

Full Length Research Paper

Characterization of seed potato (*Solanum tuberosum* L.) storage, pre-planting treatment and marketing systems in Ethiopia: The case of West-Arsi Zone

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Potato is a high potential food security crop in Ethiopia due to its high yield potential and nutritional quality tuber, short growing period, and wider adaptability. Arsi administrative province is one of the potential potato growing areas in southern parts of Ethiopia. The potato is grown there as a field crop, and it substantially supplies potatoes to the whole country. Despite the suitability of this area for high quantity and quality potato production in the country, there are several constraints, which drastically affect to the low production and productivity of potato crop by smallholder farmers. The objective of this study was to evaluate the potato seed system, storage, pre-planting treatment practices applied and marketing systems followed by potato producing farmers and to suggest improvement options. In this research, a combination of literature study, expert elicitation, group discussion, field observation, and questionnaire base survey were used. The result of this study showed that a number of factors constraining the system including: unavailability of high quality seed tubers, unavailability of improved varieties, unavailability of improved storage structure, low price of the produce and poor transportation. It is concluded that availability of improved potato varieties, improved storage facilities, use of pesticides and better marketing opportunities are crucial to improve the potato crop system, to alleviate poverty and improve food security of smallholder farmers in the Arsi area in particular and in the country in general.

Key words: Seed potato, pre-planting-treatment, improved storage, seed potato marketing.

INTRODUCTION

Potato (*Solanum tuberosum* L.) is the most consumed food crop world-wide next to wheat and rice (Nicolas et

al., 2010; Verzaux et al., 2010; Visser et al., 2009). Although the total per capita consumption is low, potato

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production is rapidly increasing in Africa as well (Fuglie, 2007; Haverkort et al., 2009). This increase in potato production is pronounced from the 1990's since potato is significantly used as a staple food by resource poor farmers and contributes to the livelihood of millions of people worldwide (Verzaux et al., 2010).

In Ethiopia, potato is a high potential food security crop due to its high yield potential per hectare and nutritious tubers. Potato production in Ethiopia is possible on about 70% of the arable land (FAO, 2008; Medhin et al., 2000; Yilma, 1991). Potato is a leading vegetable crop in Ethiopia and smallholder farmers cultivate about 50,000 ha each season (Teriessa, 1997 as cited in Getachew and Mela, 2000). Moreover, in Ethiopia potato production serves as a means to overcome food shortage periods 'hungry months', since it matures before the harvest of other food crops such as cereals (Sanginga et al., 2009). Although the edaphic and climatic conditions are suitable for production of high quality potato in Ethiopia, the national average production is as low as 8 t ha⁻¹ (Medhin et al., 2000). This national average yield is very low compared to the potential yield (40 t ha⁻¹) obtained under research conditions (Getachew and Mela, 2000). Lack of quality seed tuber potato (Amede et al., 2006; Hardy et al., 1995; Medhin et al., 2000); high yielding varieties, and storage facilities coupled with poor agronomic practices (Medhin et al., 2000) have been found to contribute to the low yield of potato in Ethiopia. Seed tuber quality refers to the ability of tuber to give a healthy and vigorous plant capable of producing a high yield of good quality within the time limits set by growing season in to which the seed is going to be used. The quality of the seed is affected by the health of the seed, physiological age and status, size of the seed, purity and genetic quality of the seed (Hirpa et al., 2010). The majority of potato growing smallholder farmers use low yielding and late blight susceptible local varieties due to the limited availability of improved seed potatoes in the country (Getachew and Mela, 2000; Medhin et al., 2000).

At present, chemical treatment and biotechnological techniques are widely applied throughout the world to manage sprouting at a desired level (Farre et al., 2001); which is not a common practice in Ethiopia. Pre-planting dormancy breaking of seed tubers is another important issue in seed potato production (Struik and Wiersema, 1999). In Ethiopia, where potato are produced twice per year, pre-sprouting of the seed tubers prior to planting could lead to higher yields. In addition to the shortage of improved potato varieties, the lack of appropriate seed potato storage contributes to the low production of potato in Ethiopia. For instance, about 30 to 50% yield loss is attributed to the lack of appropriate potato storage and other post-harvest management related problems. (Endale et al., 2008 as cited in Hirpa et al., 2010).

