

Full Length Research Paper

# A review status of potato production and marketing in Ethiopia

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This study examined the status of potato production and marketing in Ethiopia to provide information on the status of potato production and marketing systems. Different literatures on potato production and marketing are reviewed to accomplish this study. Potato was a high potential food security and cash crop in Ethiopia. Because it provided high yield and nutritional quality tuber, short growing period and wider adaptability. Despite the suitability of the agro-ecology for producing quantity and quality potato in the country, farmers' potato production and marketing are affected several constraints. Among these constraints shortage of improved potato varieties, absence of improved storage facilities, low potato market price, and inadequate market information were the major constraints affecting potato production and marketing in Ethiopia. Thus, this study recommended that improve access to improved potato varieties, improved storage facility and creating better marketing opportunity are very crucial to improve potato production and marketing system in the country.

**Keywords:** Constraints of potato production and marketing, Irish Potato, Potato production system, Potato marketing system, Ethiopia

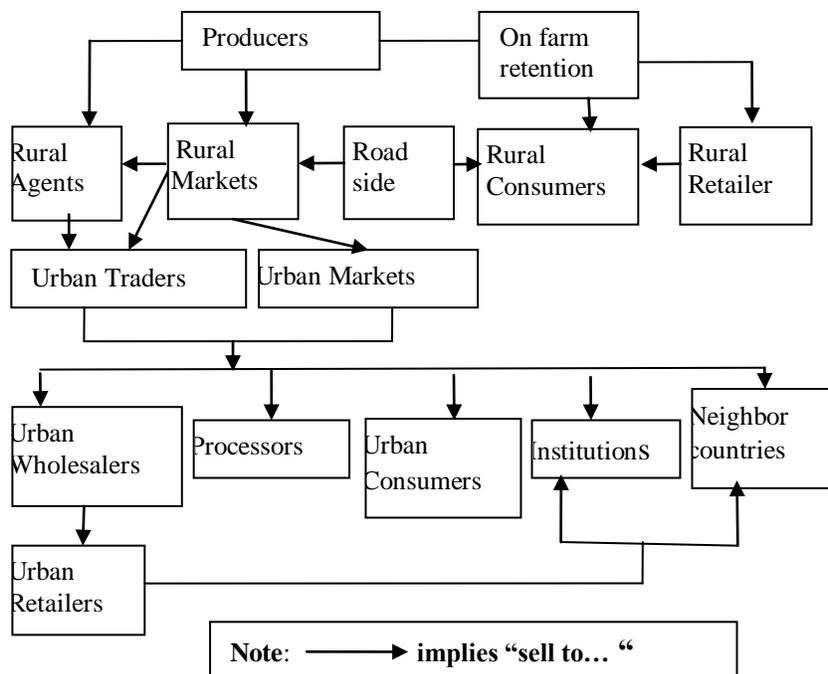
## INTRODUCTION

Irish potato (*Solanum tuberosum* L.) is the world's fourth largest food crop next to wheat, rice and maize (FAO, 2010). It is an important source of food and employment in developing countries. Potato provides high energy and quality protein as well as substantial amount of vitamins and minerals (Kuarabachew et al., 2007 and FAO, 2008). The potato's high energy content and ease of production have also made it an important component of in urban agriculture which provides jobs and food security (Hoffler and Ochieng, 2008). The developing countries including Ethiopia are facing food crisis due to price rise of staple foods but stable potato price neutralize food crisis (Hoffler and Ochieng, 2008). Yet, the potential of potato is not fully realized and no more evidence until the recent rising prices of rice, wheat and maize (FAO, 2008). Potato has the potential to relieve the pressure of increasing cereal prices on the poorest people and contribute significantly to food security. It is grown and eaten locally with less contribution in international trade compared to cereals. so it is particularly valuable as food in the developing

countries (Muthoni and Nyamongo, 2009).

Potato was first introduced to Ethiopia in 1858. However, its adoption was limited until nineteenth century due to genetically very limited availability of potato varieties and their susceptibility to diseases and pests (Kidane-Mariam, 1980). The occurrence of a prolonged famine, which happened at the end of the nineteenth century, rapidly increases potato adoption in Ethiopia (Medhin et. al., 2000). Potato production has increased considerably through the twentieth century. In 1975, the area of cultivation was estimated at 30,000 hectares, with an average yield of approximately 5 tons per hectare (Medhin et. al. 2000). However, potato cultivation declined in the early 1980s due to widespread infestation of late blight, *Phytophthora* infestations and civil war to overthrow Dergue regime (Wolfe, 1988).

