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Research Article

Current Status, Opportunities and Constraints of Cassava Production in Ethiopia- A Review

Ashebir Seyoum Feyisa

Department of Plant Science, College of Agriculture and Natural Resource Management, Bonga, Ethiopia

ABSTRACT

The objective of this current paper was to review the current status, major opportunities and constraints in production and utilization of cassava in Ethiopia. Cassava is one of the most important food crops that serve major sources of carbohydrate. Despite its significant importance to attain food security in drought prone region of the country, production and utilization of cassava in Ethiopia has different opportunities and constraints. Several constraints are responsible for this among which poor access to improved cultivars, diseases and pest problems, improved processing methods; post-harvest losses and agricultural policy which only focused on cereals are the major ones. But nowadays climate change threatened the production and productivity of major cereals crops in the nation, so it is important to focus on climate resilient food security crops like cassava. They are well adapted to diverse soil and environmental conditions, tolerance of drought, resistant to insect pests and diseases, and flexibility in planting and harvesting time. Thus, cassava can be used as a weapon toward food insecurity [1].

Keywords: Cassava; Constrains; Food security; Processing

INTRODUCTION

Agriculture is the backbone of the Ethiopian economy and about 85 percent of the population lives in rural areas entirely depends on it (CSA, 1998). It is the leading economic sector which contributes 40% and 85% of nation's GDP and export respectively. Coffee, sesame, and fruits & vegetables are Ethiopia's top three agricultural exports (FAO, 2015). Diversity of agro-ecologies and climates allows for cultivation of wide range of crops but cereal crop cultivation took the highest (54%) share of nation's agricultural production (CSA, 2015). The sector is dominated by small-scale farmers who practice rain-fed mixed farming by employing traditional technology, adopting a low input and low output production system (World Bank, 2015).

Recently, global food security faced challenges, with ever increasing population, rises in food prices due to adverse climatic effects, agricultural input costs, increasing use of food items for other products and agricultural policies. In addition, environmental sustainability issue also becomes serious agenda because of rapid industrialization, urbanization and population growth. Thus, there is a greater need for farmers to have access to other crops with modern and eco-friendly technologies that will ensure food security and environmental sustainability. Africa is the center of origin and also a major producer of several cereals crops. But, yield gaps are high due to climate change, population growth; poor mechanization, poor soils and weak agricultural policies (Peter O. Kolawole et al., 2010)[2].

In Ethiopia, food security is the great challenge and most crucial constraints to further growth and development with respect to agriculture. This is situation comes due to heavy reliance on rain fed agriculture. In order to tackle food security problem, there is a need of crops which can tolerate climate change and give better productivity. Analyses of the susceptibility of crops to the impacts of climate change indicate that cassava may be better suited to survive climatic variations than most major tropical staple crops, which would make it a key food security crop for the future (Jarvis et al., 2012). And it is the only potential crop to produce and store more carbohydrate than any major grain and root crop (El-Sharkawy, 2004; Jarvis et al., 2012). For this reason and perceived others, Cassava (Manihot esculenta, Crantz) became the most important food crop in Africa.

Cassava (Manihot esculenta Crantz) is a perennial dicotyledonous plant, which belongs to the family

Correspondence to: Ashebir Seyoum Feyisa, Department of Plant Science, College of Agriculture and Natural Resource Management, Bonga, Ethiopia, Tel: 251921656872; E-mail: ashebirseyoum20@gmail.com

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Euphorbiaceae. It is the fourth most important food crop in the developing countries after rice, wheat and maize (Jansson, 2009). Its roots are also one of the most important sources of commercial starch. In fact, the crop is the second most important source of starch worldwide after maize (Stapleton, 2012). The crop also contributes to energy sector by competing with sugar cane, in Southeast Asia the crop become center of ethanol production (Jansson, 2009). Undoubtedly, ethanol is the key byproduct as oil prices are increasing and most of the developed countries are in favor of plant based ethanol production (FAO, 2015) [3].

