nikus and Mulugeta (2010), Ethiopian Agriculture Research Institute (EARI) and Ethiopian Seed Enterprise (ESE) supplying of onion seed was in limited amount to the farmers. The insufficiency of seeds brought high price of seed to farmers that currently reached the price of onion seed of 400 ETH Birr per/kg.

The significant points associated with inputs were storage capacity of farmers in the area. In this study it was identified that there was only one onion storage facility constructed by International Development Organization (IDO), however it was not functional. As a result the farmers were forced to sell their produce at farm get level. This result showed that the lack of storage facilities were one of the influencing factors of onion production package.

Irrigated land: In the study area shortage of irrigated land was not a major problem. The survey finding showed that the average irrigated landholding of the farmers was 1.2 ha in which 0.86 ha was used for onion production. On the other hand the rented land was a common practice with irrigated land use due to gain in extra yield. In the study area during rainy season most of the farmers' farm land was covered by other crops, as the onion variety is highly susceptible to disease during the rainy season.

Means of farmers for onion production: onion production is a capital-intensive business. According to the majority of the farmers there was shortage of money or capital for onion production. The onion package required high initial capital investment (i.e. water lifting equipment such as motor pumps and other inputs).

6.2. Farmers skill and knowledge for onion production package

Onion production involves the use of different package practices. For this study, the knowledge and skills of farmers was realized with onion production package practices with reference to the research recommendation. These included seed rate per hectare, the time of seedling and transplanting, spacing, frequency and quantity of watering, frequency, timing and quantity of fertilizer and pesticide application.

Majority of the farmers were aware of the recommended onion production package. But most of them do not apply this recommendation on their own irrigated land. The reason was the existence of consideration gaps between farmers and research centres. The research centres only considered amount of production or yield per hectare. But the farmers consider the price of onion, market availability, bulb size, yield and requirement of inputs. As a result there was a high variation among farmers and research centres on the application of the package.

On the other hand, experience of the farmer is likely to have a range of influences on adoption. Experience will improve the farmer's skill at onion production. A more experienced farmer will have a lower level of uncertainty about the innovation's performance. Farmers with higher experience appeared to have often full information and better knowledge and are able to evaluate the advantage of the innovation considered. Therefore, it was expected that onion farming experience had a positive influence on adoption of onion production package.

6.2.1 Application of onion production package by farmers

Seeding rate per hectare: Use of proper seeding rate is one of the most important agronomic practices in onion production packages. Excessive or underutilization of seed will result in poor production performance. Usually research recommends specifying the level of seeding rate for a given variety or crop with a given range of seed viability. Farmers' adoption of the recommended seeding rate however depends among several things on the appropriateness of the recommended rate itself and availability of quality seeds.

However, the survey result indicates only few farmers used seeding rate as recommended by the researchers. But, the majority of them has used above the research recommendation.

The main reasons for using such high seeding rate was the availability of uncertified seed or poor quality of seed and at the same time they need to have a denser plant population in order to get better yields. Farmers also questioned the adequacy of the recommended seeding rate of the research system which is 3.5-4kg per ha. They claimed that whatever the quality of the seed may be, the recommended rate is not sufficient under their physical and management condition. Despite of this, half of the sample respondent farmers obtain their seeds from traders or market while other farmers purchased onion seed from cooperative union and few farmers purchased from the Agriculture Development office (Table 9). However, it could be inferred that most of the seeds used by a majority of the farmers are not certified ones.

Time and rate fertilizer application: Fertilizer application is one of the most important practices that need to be adopted by onion growers. Similarly, proper application of the recommended rate is important to obtain the required yield. As far as fertilizer use is concerned, onion growers in the study areas are aware of the need for using fertilizer in their onion production. However, farmers in the study area use varying fertilizer rate, which in most cases is above the recommended rate. The (Table 10 and 11) showed majority of the respondent used above the recommendation level of UREA and DAP fertilizer. The research recommendation of fertilizer application is DAP 200kg/ha and UREA 100kg /ha (Dessalegn and Akililue, 2003).

The respondents mentioned different reasons for their use of such higher fertilizer rates. One of the reasons, they assumed that intensive use of fertilizer which is higher than the recommended rate is required to obtain better yield. In their view, the research recommended rate is not sufficient to get the required yield level. This has an implication for research indicating the need to reassessing the previous research recommendation by conducting further site-specific fertilizer trials.