Potato production has resumed its upward trend and covered 50,000 hectares by the mid 1980's (Medhin et. al., 2000). In 2001, potato area coverage had grown to 160,000 hectares, with average yields around 8 tons per



Source: adopted from ASARECA, 2003

Figure 1: Ware potato supply chain

hectare due to the continuing increase in population and subsequent decline in the average size of farm holdings (Medhin et al., 2000). Currently, the national average potato production in Ethiopia reached 13.7 tone/ha (CSA, 2015). The national average potato yield is very low as compared to the potential yield (40 tone ha<sup>-1</sup>) obtained under research conditions. This is due to narrow genetic basis of potato varieties, poor seed quality, susceptibility to diseases and poor farmers' management (Haverkort et al., 2012; Tewodros, 2014). The central highlands (1500 - 3000 m.a.s.l.) and annual precipitation of 600 - 1200 mm are the major potato producing areas which cover 44% of the nation's area (Grepperud, 1996). Potato is grown in a multi-cropping or rotational system. It alternates with cereals such as wheat or barley at mid altitudes (1800 - 2000 m.a.s.l.). Many farmers plant cereals including maize in the short rains followed by potatoes or cereals (typically wheat or barley) in the long rains (Medhin et al., 2000).

Market integrates the national economy with widely dispersed producers through linking the producers with the input and output markets of agricultural products. This linkage increases farmers agricultural output which enhances market participation (Holloway and Ehui, 2002). According to Onoja et al. (2012), market offer households the opportunity to specialize according to comparative advantage and thereby enjoy welfare gains from trade.

Potato cropping is also rapidly becoming a valuable source of cash income, as potatoes demand by the food processing sector is increased to meet the increasing

demand of the fast food and snack (FAO, 2010). This increased demand for processed products is due to growing urban populations, rising incomes, and diversification of diets (FAO, 2010). This enhances the demand of potato products in the market which makes potato the most commonly marketed crop (Bezabih and Hadera, 2007). However, the absence of well integrated market system which increases transaction cost and reduces farmers' incentive to produce for the market limits farmers' market participation. Production risk which is the result of low yields and/or poor quality and price risk which is caused by perishability of commodities, transportation problem and lack of alternative market channels also limited farmers' market participation (Leykun and Jemma, 2014).

This study is initiated with the objective of reviewing the status of potato production and marketing in Ethiopia.

## Reviewed Literatures

### Potato production

#### Seed Quality and Source

The quality of potato seed determines the quantity and quality of potato outputs (Struik and Wiersema, 1999). According to Almekinders et al. (1994), farmers can get potato seed from own previous harvest, neighbor farmers, local markets and formal seed sectors. Quality seed availability gets higher priority rank by potato

producer farmers in Ethiopia (Fuglie, 2007). However, unavailability of improved potato seed and improper potato seed management are the major problems for resource poor small-scale farmers. According to Gildemacher et al. (2009), about 50% of the potato farmers use farm saved potato seed during planting. Moreover, the farmers use low quality seed for potato production (Getachew and Mela, 2000). This occurs due to shortage of improved seed and poor management of potato seed by farmers.

Although getting improved potato seed is the main problem for most potato producing farmers in Ethiopia different organizations, institutions, NGOs, and private limited company like Solagrow are supplied improved potato seed to solve seed shortage problem (Haverkort et al., 2012). Medium sized (egg sized) potato seed is recommended for planting however the majority of the farmers traditionally use small size seed for potato production since small sized tubers cover large more land (Agajie et al., 2007). This results in low yield of potato production.

### **Land Preparation**

Potato production needs well cultivated land than other crops (Tewodros, 2014). Plowing, disking, and ridging must be done before the start of the rainy season, generally one or two months before planting. Preparation of uncultivated land is usually done by hand or with oxen. Generally, fields are plowed two to five times followed by disking and hilling or ridging to regulate soil temperature and moisture level of the soil which enhances sprout growth, expansion of tuber in the soil and also for ease of harvesting (Pavek and Thornton, 2009).