West-Arsi zone is among the main potato growing area in the southern part of the country. The farmers in West-Arsi zone grow potato as a field crop, whereas most of the farmers in other potato growing areas of Ethiopia

grow potato as a garden crop mostly for household consumption. Seeds stored in the farm and/or purchased from the farmers of the surroundings and other places are the main sources of planting material in this area. Farmers in West-Arsi area neither practice positive selection nor produce seed tuber on separate plot (Hirpa et al., 2010). Even though West-Arsi zone and the region are suitable for quality potato production, the yields obtained in the area are low (10 t ha⁻¹).

Lack of proper storage systems are among the main factors contributing to the low yield of potato in the region, which is the case at the country level also (Medhin et al., 2002). Furthermore, market price of the product and marketing systems are also problematic. Empirical studies on factors which contribute to low yield of potato crop and profitability of farmers are very few and limited in geographical coverage. West-Arsi zone is among the unaddressed areas. Therefore, there was a strong need to generate quantified data on the storage structures, pre-planting treatment methods, and marketing systems to enhance production and productivity of seed potato, and seed potato producing farmers' profitability.

The purpose of this investigation was therefore, to describe the storage methods, pre-planting treatments and marketing systems practiced in the area, identify the main problems and recommend improvement options. For these purposes the combined efforts of literature review, expert elicitation, formal survey and field observation were used. Based on the obtained data the challenges and opportunities for seed system, storage, pre-planting treatment, and marketing are discussed.

METHODS

The study area

The study was conducted in West Arsi zone, one of the major potato growing zones of Oromiya Administrative region, Southern Ethiopia. Three major potato growing districts namely Shashemene, Arsi-Negele and Kofele were purposively selected in the West-Arsi zone, since these districts are potential potato producing areas and can considerably contribute to the supply of potatoes to the country. The area also known by growing a huge variety of potatoes mainly of Agazer, Nech abeba, Jalene and Gudane. These districts ranked second, third and fourth in potato production potential from the twelve districts in the zone. Moreover, the area is research unaddressed and affected by different problems including diseases, unavailability of improved varieties and lack of advanced production technologies. This was identified during ground truth assessment done before defining this research. Furthermore, different Kebeles/villages were considered from each of the three districts. The Kebeles were also selected based on their potential of potato production. The three districts considered in this study are 230, 250 and 275.1 km (Arsi-Negele, Shashemene and Kofele respectively) southeast of the capital city, Addis Ababa.

Data collection techniques

The data was collected in five different stages. Literature review,

expert elicitation, rapid appraisal, formal survey and field observations were carried out to solicit the appropriate data.

Literature review

To describe the seed potato system, secondary data was collected. Zonal agricultural and rural development office annual reports were reviewed and information on total arable land, total annual production of vegetable crops and the contributions of potato crop for the total yield were obtained. The literature review was useful to obtain general understanding of the subject matter related to the objective of the study and the importance level of the crop in the area ahead of field work. Moreover, reviewing the secondary information helped to understand the main problems or issues and gaps that need to be emphasised and addressed during the study.

Expert elicitation

Following the literature review, an interview was made with different professionals from agricultural and rural development office, and one non-governmental organization. Information on pre-planting seed treatments, storage methods used and marketing systems were obtained from the interviews. The information was obtained through thorough discussion with agricultural and rural development office heads and experts of the three districts (Shashemene, Arsi-Negele and Kofele).

Rapid appraisal

The rapid appraisal survey was executed to obtain specific qualitative information. During rapid appraisal survey stage, the main problems associated with seed potato production practices were also discussed. This stage, allowed us to make a free discussion on issues related with the study objectives. Thus information was also used to strengthen and develop the final questionnaire.

Field observation

Field observation were conducted in some potato production farmers' plots and in improved variety demonstration plots planted by Kofele district agricultural office.