The farmers who used fertilizer above the recommendation level were produced from 16 to 20 tons and they also produced above 20 tons. This result indicated that the positive relationship between amount of fertilizer application and onion yield per hectare.

Regarding on the applications of fertilizer most of the time farmers used the UREA fertilizer at cultivation time and the DAP fertilizer applied at the transplanting time, but in some times they applied at cultivation time. The importance of fertilizer application were supplying the necessary nutrients, improves soil texture and improving water holding capacity of the soil. These results shown that, farmers understood the application of fertilizers in the basis of their growing stages of onion plants. Transplanting time refer to transfer onion plants from nursery site to the main field and first cultivation refer to cultivate onion plant when the plant has 15 days old after transplant.

Transplanting time of seedling: The survey result showed (Table 12, 13 and 14) that there were no significant variation between first, second and third onion harvesting time as well as research recommendation. According to Dessalegn and Aklilu (2003), the transplanting time of seedling is depending on the climate, soil condition and cultivar. Seedlings will be ready for transplanting 45-55 days after seeding. Prior to planting pre irrigation is also carried out to settle the soil around the transplants and facilitate the planting operation. It takes about 55-65 days to develop visible bulbing from transplanting and then 60-70 days from visible bulbing to maturity, which is on the average takes about 110-130 days from transplanting to bulb maturity.

Chemical application: The control and prevention of pest and disease can be achieved through site selection, use of resistance variety, crop rotation, and good land preparation, use of quality seed and cultural practices and chemical application. In the study area crop rotation was normally done by onion growers during the rainy season. Because, the farmers were not produced onion due to the existed onion variety was highly susceptible to disease.

The result of the survey revealed that farmers in the area used varying rates depending on their growth stage of crop and level of disease incidence. In the area the farmers were most likely used the rate of chemicals application varying from 6-15kg per hectare. According to Desalegn and Aklilu(2003) cited, chemical control measure for fungal diseases, the research recommendation was to use fungicide chemicals called ridomel and mancozeb at a rate of 3.5 kg per ha mixed with 600 lit of water.

Spacing: Based on the result of the findings the majority of farmers in the study area do not follow the recommended spacing (Fig.9 and 10). They usually plant the seedlings very close to each other and hence the space between the plants is very small. Some of the reasons where mentioned by the farmers spacing requires additional labour and capitals, they need to have denser plantation to compensate for deaths of seedlings, they also believed that denser plantation would enable to obtained better yield. Moreover medium size of onion bulb was more marketable than big size onion bulb. These reasons influence the farmers' adoption of appropriate onion production package application.

Appropriate plant spacing is important because overcrowded plantation would result in slow and stunted growth, poor yield and eventually low income. The research recommended spacing for onion production is 10X20X40 cm spacing where 10 cm is spacing between

plants, 20 cm between rows and 40 cm is the size of the bed including irrigation water path used for irrigating the plant (Desalegn and Aklilu, 2003).

Figure 13 Onion plant after transplanting of seedlings

Frequency of cultivation and weeding: Unlike other practices, there was no significant variation among farmers used frequency of cultivation. Moreover, the frequency of cultivation used by sample growers was almost similar to the research recommendation, which was 2-3 times in a production season. The farmers applied weeding activities simultaneously with cultivation of onion plants.

Frequency of irrigation: In the study area, improved onion production is practiced under irrigation. The major irrigation water sources were Zeway Lake and underground water (Table16). Because of the proximity of the vegetable production to the Lakeshore, the area is rich in underground water. Based on the researcher's observation, the water pump is required to pull water from all the water sources available in the area except limited areas perhaps, where diversion is possible.

Figure 14 Sources of irrigation water and irrigation system

In addition, farmers in the study area use furrow irrigation (flooding) method to irrigate their onion farm. During their application of irrigation water they do not know the exact amount of water rather they consider only the coverage of the field. As a result there was no equal

distribution of water flow under the field. In the area most of the farmers used irrigation water on their own irrigated land was 2-3 times per week before transplanting of seedlings then after they used 3-4 days interval after transplanting of the seedlings. Although the research recommendation regarding irrigation frequency is to irrigate the crop two times per week for the first three weeks and at 5-7 days interval then after. The total frequency of irrigation could vary depending on the nature of the soil and weather condition (Dessalegn and Aklilu, 2003). In line with this, the amount of water needed for irrigation depends on the stage of crop growth, the depth of the rooting zone, and the field capacity of the soil. Thus, the amount of water applied should vary according to the stage of plant growth.