According to (Gebremedhin et al. 2001) the majority of the Ethiopian population depends on cereal crops as food source and the food potential root and tubers crops has not been fully exploited and utilized despite their significant contributions towards food security, income generation and providing of food energy. But cassava has several other advantages over rice, maize and other grains as a food staple in areas where there is poor soil condition, uncertain rainfall and weak market infrastructure. However, cassava has been neglected for numerous reasons by researchers and policy makers and it's also considered as food of peoples with low per capita incomes (Nweke, 2004). Regardless of researches on crop adaptability, selection, nutritional and anti- nutritional factors, there is lack of information on overall status, challenges and the future role of cassava production in Ethiopia.

This paper, therefore, is aimed at giving a brief highlight on the status, opportunities and challenges of cassava production in Ethiopia, and to give information to stakeholders about some potential benefits of cassava crop within the country.

STATUS OF CASSAVA PRODUCTION IN ETHIOPIA

Cassava is mainly cultivated in the tropics for its starchy tuberous root. Twenty-three countries (13 in Africa, 3 in Latin America, and 7 in Asia) are considered to be major global cassava growers, each producing 1 million tons or greater annually, even though Nigeria, Thailand and Brazil are the major growers of cassava accounting for more than 40% of world cassava production (FAO, 2016). 276.5 million tons of cassavas were produced worldwide in 2016. Africa accounted for 57%, Asia for 32%, and Latin America 10 % of the total world production. Cassava production and productivity increased throughout the world because of the decline productivity of main cereal crops as result of climate change. In Africa cassava production increases in order to promote local available food products to limit wheat import from foreign countries (FAO, 2016). The largest producing nations of Africa are Nigeria, Ghana, Democratic Republic of Congo, Mozambique and Angola. According to the report of FAO (2016) production year book, Africa produces 155.6 million tons of cassava, which is more than half of the world production of the same year that is 276.5 million tones. But, Africa has the lowest average regional cassava yield (8 tons/ha), compared with Asia (22 tons/ha) or South America (13 tons/ha). These low yields are mainly due to lack of use of adequate inputs, such as fertilizers and pesticides, slow dissemination of high-yield varieties, and spread of pests (FAOSTAT, 2013) [4].

In Ethiopia, there is high cultivation of cassava in South and Southwest part of the country mainly for its edible tubers. It serves both as food security and a cash crop for small scale farmers. Most of cassava production in the country comes from southern region of the country. There is a lack of reliable data from the country on cassava production and consumption. The average total coverage and production in this region is 4942 hectares with the yield of 53036.2 tons per annum, respectively, and the average productivity of cassava in the country is not more than 10 tons per hectare (SNNPR BoA, 2014). This is lower than the world average (11.3 ton per hectare per year). The yield is even lower compared to neighboring Kenya (15.8 t/ha) and Uganda (12.2 t/ha) (FAOSTAT, 2013). The widespread lack of data on harvest expectations and negligible information on planting intention made forecasting cassava production difficult in sub-Saharan Africa countries (FAO, 2018).

OPPORTUNITIES OF CASSAVA PRODUCTION

Nutritional Value of Cassava Roots

The nutritional composition of cassava depends on the specific tissue (root or leaf) and on several factors, such as geographic location, variety, age of the plant, and environmental conditions. The roots and leaves, which constitute 50 and 6% of the mature cassava plant, respectively, are the nutritionally valuable parts of cassava (Tewe and Lutaladio, 2004). The nutritional value of cassava roots is important because they are the main part of the plant consumed in developing countries. Cassava root is an energy-dense food. In this regard, cassava shows very efficient carbohydrate production per hectare. It produces about 250,000 calories/hectare/day (Julie et al., 2009), which ranks it before maize, rice, sorghum, and wheat. Cassava has bitter and sweet varieties. In the latter varieties, up to 17% of the root is sucrose with small amounts of dextrose and fructose (Charles et al., 2005).

Cassava roots have calcium, iron, potassium, magnesium, copper, zinc, and manganese contents comparable to those of many legumes, with the exception of soybeans. The calcium content is relatively high compared to that of other staple crops and ranges between 15 and 35 mg/100 g edible portion. The vitamin c (ascorbic acid) content is also high and between 15 to 45 mg/100 g edible portions (Charles et al., 2005) [5].