Quantitative survey

After rapid appraisal survey, quantitative survey was executed using the structured questionnaire in all the three districts. Quantifications of these important parameters used to confirm the qualitative information gathered during the qualitative data collection stage, to assess issues untouched during qualitative survey and to present the findings with empirical evidences. Structured questionnaire was designed by incorporating the feedbacks from rapid appraisal survey on the pre-designed semi-structured questionnaire. The questionnaire was pre-tested and based on the pre-test input and then the final questionnaire was designed. A total of 91 respondents (31, 30 and 30 from Shashemene, Arsi-Negele and Kofele, respectively) were selected and the survey was executed.

Data management

Relevant information obtained from all parts of the data collection

was summarized using tables, pictures and graphs. To analyse and summarize the quantitative data obtained from quantitative survey, the questionnaire was tabulated, coded, and excel and descriptive statistics using SPSS software was employed.

RESULTS

Seed potato storage practices and methods

Storing potato either for ware or seed is a common practice in the study area. Majority of the sampled farmers have experience of storing potato (Table 1). Storing potato allows the farmers either to use tubers of their own harvest as a seed source, to postpone sales to get better market price, and for household consumption in the later season. Potato farmers in the study area used different traditional storage methods to store seed potatoes (Table 1).

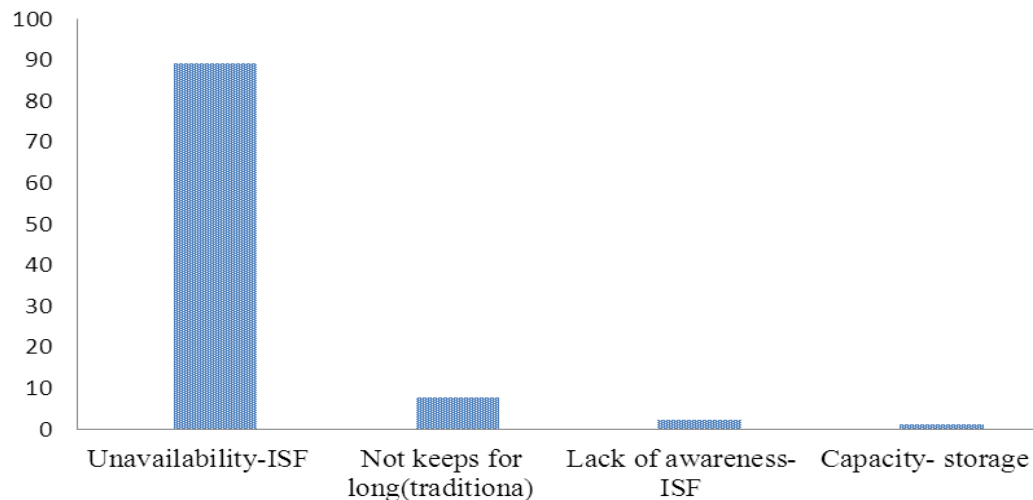
These storage facilities do not allow the farmer to store seed potatoes for long periods. Using these traditional storage methods, the farmers store seed potatoes on average for three and half months without tuber deterioration. Leaving potatoes unharvested (storage in the field) encounters different challenges such as untimely rainfall that hasten tuber rotting and tuber moth that cause considerable yield loss. None of the sampled farmers used improved-diffused light storage. Ninety percent of the farmers stored seed potato in bulk. Bulk store cause physical damage to the tubers, affecting the sprouting capacity and market acceptance of the tubers. Furthermore, farmers did not practice any kind of storage facilities which may keep the seed tubers for longer periods without deterioration. Sacks are the main packages used to put-in potato after harvest for temporary storage and for transportation. Sacks do not protect the tubers from physical damage caused during transportations. This can result in secondary physiological and pathological losses. After transporting to home, farmers' keep the tuber outdoor covered with canvas temporarily then bring to storage structures (Figure 1).

Eighty-nine percent of the sampled farmers identified unavailability of improved storage facility as a main problem (Figure 2) related to keeping potato seed for long period of time. The available traditional storage methods cannot keep seed tuber until the next planting season free of damage. The reasons of using traditional storage methods were their availability, their low cost, and the unavailability of improved storage facilities. Forty-seven percent of the farmers store potato tuber in their house which is inconvenient because of the wide space occupied by the tubers. Some farmers used 'gotera' (local storage structure).

Unavailability of improved storage facilities forced farmers to sell potato product immediately after harvesting at low price and buy seed during planting at very high cost. They also explained that if improved

Table 1. Farmers experience of storing seed potato and storage methods used in the study area (% of farmers).