6.3 Institutional environment for adoption of onion production package

Onion grower farmers make decisions within a broader environment. Institutional environment are a part of such broader environment which affects farmers' adoption decision of agricultural technologies. Institutional environment in the context of this study include supported by various institutions and organizations to enhance the adoption of improved onion production package such as market access, extension contact and access to credit.

6.3.1 Market access

The findings shown in (fig. 4 and 5), could mean that all respondent farmers have got market access. However, the respondent which accounts for (75%) sells their produce in local market which is Meki and Zeway. On the other hand, few farmers sell their produce at the central market which is Addis Ababa and Dire-dewa. The reason for these, there was poor road network for supplying the product especially during rainy season, high transportation cost, no reliable source of price information and the lower price settled by middlemen and traders. The major sources of price information for farmers were middle men, neighbour farmers and traders.

6.3.2 Extension contact

The result indicates that, extension service given by government through Agriculture development office was low as compared to other crops. The extension service biased towards other food crops could be due to governments' strategy to focus on food crops to achieve food self-sufficiency. The data indicates the majority of respondent (82.5%) receive extension services however, majority of them has got from cooperative and NGOs. Few of farmers have accessed to contact extension services from agriculture development office. However there was a yield gap among these farmers due to the farmers who are a member of cooperative have accessed to inputs in credit form. And also they are benefited other extension supports through training. Despite of this, the farmers who are not a member of cooperatives, they do not have accessed to input in credit form and they do not get continuous training related to horticulture production. According to Kassa (2002) stated that research and extension activities are carried out by different organizations without much coordination.

Additionally, extension workers who are from agriculture office have not enough knowledge about the recommended onion production package. The reason was mentioned by them, there was frequently reshuffling between extension workers instead of them by assigning new extension workers without getting any training related with horticulture production especially about onion production package in the area. This problem was also confirmed by Kassa (2002) capacity or training is a major issue within the extension system; many extension workers and experts have low technical capacity. The other study also identified that extension workers and other extension staff appear to have limited skills relating to the innovation, networking, social learning, policies, and farmer group development (Abate 2007; Aberra and Teshome 2009).

6.3.3 Access to credit

In the study area, mostly farmers were got credit from different organizations or institutions. One of the most important credits institutions that given credit for the farmers were Oromiya micro-credit. Cooperative societies are also important credit sources for farmers in the study area. Cooperatives and unions provide a wide variety of services, including input supply management, grain marketing, and the supply of consumer goods to members at prices that compete with local traders (Spielman et al. 2006).

In addition to these formal credit sources, informal credit sources such as neighbour at local levels were also important particularly with regard to vegetable production. Amongst of all it was realized that neighbour farmers in their residences were the major informal credit sources for improved onion grower farmers. Because, the onion packages had mainly the capital intensive nature of having access to credit sources was found to be very crucial for adoption of the improved onion production package.

In the study area, financial limitation is one of the common problems of farmers. This problem is relatively more critical particularly for onion growers because onion production is more capital intensive than other crops. A farmer who has access to credit can overcome the farmers' financial constraints and can purchase various inputs required for his farm production. A farmer without cash and at the same time have no access to credit will find it very difficult to adopt new technology particularly those, which needs high initial investment capital. Besides availability of credit, farmers' level of credit use also matters particularly in activities like onion production. Therefore access to credit was positively affects the adoption of onion production package.

From the overall findings indicated that the farmers were used onion production package on their irrigated land. However, except transplanting time of seedlings and frequency of cultivation and weeding the other recommendation from the research institutions were not applied by most farmers. Therefore, this study found that all farmers were partially adopted the onion production package in the study area.

7 CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

This study was conducted in order to assess the reason for the low adoption of the recommended onion production package by farmers in the area. The study tried to investigate the willingness, knowledge and ability of farmers to adopt an onion production package. Onion production package considered in this study includes the use of seed rate, spacing, frequency and quantity of watering, timing and frequency of fertilizer and pesticide application by farmers.