Source for Industrial Products

Flour production: Wheat is one of the most important cereal crops in Ethiopia. It accounts 20 percent of the total nation's total cereal production. Wheat production in Ethiopia has grown significantly in the past two decade following different government programs; however wheat demand also increases significantly. In order to close the gap between demand and supply government has been continuously importing wheat from aboard for the last several years paid with high foreign currency that largely comes from export of other primarily

agricultural commodities (Samuel G. et al., 2017). According to Bergh et al., (2012) wheat demand expected to grow by 90 percent, whereas supply expected to grow by 73 percent which show that there will be supply shortage in the future too. This situation comes due to Population growth, urbanization and change in food habits, in addition to that wheat price also has been increases in the last five years on the globe market and expected to be grow in the future too.

Wheat flour is the main cereal crop used for baking different products such as bread primarily because of its high gluten content and production of different baked products which can be done at both household and industry level. There are more 200 flour mills in Ethiopia, with a total production capacity of 3.2 million tons of flour a year. Bergh et al. (2012) indicate that most of the millers have been operating at half-capacity due to shortage of local wheat supply. Wheat import has also grown significantly over the past decade. Yet, this substantial increase in domestic production and import of wheat has not reversed the increasing trend in wheat and wheat product prices, implying an even faster growth of wheat demand (Samuel G. et al., 2017).

Accordingly, there is an interest of to promote utilization of local sources of flour for partial substitution of wheat flour in food products in many countries (Eriksson, 2013). Incorporation of different proportions of flours from cereals and legumes in baked products such as bread is extensively being studied especially in developing countries (Masamba K. and H. Jinazali, 2014). Inclusion of cassava flour as composite for production of foods such as noodles, breakfast cereals, cookies, breads, cakes, pastries, muffins and doughnuts among others could reduce costs and increase the production of these products locally (Akinlonu, 2011). In addition, Wheat flour contains gluten which causes celiac disease especially to gluten intolerant persons (Briani et al., 2008). Therefore, non-wheat gluten-free flour developed from root and tuber crops such as cassava offer the potential to alleviate the double burden of rising cereal prices and gluten intolerance [6-10].

Therefore governments should make efforts to promote competitive production and processing of cassava into industrial raw materials for import substitution and foreign exchange earnings. To achieve this, efforts should be set in increasing cassava production simultaneously with increasing value addition, market diversification and trade in high-value and shelf-stable cassava products such as high quality cassava flour, cassava starch and dried cassava chips. The largest cassava producer in Africa, Nigeria, for example, continues to encourage the processing of cassava into flour as a substitute for wheat in bread, in an effort to help the country limit its high dependency on imported wheat (FAO, 2018). In Indonesia and the Philippines, cassava is become more important crop to attain for food security and dietary diversification programmes in the two countries have targeted cassava as a substitute for rice, which both countries import heavily (FAO, 2018).

Starch production: Starch is one of the most abundant substances in nature and it's produced from grain or root crops. It's a valuable ingredient for the food industry, being widely used as a thickener, gelling, bulking and water retention agents (Singh et al., 2003). Presently, corn, wheat, cassava and potato are the dominant crops widely in wider utility for the extraction of starches.

According to Tesfaye and Yalfal (2015), starch production in Ethiopia is very low and only two private limited companies provide close to 40% of the total starch demand in the country. The remaining balance is filled dominantly from aboard with high foreign currency. The factors that affect the demand for starch mainly include population growth and industrial development of the country; specifically the food and beverage, textiles, paper and printing, pharmaceuticals and other health and beauty products and adhesives. Estimations also indicate that the demand for starch will increase from 440 tons in the year 2013 to 695 tons and 1,120 tons by the years 2018 and 2023 respectively.