Variables	Number	Percent
Farmers storing seed potatoes	57	63
Storage method		
In the soil/delayed harvesting	9	16
Dark space in the house	31	54
'Gotera'	9	16
Spread outside the house	8	14

**Figure 1.** Farmers practice of temporary store in the outdoor.**Figure 2.** Main problems related to seed potato storage (% of respondents). Note: ISF - improved storage facility.

storages were available the cost of production input could not be a problem, since the storage would allow them to sell the tuber with better market price later in the season.

Pre-planting treatment methods

Ninety-five percent of the sampled farmers practice pre-

planting treatment to advance sprouting. None of them indicated the use of pre-planting treatment methods for other purposes like soil-borne diseases protection. Farmers used traditional sprouting techniques prior to planting to stimulate sprouting. Covering the seed potato tuber with straw was the most popular method practiced by farmers. Putting the tuber on the sun and combination of the aforementioned methods were also practiced

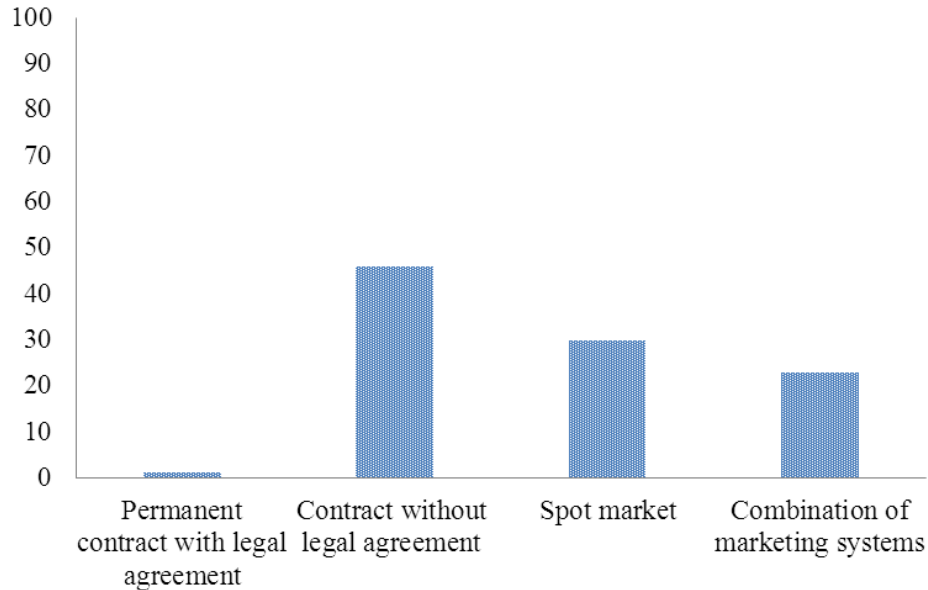


Figure 3. Seed potato marketing systems (% of respondents).

frequently. In the combined case they put the tubers first on the sun for some days and then cover them with straw. Those farmers, who did not found practicing any techniques to enhance tuber sprouting; mentioned lack of awareness about the importance of the practice as the main reason for not applying pre-planting treatment followed by labour required for the practice.

Seed potato marketing systems

Potato is a main food and cash crop in the study area. Of the sample farmers 87% of them had an experience of selling potato for different parties. The potential sources to sell potato are traders and/or farmers/consumers. Farmers produce potato primarily for marketing followed by household consumption. This also contributes a lot for potato seed system, since the farmer exchange seed potato tubers within a district and/or across districts. There is no difference in production management between market oriented and home consumption. Farmers did not know exactly the fraction they sell for seed. Farmers explained that the traders may sell the tuber as seed in other places. Farmers know whether it is used for seed when they sell to neighbour and to other district farmers.

Some farmers also reported that a number of farmers from other parts of the country had taken seed potato from this area. This shows that the local seed exchange system has been delivering important services to farmers producing potato in and outside of the study area. Moreover, farmers are also getting premium price when they sell the potato tuber as seed than as ware potato. However, selling tubers as a seed faces different

problems such as low market demand, unavailability of improved storage facilities, inaccessibility of the area and high cost of transportation.