From this study it is concluded that the willingness, knowledge and ability of farmers are interdependent factors in the adoption of onion production package. The study result indicates the onion production packages users were found that increased the yields of onion as compared to the traditional onion growers. And the other important advantages were realized that there was the possibility to produce onion twice or three times a year. These also contributed to increase the farmers' income from onion production.

Onion production activities were the most labour intensive due to this it required labour shortage in those farmers who used the onion packages. However the farmers were given their own solution by hiring both female and male labours from their locality. Availability of labour was found a positive effect on onion production. Farming experience of farmers' increases the production of onion was increased, this indicates farming experience was found a positive effect on onion production.

According to the study, it is evident that farmers are using the onion production package on their irrigated land. They are using seed, fertilizer, chemical, spacing and other agronomic practices used either above or below the recommendation of the research institution. This study find out that almost all farmer's application of the recommendations is only warrants for higher production and higher income. Partially applying the recommended package might indicate the inappropriateness of the recommendation rate as compared to the farmers' benefits. Shortage of certified seed supplier and storage facilities are the major problems in the area.

The institutional environment is also affects the decision of farmers to adopt onion production package. According to the majority of farmers are sold their produced at farm get level. This is due to poor road network, unavailability of reliable source of price information, the prices settled by middle man and the traders. Extension contact is another factor to adopt onion production package by farmers. The farmers who had contact with cooperatives and NGOs are benefited either by getting inputs or trainings. But the farmers who had extension contact from agriculture office do not fully benefit from the package. This is generally due to the extension workers have not enough knowledge about the recommended onion production package. Access of credit is crucial factors for farmers to adopt the onion production package because the onion production required capital to manage and apply the farm inputs.

The researcher concluded that the reason for low adoption could attribute to a number of factors: (1) farmers consider price of onion market availability, yield, and requirement of inputs; (2) the researcher consider only the production or yield per hectare; (3) lack of certified seed supplier; (4) lack of market outlet and lack of market information (price information); and (5) poor extension contact and credit services.

7.2 Recommendations

Onion production is a highly profitable business. However, the emphasis given nationally to the sector is relatively low compared to other food crops. As a result of this, institutional support provided to this sector, such as credit service, research and extension was not to the expected level. These factors greatly affect the adoption of onion production package and

consequently production and productivity of onion. Based on the research findings of this study, the following points are recommended to improve farmers' adoption of onion production package to enhance production and productivity.

- The recommended onion production package is not appropriate to achieve the potential onion production. So as revising of the previous research recommendations is highly important to meet the needs of farmers.

- During seed production time the seed producer should get technical assistance from Agriculture Research Institutes through organizing on farm demonstration, training and farmers field days. Therefore they can be able to produce quality seeds.

- To expand onion seed production in the study area, Agriculture Development Office and Research Institutions should be facilitating and organizing scaling up programme through distributing of quality seeds to farmers. In addition, cooperative society should be facilitating seed quality control mechanisms and providing quality onion seeds to farmers.

- Much emphasis has to be given the improvement of market and marketing system particularly with cooperative unions is important. Therefore, increasing cooperative union members and strengthening the marketing system of the study area through establishing strong linkage with Oromia agriculture production market centre.

- Market access enablers are critical in order to farmers to reap the benefits of increases in production. Reducing market transaction costs, increasing value addition, and promoting an enabling environment for market access (including market information, storage, and transport infrastructure) are essential components of adoption of onion production package. Therefore, strengthening and enhancing the market information systems will help farmers to access updated price information.

- It is necessary to establish strong network and collaboration between partners among the farmers and institutes related with the area of onion production package (such as cooperatives, agricultural office and NGOs who are engaged in this area. The NGOs should be support through training on horticulture production for extension workers and farmers in collaboration with agriculture development office. These all will assist to make the onion package better accessible to farmers and to strengthen the adoption of the onion growers.

- Onion production package involves the use of different practices which required knowledge and skill of application. Therefore, a great emphasis should be given to continuous training of new assigned extension workers that may help to fill the gaps of knowledge and skills with related to the onion production package.

- Provision of credit is a paramount important to improve farmers' onion production. So as credit institution should be strengthening and providing enough credit service to farmers.