### **Planting Depth**

Planting depth is an important agronomic practice which affects early growth of sprouts, tuber expansion, yield and tuber quality (Pavek and Thornton, 2009). Moreover, it determines the time and energy the sprout requires for emerging (Struik and Wiersema, 1999). Pavek and Thornton (2009) reported that planting potato in shallow depth soil restricted rapid sprout emergence because shallow soil has less moisture content.

### **Spacing**

Potato crop needs intra and inter row spacing. Enough spacing allowed maximum tillering growth of the plant and better quality tuber formation. For potato producing areas of Ethiopia 20-30 cm and 60-75 cm spacing are recommended between plants and between rows respectively (Agajie et al., 2007). Pavek and Thornton (2009) reported that tuber expansion is affected by spacing as the surrounding soil volume

becomes insufficient to hold the expanding masses of tubers in addition to competitions from imposed by nearby planted crops. However, potato producer farmers did not use the recommended plant spacing due to lack of awareness (Agajie et al., 2007).

### **Fertilizer Application**

Potato is sensitive to low fertilizer application. It needs appropriate supply of nitrogen to give high yield and also reduce internal-external tuber defect (LeMonte et al., 2009). Westermann and Kleinkopf (1985) reported that appropriate recommendations and application of recommended rates of fertilizer based on the dry matter production and nitrogen uptake rates must be used to increase potato final yield. Nitrogen fertilizer also plays a major role in the production and maintenance of plant canopy which result in continued tuber growth (LeMonte et al., 2009). Agajie et al. (2007) reported that about 94% of potato producers in Ethiopia practice organic or inorganic fertilizer application of to get better tuber yield. Application of inorganic fertilizer during planting is also recommended to get better tuber yield.

Fertilizer application rate of 195 kg ha<sup>-1</sup> DAP and 165 kg ha<sup>-1</sup> UREA are recommended for major potato producing areas of Ethiopia. But, application of DAP is largely practiced by most potato producing farmers in the country (Agajie et al., 2007). Farmers, who do not able to get the recommended amount of inorganic fertilizer, additionally apply organic fertilizer (compost and Farm Yard Manure (FYM)) to compensate potato fertilizer requirement. Farmers sometimes apply organic fertilizer for potato production due to high cost of inorganic fertilizer. But, farmers have less skill on preparation and use of organic fertilizer (Agajie et al., 2007).

### **Utilization of Irrigation Water**

Potato is sensitive to water shortage. Most potato cultivars are characterized by their shallow rooting system and grown on soil types which have low water holding capacity. This makes potato crop more susceptible to water stress than other crops. Therefore, to achieve the desired quantity and quality potato production provide the required amount of water for the crop is very crucial (Pehrson et al., 2010).

Although most potato producing farmers in Ethiopia are dependent on rainfall, some farmers produce potato by using irrigation water. However, farmers sometimes irrigated water above or below the potato crop requirement. This leads to quantity and quality loss of potato tuber (Pehrson et al., 2010). For example, maximum water application results in loss of nutrient and water to the environment.

### **Crop Protection**

Haverkort et al. (2009) reported that potato crop is affected by late blight disease. Late blight infestation took

the first rank by affecting potato production and productivity (Fuglie, 2007). Most of the potato producing farmers in Ethiopia faced this problem although the degree of infestation varies from area to area (Agajie et al., 2007). The presence of high rain fall, moisture and mist was aggravated the incidence of late blight disease (Agajie et al., 2007).

Potato producer farmers use fungicide to overcome late blight problem. But, still farmers do not aware proper application of fungicide application to control late blight and other diseases (Agajie et al., 2007). Unavailability of chemicals in the farmers' local market and high cost of chemicals are also other factor that hinders farmers to use fungicides (Agajie et al., 2007). Medhin et al. (2000) reported that up to 100% potato yield loss was occurred due to late blight infestation. In some potato producing areas of Ethiopia, the farmers had forced to stop potato production due to late blight problems. However, introduction of new late blight resistance varieties enable farmers to re-start potato production (Agajie et al., 2007).