Different marketing systems practiced to sell seed in the study area. Majority of the farmers make contract without legal agreement mediated by broker during potato harvest contributing 46%. Spot market and selling for neighbour and other districts farmer are the main marketing system for seed potatoes although spot market used frequently accounting 30%. Of the farmers who sold potato 23% used a combination of marketing systems, whereas 1% of the sample farmers used permanent legal contract system (Figure 3). Combined use of two different marketing systems helped the farmers. The part sold during harvest helped the farmers to cover their immediate cash need, whereas the part sold in the later season helped them to get high price, since the price get better during planting or in the latter season.

Market sources

The surveyed farmers sold seed potato to different groups of clients. Traders who bring the potato tuber to the different parts in the country were the most dominant market source constituting about 49% of the total market opportunities. Farmer to consumers was the second market sources contributing 43% of the total market opportunities, whereas direct farmer to farmer exchange covers about 8% of the market sources.

In the studied districts farmer sell potato in different periods. About 70% of the sample famers sold potato produce immediately after harvest, whereas only 17 and 13% of them sell potato later when the market price

become high and during planting, respectively. This is largely related with unavailability of improved storage facilities and the low keeping ability of the available traditional storage systems and, this reduces the profit that, the farmers likely to get from potato farming and the amount sold as seed. Furthermore this restricts the farmers to adopt low rate application of production inputs, this is because they sell the produce with low price and expect to spend more to get the production inputs. Farmers preferred to sell potato at farm gate than to bring to market. Farmer reported the price they could fetch through the informal contract was lower than the price at spot market, but the cost of the transport forced them to sell in the farm gate. On the other-hand farmers are less involved in price setting thus the broker is the dominant party who set the price of potato.

Farmers explained that the brokers set prices in a way that benefits themselves. For instance, if a trader is willing to pay ETB 140 per 0.1 Mg, the brokers tell the farmers the price per 0.1 Mg is ETB 120 and takes the difference (ETB 20 per 0.1 Mg). Despite this huge exploitation more than 50% of the sample farmers need the brokers because it is difficult for them to market without the intervention of brokers. This shows the complexity of the problem the farmers are facing in relation to potato marketing. Seed potato marketing was affected by different factors among which low demand for seed potato is the main one contributing more than 90% of the problems in this regards. Storage, low price of the product and means of transportation were among the other factors that affected seed potato marketing. The assistance from agricultural and rural development office on seed system, including production and marketing is insignificant.

DISCUSSION

Seed potato storage

The results of this study showed that from the farmers who stored seed potatoes none of them used improved storage facilities. The entire dependency of farmers on traditional storage system might be due to the lack of improved storage system like diffused light storage (DLS). DLS is a cheap storage technology which can substitute alternative temperature-controlled storage system (Rubatzky and Yamaguchi, 1997 as cited in Mulatu et al., 2005). Agajie et al. (2007) reported the use of DLS by potato farmers in the Western part of Ethiopia, and its considerable advantage over the traditional storage system. The advantage DLS over traditional storage system explained by the long time keeping ability of this storage system. Moreover, tubers stored in DLS system produce robust and short sprout; this also makes the transportation easy and reduce breaking of sprout during market to home as well as to field transportations

and the tuber stored in DLS resulted in production of more number of stem per plant. Whilst the tuber stored in the traditional storage system produces long etiolated sprout which is susceptible to breakage during transportation and result in production of less number of tillers in the field. Lack of awareness about this low cost and better keeping ability storage system might hinder farmers not to use it (Agajie et al., 2007; Mulatu et al., 2005). The results of the present study showed that, farmers in the studied area stored potato for three and half months on average using traditional storage systems. Similarly, Agajie et al. (2007) reported four months storing ability of local storage systems. In addition to the short time storing ability of the local storage systems, the tubers stored in these storage results with less number of stems per plant and the plant is also not vigour. The dependency of farmers on traditional storage system explained by absent of improved storage systems and lack of knowledge on the importance and construction of this storage system (that is, DLS), otherwise the farmers explained the low keeping ability and capacity of the traditional storage they are using currently. This confirms the importance of the introduction of improved storage systems in the area.