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APPENDIXES

Appendix 1: Sources of extension service to the respondent

Onion yield per hectare (ton/ha)	Extension contact	Frequency of extension	Sources of extension
24.0	1.0	3.0	Cooperative union
20.0	1.0	4.0	NGOs
25.2	1.0	2.0	Cooperative union
5.0	1.0	3.0	Cooperative union
22.0	1.0	2.0	Cooperative union
20.0	1.0	3.0	Cooperative union
25.0	1.0	5.0	NGOs
23.0	1.0	2.0	Cooperative union
22.0	1.0	3.0	Cooperative union
20.0	2.0	0.0	O
2.0	1.0	2.0	Agriculture Development Office
3.0	1.0	2.0	Agriculture Development Office
2.0	2.0	0.0	0
2.0	2.0	0.0	0
2.0	1.0	2.0	Agriculture Development Office
12.0	1.0	4.0	NGOs
2.0	1.0	2.0	Agriculture Development Office
22.0	1.0	3.0	Cooperative union
20.0	2.0	0.0	0
2.4	1.0	1.0	Agriculture Development Office
1.8	2.0	0.0	0
20.0	1.0	4.0	NGOs
22.0	1.0	4.0	NGOs
3.0	1.0	1.0	Agriculture Development Office
5.0	1.0	4.0	NGOs
20.0	1.0	2.0	Agriculture Development Office
24.0	1.0	2.0	Agriculture Development Office
18.0	1.0	3.0	Agriculture Development office
24.5	1.0	4.0	NGOs
3.0	1.0	1.0	Agriculture Development Office
20.8	1.0	4.0	NGOs
20.0	1.0	4.0	NGOs
19.5	2.0	0.0	0
23.6	1.0	4.0	NGOs
18.0	1.0	3.0	Cooperative union
26.2	1.0	3.0	Cooperative union
32.0	2.0	0.0	0
1866	1.0	3.0	Cooperative union
18.0	1.0	3.0	Cooperative union
30.0	1.0	5.0	Cooperative union

Frequency of extension contact *1 once a week 2) twice a month 3) once a month 4) twice per year 5) three times per year
Access to extension contact *1) Yes 2) No

Appendix 2: Interview questionnaire for the respondents

This questionnaire is designed to assess the reasons for low adoption of the recommended onion production package by farmers in the Dugda district of Ethiopia.

Basic information of the respondents

Interview date _____

Name of the respondent_____

Name of village _____

How many years of experience did you have in onion farming? _____

I. Question related to willingness

1. How many times do you produce onion per year? 1.Once/ year 2 Twice/ year 3 Three times/ year
2. How much yield did you get per one production harvest? (Yield per hectare). _____
3. Do you have market access for your production? (1) Yes (2) No
4. If yes, which market centres are accessible to you? 1 Meki (2) zeway (3) Alem-tena (4) Adama (5) Addis Ababa (6) main road side 7 Other, specify_____
5. Where do you sell your onion production? 1 At farm gate 2 At market 3 Both
6. How much yield did you use for home consumption from one harvest? _____
7. What is the price of onion/Kg? _____
8. Do you know the advantages of using onion production package? (1) Yes (2) No
9. If yes, what is the advantage? (1) High production per ha. (2) high price/kg (3) market demanded (4) other specify_____
10. If not, why? 1 I haven't knowhow about, 2 I have no interest 3 Others specify _____
11. What problems do you have in relation to onion production package? 1 Shortage of seed 2 Shortage of fertilizers and chemicals 3 Shortage of Labour 4 Storage problem 5 High cost of inputs 6 Other, specify_____
12. Is there any reason that hinder to use appropriate onion production packages? 1 yes 2 no
13. If yes what are they (1) shortage of money or capital (2) labour shortage (3) shortage of irrigated land (4) Unavailability of input (5) other specify _____
14. Do you have labour shortage in onion production package? (1) Yes (2) No
15. If yes, how do you solve the problem? 1 By hiring labour (2) asking for cooperation (debo) (3) assistance from relatives (4) others specify _____

II. Question related to knowledge

16. Do you use Onion production package on your farm? (1) Yes (2) No
17. If yes, when did you start full onion package farming? (Year) _____
18. Seeding rate kg/ha _____
19. Fertilizer Application DAP kg/ha. _____ Urea kg/ha._____
    Time of DAP application _____ _____ _____
    Time of Urea application _____ _____ _____
20. Chemical (fungicide) application Kg/ha._____
21. Frequency of irrigation