### **Weed control method**

Chemical application and cultivation method was practiced to control weed in potato production (Eberlein et al., 2001). Using cultivation method has economic and tuber health related advantages than chemical application. The cost of chemical is also higher than the cost of cultivation to control weed. Moreover, efficient mechanical (cultivation/hilling) weed control method needs repeated application which demands more labor, time and implements. A combined practice of timely hilling and herbicide application is efficient way of weed control method (Eberlein et al., 2001).

### **Harvesting of Potato Production**

Appropriate date of harvest and proper harvesting are among the most important practices to secure the quality and quantity of potato yield because post-harvest quality of potato is affected by harvesting date (Bethke and Busse, 2010). Aspects of tuber physiology such as mature periderm formation, respiration rate and reducing sugar accumulation are among the important aspects for long term storage of high quality tubers which affected by maturity level of potato tuber at harvest. Because well-developed periderm helps to minimize water loss and resist entrance of disease causing pathogens into the tuber during storage life of potato tuber (Bethke and Busse, 2010).

Harvesting is done by hand or through ploughing the soil by oxen in Ethiopia. During hand harvesting, it needs to practice harvesting carefully since the hand tools or digger nick potato tubers and it affects the shelf life of the tuber (Yangta and Tong, 1993). Additionally, external tuber damage increases the susceptibility of the tuber for entrance of diseases causing vectors. Moreover, tuber

physical damage during harvesting affects the market quality of the potato tuber as well as seed quality. Maintenance of post-harvest market quality is a prime importance for producers and processors. Tuber deterioration during storage can result from both disease related and physiological processes which shows the importance of pre- storage management of potato tuber (Yangta and Tong, 1993).

### **Potato Storage Methods**

Storage is the tool to realize the optimum physiological status of potato products to keep it in an optimum condition and also to get ready the seed for planting (Struik and Wiersema, 1999). According to Wiltshire and Cobb (1996), storage adds a great value in potato production and need to be maintained at optimum temperature level to avoid undesirable changes on the tuber. Storage method determines the longevity and the quality of seed during storage (Thijssen, 2008). Potato tuber differs in storage condition requirements from the processing potatoes since tuber is sensitive to storage conditions (Pringle et al., 2009). Storage conditions determine soundness, viability and cooking quality. The level of potato quality loss depends on the status of the tuber before storage, length of the storage period and conditions of the storage facilities (Rastovski and Van Es, 1987).

The main processes causing storage losses are respiration, sprouting, change in chemical composition, disease spread, damage by extreme temperatures and evaporation. Therefore, maintaining these processes at optimum level result in reduction of losses and thus appropriate storage conditions are necessary in potato production to reduce yield losses (Muthoni et al., 2010). Absence of improved potato storage and lack of appropriate management in storage are also the main constraints that affect small scale farmers potato productions (Wiltshire and Cobb, 1996; Fuglie, 2007). According to Acasio et al. (1986), potato products stored in diffused light storage resulted in higher economic benefits because of improved emergence, higher tillering and increased final yield. This increases the possibility of keeping potato products for long (up to eight months) without deterioration (Acasio et al., 1986).

According to Mulatu et al. (2005), good storage conditions of potato products has resulted in long shelf-life of the potato (six to eight months) whereas potato products stored for two months under inappropriate storage conditions resulted in weight loss, withering and depletion of reserved food leading to rotting and diseases build-up. This warrants the need for an appropriate storage conditions for increased net returns from potato cultivation.

Farmers can sell their potato product as seed if they have appropriate storage facilities and benefited from premium market price. However, the farmers were discouraged

from storing potato for subsequent planting and market because of the high product potato crop loss during storage. This calls for development and use of appropriate storage system in the country. Moreover, the inter-seasonal gap is about eight months and this makes using own saved seed tuber for the next production season more difficult and farmers forced to purchase seed tuber for every growing season due to unavailability of appropriate storage methods under farmer conditions (Mulatu et al., 2005). According to Gildemacher et al. (2009), potato tuber stored in a DLS ensures the availability of ready seed tuber at time of planting. However, farmers are not aware of the cheapest but modern storage methods like DLS which reported to store potato tuber without loss for about six to eight months.