Starch is a source of carbohydrate, which is widely occurs in agricultural products, mainly in cereals (such as wheat, maize and rice), and in roots and tubers of potatoes, Sweet potatoes, and Cassava. Maize (Corn) is the leading source of starch both for food and for its use in industries. Ethiopia presents wider opportunity for cultivation of various starch source crops owing to its diverse agro-ecologies that permit the production of different crops. Cassava crop will probably have the potential to be cultivated and valued over other root crops for its outstanding ecological adaptation, low labor requirements, ease of cultivation, pest resistance and high productivity as primary starch crop in Ethiopia.

Cassava starch has many remarkable characteristics, including high level of purity, excellent thickening, neutral taste, desirable textural characteristics and relatively cheap source of raw material make it better than others starch source crops like maize, wheat, sweet potato and rice. The process of starch extraction is also relatively simple and this can makes the processing of cassava starch particularly suitable for developing countries like Ethiopia. Moreover, market for starch products can be increased using starch for biodegradable packaging material regarding to world concern to environmental issue. Among the crops, cassava is most widely grown to produce sustainable and cheap source of starch globally (Sin et al, 2011). Thus, replacing non-biodegradable products can be a huge market all over the world, and cassava producer countries can take advantage of this opportunity.

Biofuel Production: Ethiopia is one of the fastest growing nation in Africa and aims to reach lower-middle-income status in the coming few years. In order to ensure nation's continued development program, maintain nation's fuel security is mandatory (Geremew, T et al., 2017). About half of the population lacks electricity and the only potential fuel source is woods. Ethiopia also spends $2.5 billion annually on imported petroleum products, which is 20 percent of the country's foreign exchange. Thus, in order to tackle the above problems and to attain fuel security, it is important to increase the production and utilization of locally produced fuels such as bio-ethanol (Ministry of Water & Energy, 2010).

The production and use of bio-ethanol is rising worldwide due to the environmental concerns about air pollution caused by the

combustion of fossil fuels, energy security and dependency and import burden of petroleum products (Girma A, 2012). Locally-produced ethanol can be used in an attempt to tackle deforestation, land degradation, malnutrition, poverty; indoor air pollution and carbon emissions and ethanol can be also used for production of alcoholic spirits, which can be used in production of medications and sterilizers.

Bio-ethanol demand is expected to increase to 200 billion liters by 2025 (IEA, 2016). With this the global future demand of bio ethanol there will be future market opportunities for low cost producer developing countries like Ethiopia (FAO, 2013). According to Ministry of Water & Energy (2010) bio-ethanol production in Ethiopia is linked with sugar factories with total production potential to produce one billion liters by utilizing 700,000 hectare land for sugar cane plantation. However, the total bio-ethanol production and supply of the country was reached 181.5 million liters in 2015 (Ministry of Water & Energy, 2010).

Findings of Zenebe et al. (2014) revealed that bioethanol production in Ethiopia is quite viable whereas the viability and competitiveness of bio-ethanol production will largely depend on the cost and price of feedstock. There are different potential crops for ethanol use in Ethiopia; these include sugar cane, maize, Jatropha, Castor, Cassava, Cottonseed and Sweet Sorghum. As a biofuel crop, cassava has the advantage that the root can remain in the ground for months without deterioration, allowing for carefully planned and continuous harvest schemes. The crop is also resilient to poor environmental conditions, such as low rainfall. Cassava roots are not as voluminous as sugarcane or sorghum stalks and thus, it makes easier and cheaper to transport (FAO, 2008). Cassava is also found to be the cheapest bio-crop, costing 30% less than sugar cane and 20% less than sweet sorghum (Sinkala et al., 2013). Tenaw G. et al. (2017) reported that 34 percent of country's area land suitable for cassava cultivation. Hence, the country can produce up to 355.44 and 225.09 billion liters of biodiesel and bioethanol, respectively, by cultivating different potential feedstock crops.