However, potato storage had tremendous advantage for potato farmers in the studied area. Storage creates opportunity to look for high market price in the later season as well as help farmers to keep potato tuber as a seed and to have their own seed sources for the subsequent season. The substantial contributions of farmers own harvest in the potato seed source (30% the current study) increases the value of storage for potato producers in the area. Some previous studies (Gildemacher et al., 2009) 50% in East Africa and (Mulatu et al., 2005) 45% in the Eastern Ethiopia were reported the contribution of farmers own harvest in potatoes seed source, which shows the importance of storage in this regard. The local storage facilities cover 100% of the current storage system in the studied area. Moreover, these traditional storages are not able to store for long without tuber deterioration, low holding capacity, reduce the farmers housing safety for those who store in the house. Based on the results of the present study several suggestions can be made to overcome storage related problems in seed potato system in the area. Introduction and dissemination of improved storage structures such as DLS from research addressed areas. This helps the farmers to overcome storage related problems, since DLS can store seed potatoes for long period (six-to-eight months) without deterioration (Agajie et al., 2007; Jalleta, 1976 as cited in Mulatu et al., 2005), which is longer storage period as compared with that of traditional systems which only found to store for about three to four months on average. This could be supported with training to increase farmers' awareness about the system and hasten adoption rate of the technology. Moreover, in store potato management is not practiced in the studied

area. This shows the lack of knowledge in this regard and calls for more emphasis to solve this problem. This is because the pre-storage state of the tuber takes immense share in determining the length of the shelf life of the tuber without deterioration (Pringle et al., 2009). Farmers also found to store potato temporarily in the outdoor. This might expose the tuber to external environment which result in the tuber quality reduction by causing tuber condensation (Pringle et al., 2009). Exposing the already sprouting seed tuber also found causing negative effect by fastening the physiological ageing (Struik and Wiersema, 1999). Moreover, occurrences of rain fall when the potato is in the outdoor cause deterioration. This kind of storage also increase the opportunity for tuber physical damage since it involves moving of tuber later to the permanent store as well as animals may reach the tuber stored in the outdoor. To solve storage related problems a cooperated effort of the professionals in this field and the extension workers in the area as well as the agricultural officers are crucial. The already farmers available traditional storage systems can be improved by investing scientific knowledge. According to Rhoades (1989, as cited in Mulatu et al., 2005) DLS developed by refining the already farmer available storage system. Improving the already farmer available storage and letting them to use it also hasten the adoption of the system by farmer since it is already on their hand and they might have indigenous knowledge and skill on the construction and use. In addition, market facilitation by the concerned body should be done to let the farmer to get market with premium price during harvest, and also make the seed potato accessible for farmers during planting; this may be done by developing public seed storage in the farmers' vicinity.

Seed potato pre-planting management

From the farmers who practiced pre-planting treatment on seed potato, all of them only did for sprout enhancement. The absence of treatment practices for other advantage like diseases management were attributed to lack of awareness of the farmers about the advantage of applying pre-planting treatment. Uses of chemicals like ethylene chlorohydrin, thiourea, and potassium thiocyanate (5, 6, and 12) to advance sprouting, keeping uniformity of sprout and to get maximum stand of potatoes at field is reported by Rappaport et al. (1957). Moreover, the pre-planting treatments applied by the farmers were entirely traditional and based on their own experience. Majority of the farmers attempted to increase temperature in the environment of the tuber for some time before planting. Arsenault and Christie (2004) and Wiltshire and Cobb (1996) suggested exposing the tuber to warmer condition prior to planting to motivate sprouting, early ground cover and to get vigour crop stand. Only a small number of

farmers were found not applying treatment to advance sprouting. These farmers might not be interested to invest more time and labour on sprout enhancement so that cost of production would be low. This situation calls for due consideration on how the awareness of farmers towards application of pre-planting treatment can be increased and how the traditional pre-planting treatments can be improved. Different options can be suggested to solve the pre-planting treatment problems. Training can be done to increase farmers' awareness towards the importance of pre-planting treatment application. In-depth study can be made on the already available traditional treatment methods to understand the weakness and refine by incorporating scientific knowledge. Furthermore, investigation for modern treatment practice and treatment inputs can be done.