Stage	**Irrigation time**			**Water quantity**	
	Morning	**Mid-day**	**After noon**		
At seedling stage				Lit./m^2---------	
At transplanting time				Lit/ha.----------	
After transplanting				Lit./ha.----------	

22. Spacing. At seedling stage between row_____ After transplanting between row_____ between plant _____

23. Transplanting time

1st harvest	2nd harvest	3rd harvest	4th harvest

24. From where did you get all onion package inputs? 1 From Agricultural office (2) From Farmers Cooperative Union (3) Input Supply Agency (4) Others (specify) _____
25. Source of your irrigation water _____ _____ _____
26. Is there the shortage of irrigation water? 1 yes 2 no
27. If yes how do you solve the problem? _____ _____

III. Question related to ability

28. How many hectares of land do you have under irrigation? _____
29. How many hectares of irrigated land do you use for onion production? _____
30. Is there any area of irrigable land you have rented in 2012 production year? (1) Yes (2) No
31. If yes from whom? _____
32. If yes, how much area of land you have rented in? _____
33. What is the price of leasing per year/ha? _____
34. Do you know about the agronomic practice of onion production package? 1 Yes 2 No
35. If yes, what kind of new skills are required as compared to the traditional onion cultivation practice?

	Traditional	In new agronomic practice
Seed rate kg/ha.		
Fertilizer application kg/ha, DAP Urea	 ---------- ----------	 ---------- ----------
Chemical (fungicide) kg/ha.	----------	----------
Spacing at seedling stage b/w row After transplanting B/w Row B/W plant	 ---------- ---------- ---------- ----------	 ---------- ---------- ---------- ----------
Weeding frequency		

36. Do you have access to extension service for onion production package? 1) Yes 2) No
37. If yes, from whom?(1) agricultural office, extension expert (2) Research centre (3) F. Cooperatives (4) NGO (5) relatives (6) others (specify) _____
38. How often extension experts contact you? 1 Once a week 2 Twice a month 3 Other specify_____
39. Did you discuss about onion production package before applying to your farm? (1) Yes (2) No
40. If yes, with whom? 1 Wife/husband 2.Children 3 Extension expert 4 Other, specify_____
41. If not, why? _____
42. Do you have credit access for onion production package? (1) Yes (2) No
43. If yes, from which organization did you get? _____
44. If not, why? _____
45. Labour activities for onion production

Onion production activities	n	Family labour			
		Women	Men	Girls	Boys
Land preparation					
Bed preparation for seedling					

seeding					
Watering for seedling					
Weeding for seedling					
transplanting					
Fertilizer application					
cultivation					
harvesting					
Carrying the product					
Storing the product					

46. Hired labour for onion production

Activities for onion production	Number of hired person										Remark
	Female labour					Male labour					
	1	2	3	4	5	1	2	3	4		
Land preparation											
Bed preparation for seedling											
seeding											
Watering for seedling											
Weeding for seedling											
transplanting											
Fertilizer application											
cultivation											
harvesting											
Carrying the product											
Storing the product											

Appendix 3: Checklist for key informants

For agronomist and Extension worker

- Did you gate training about the onion package?
- How the extension service approaches deliver information to the farmers about onion production package?
- What methods did you apply for transferring knowledge and practice about onion production package?
- What do you say about the exact agronomic practice of onion production package to farmers?

Activities	Recommended rate of application	Time of application	Frequency of application	Time of transplanting
Seed rate/ha				
Seedling				
Spacing				
Fertilizer application				
Chemical application				
Irrigation frequency				

For Cooperative leader

- Is the farmers are accessible to market information? If yes, how? If no, why?
- What is the problem related to input supply to onion producers?
- Do you supply all necessary input to onion producers timely?
- What is your selling method? Credit or cash? Did you include transport cost when you sell input to end users?

For irrigation leaders

- What is the rule of irrigation utilization? Is farmers are timely accessible for irrigation? Is there any requirement for utilization of irrigation?
- Is there other challenges related to adoption of onion production package?
- Is there enough water resource for irrigation?

For PA leaders

- Did you have enough extension agents in your locality?
- What farmers' motivation is looks like?
- Did you get all necessary inputs for farmers timely?
- Are there any challenges related with technology adoption in your locality?
- Is there conflict of interest on resource utilization? for ex. water