### Market Performance of Potato

Potato is one of the most important sources of income for the farmers in Ethiopia. It becomes a cash crop and the introduction of improved varieties hastens the broadening expansion of potato marketing, since potato creates a better market price for the farmers (Agajie et al., 2007). In areas of good market infrastructure, potato has become the leading cash crop and also one of the most important food security crop for farmers. However, such as low market prices offered for potato products, suboptimal cultural practices, lack of buyers and poor access to market which results in weak domestic market demand for potato products, and hinders less potato consumption diversification are the major problems in potato marketing (Bezabih and Hadera, 2007). Tuber deterioration during storage is also affects the marketability of potato tubers. Thus, post-harvest management is important for maintaining the quality and marketability of potato tubers (Suttle, 2004).

Market offer households the opportunity to specialize according to comparative advantage and thereby enjoy welfare gains from trade (Onoja et al., 2012). However, fragmented and weak not well market integrations which increases transaction cost and reduces farmers incentive that obtained from market participation limits smallholder farmers (Leykun and Jemma, 2014).

The supply chain of potato starts with the producers and ends with the consumers. The structural transformation of rural based economies into more urbanized societies has opened new market opportunities to participants in the potato value chain through both increase incomes and create employment in the sector (Aman et al., 2013). Although, marketing chains remain relatively short primarily due to the low level of commercial crop processing and the lack of specialization of crop wholesalers, who are often engaged in retail and other types of trade as well (Food Studies Group, 1992). According to Lirenso (1993), the marketing chain became more complex after market

deregulation, with the selling outlets for farmers increasing threefold, to six outlets, and the supply sources for urban consumers increasing twofold, to four sources in Ethiopia.

The sources of price information for the majority of the farmers were friends, client traders, sometimes personal visit of the market and nearby farmers which is not sufficient (Tewodros, 2014).

Middlemen and trader are advantages as they do not pay taxes when they buy directly from farmers and there is a rapid transfer of product to market which reduces the risk of quality deterioration (Bezabih, and Mengistu, 2011). Middlemen and trader are advantages as they do not pay taxes when they buy directly from farmers and there is a rapid transfer of product to market which reduces the risk of quality deterioration (Bezabih, and Mengistu, 2011). The major obstacles forced the farmer-traders to give up potato marketing include, high marketing costs, discriminatory practices by traders and lack of capital. Brokers play crucial role in potato marketing system by facilitating potato transaction through linking producers with traders, a wholesaler with another wholesaler, and wholesalers with retailers. The brokers sometimes go beyond facilitation of transaction and tend to control and fix prices, create price symmetry and make extra benefits from the process. However, the brokers in many parts of the country work in unregulated and informal way because they do not follow proper business conduct and as a result they constrain the marketing system more than they facilitate (Bezabih, and Mengistu, 2011).

Although the profitability of potato production in the major potato producing areas of Ethiopia seems healthy, the return on cash investment is a serious constraint. This indicates that market insecurity is high as a result of relatively volatile market prices, dependence on rain fed systems and limited chain integration (Bezabih, and Mengistu, 2011). Thus, market insecurity prohibited smallholder farmers' participation in potato markets (FAO, 2010).

### METHODOLOGY

This study was accomplished by reviewing different literatures available potato production and marketing.

### CONCLUSION

Ethiopia has the greatest potential for potato production because the country has suitable edaphic and climatic condition for high quality potato production. Potato is a high-potential food security crop since it provides a high yield per unit input with a shorter maturity period than cereal crops.

Although the crop is important for food security, shortage of

improved potato varieties and unavailability of quality seed, shortage of improved storage, adverse climatic conditions and lack of business oriented production system affected potato production.

Few studies made on potato marketing pointed out that there is a greater need to diversify export earning options by improving the quality of produces supplied to the market and enhancing the efficiency of the marketing system. The major constraints of marketing includes lack of markets to absorb the production, low price offered for the products, middlemen interferences in the market, shortage of marketing institutions safeguarding farmers interest and rights over their marketable produces, lack of coordination among producers, poor product handling and packaging, and lack of transparency in market information communications.

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- Therefore, delivering improved potato varieties, improved storage, provide adequate market information, strength producers' market linkage with key actors, and organize the producers and traders to work as partners to reduce middlemen interferences should be improved through integrative study.
- Putting the market right through institutionalizing the marketing system, the commission agents' functioning, grades and standards, improving the export system by improving the transparency in the price setting and credit system are crucial interventions. Finally, the government should review the export price, which is determined through negotiations.
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