Seed potato marketing

As the results of this study showed seed potato marketing delivers paramount services to potato producers in the study area. Most (87%) of the farmers in the study areas sold potatoes. The amount which is exactly sold as a seed is not notable by farmers. This is because; the buyer may use it as a seed or as a ware. The farmers only know whether it used for seed if only the neighbour farmers buy from them as a seed. As per their explanation potato contributes a lot in the income generation. However, the present study identified a number of problem related to seed potato marketing in the studied area. Low market demand for potato tuber as a seed and lower price as compared to production cost were among the main factors. Similarly, Agajie et al. (2007) reported lack of buyer and low price as popping problems in relation to seed potato marketing in Jeldu and Degem districts in Ethiopia. The difference between the result of the present study and that of Agajie et al. (2007) is that, the farmers in the Jeldu and Degem districts were already distinguished the seed and ware potato and they might look only for seed potato market, whereas in the case the present study area the farmers immediately sell the tuber as a ware due to fear of market unavailability for seed potato. Seed potato marketing problems also related with lack of appropriate storage facilities. This is because availability of better storage allows the farmers to sell seed potato tuber during planting when the market price become high than during harvest. According to Mulatu et al. (2005) unavailability of proper potato seed storage forces the farmer to sell immediately during harvest with low price, whereas availability of proper storage facilities allow farmers to sell their potato tuber as a seed during planting or in the later season with higher price compared to the immediate sell. In the other ways market played an important role as a seed source for the potato producers in the study area contributing 60% of the seed sources. This result is

supported by the finding of Agajie et al. (2007) which revealed the significant contribution of market as a seed source (56%) in Banja district of Ethiopia. But, the sample potato producers in the study are explained the low quality of the seed tuber which came from market. According to Hirpa et al. (2010) and Mulatu et al. (2005) the seeds which came from market were not pure, healthy and had inappropriate physiological age. Since the livelihood of the farmers and purchase of farm inputs for potato production in the studied area are largely dependent on the income from potato, it is plausible to look for different seed potato market improvement options. Research on priorities for potato research in developing countries has found that, improved potato marketing system is the most important post-harvest activity in potato system (Fuglie, 2007). It is also one of high ranked priority needs of potato producing farmers in developing countries (CIP, 2004 as cited in Fuglie, 2007). According to Fuglie (2007) poor storage condition is one of the causes for market fluctuation. The seed storage structure and availability can be improved. This is in line with the findings of Guenther (2006) in which storage development and management to improve the seed tuber production and marketing scheme in Ethiopia was recommended. Furthermore, networking the farmer with market information can be done by the concerned body so as to reduce the domination of the broker over farmers during price setting. Fuglie (2007) found lack of information as a cause for price fluctuation. Moreover, further research effort into evaluation of potential seed potato marketing strategies and the development of sustainable seed potato marketing system is needed.

Conclusion

Potato producing farmers in the studied area were dependent on the traditional methods of seed potato storage, pre-planting treatment and also inefficient marketing systems. In the area, the problems in relation to seed potato system are complex and wide ranging such as: poor market demand, low price, lack of improved storage technologies and absence of improved pre-plant treatment techniques. As far as the improvement of the system is concerned the transportation, storage, marketing and treatment methods should be improved.

RECOMMENDATIONS

Unavailability of improved varieties was identified as a major problem. This calls for the supply of improved varieties which fit with the agro-ecology with their improved production packages. All the stakeholders need to take responsibilities to address this.

Unavailability of improved storage facilities was also identified to be a major problem. This is because the improved storage facilities like DLS are not disseminated to the study area, which is already in use in other major potato producing areas of the country. This calls for cooperated efforts of stakeholders to introduce and disseminate improved technologies to the area.

Low market demand and low price of the produce was reported as a problem in the study area. Creation of sustainable market opportunities through formation of seed potato production and marketing cooperation, improving the transportation system and road, and creation of bilateral agreement between farmer and seed agents or merchants are desirable to solve market related problems.

Entire dependence of farmers on traditional pre-planting treatment and un-uniform use of the treatments are reported. This is because farmers' practices were not supported with training. This calls for strengthening the farmers practices through more scientific knowledge supported training.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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