Livestock feed: Ethiopia has a large livestock population and diverse agro-ecological zones suitable for livestock production. Ethiopia has largest livestock population of any country in Africa. Livestock production contributes up to 80% of farmers' income and 20% of agricultural GDP. It accounted for over $200 million in earnings in 2016 (NBE, 2016). Livestock production and productivity in Ethiopia is low and areas with high livestock populations tend to be arid and prone to drought (Demissie, 2018). Limited access to livestock inputs such nutritious food and fodder; improved genetic stock; and veterinary services are the major constraint in livestock production in Ethiopia. Among these constraints issues related to feed are the most remarkable ones. Feed shortage in quantity and quality has been a critical problem in Ethiopian livestock production system and causing a phenomenal rise in the unit cost of livestock products. Thus, these products have become too expensive for the majority of the population (Adunga T., 2009).

Cassava is one of the most drought tolerant crops and can be successfully grown on marginal soils, giving reasonable yields where many other crops can't do well. Both roots and leaves are usable as livestock feed. Cassava offers tremendous potentials as a cheap source of feed energy for livestock, provided it is well-balanced with other nutrients. Its leaves are rich in protein, calcium, iron, and vitamins, comparing favorably with other green vegetables generally regarded as good protein sources (S.K. Hahn, 1988). Thus, low cost livestock feed resource like cassava can be beneficiary to smallholder farmers during the dry season when there is scarcity of forage. Cassava chips have been used informally for animal feeding; however despite its great potential in the domestic market, there was little work has been done and neither private or government feed processors are interested in adding cassava to their products.

CONSTRAINTS OF CASSAVA PRODUCTION

Cyanogenic Glucosides in Cassava: The major constraint in cassava roots as human food is the presence of toxic cyanogenic glycoside compounds in the tissues. The plant is famous for the presence of free and bound cyanogenic glucosides; linamarin and lotaustralin which are converted to Hydrogen Cyanide (HCN) in the presence of linamarase, a naturally occurring enzyme in cassava (Haque and Bradbury,2004; Wilson, 2003). The amount of cyanide in the tuber is variety dependent. All plant parts contain cyanogenic glucosides with the leaves having the highest concentrations. In cassava roots, in the longitudinal direction, cyanogen concentration increases from insertion point on the plant to the root terminal and in the transverse direction, cyanogen levels decrease from the external area to center of the root (Bruijn, 1971). The presence of cyanogenic glucosides in cassava tissues is related to various health disorders that occur in populations where cassava is the staple food. These disorders include tropical ataxic neuropathy, epidemic spastic paraparesis, also known as, endemic goitre and cretinism (Delange et al., 1994). Cassava cyanogens can be reduced to low levels by several cassava processing methods and when cassava is eaten with other foods to balance the nutritional value, there is little danger of intoxication (Westby, 2002).

Long Growth Cycle of the Crop: Plant breeding is an indispensable tool in producing superior yielding cassava varieties (Harshey and Jennings, 1992). Cassava seeds are genetically diverse due to segregation and recombination from sexual reproduction (Halsey et al., 2008). Unlike many of the world's major crop plants, genetic improvements of cassava through sexual crosses have been difficult. Many varieties flower rarely and seed production is often low. Further, early flowering is associated with heavy branching, which tends to lead to low harvest index and yield (Lian, T.S. and Cock, J.H., 1979).

Nassar and Ortiz (2007) reported that cassava improvement via conventional methods continues to get genetic variation, which are needed to enhance the nutritional quality of this important crop in Africa and other areas in the tropics of the developing world.

Conventionally, cassava is propagated through seeds and stem cuttings. However, cassava seeds are normally diverse because of the cross pollination nature of the crop. Generally, any

particular cassava clone is highly heterozygous (Ceballos et al., 2004). Short viability of seeds, dormancy, variable flowering patterns and low seed set are limiting factors to use seeds as valuable source of propagation. Hence, stem cutting is the main propagation method (Leihner, 2002). However, this method also comes with disadvantages such as low rate of propagation, 10 cuttings per plant per year (1:10) which is difficult, time consuming, slow and delayed diffusion of new improved cultivars, bulky to transport and planting materials are insufficient in number for large-scale plantations (Demeke et al., 2014). Accumulation of diseases over vegetative cycle, high distribution cost and poor storage quality of the planting material are other limitations (Escobar et al., 2006).

In recent years, there is a progressive work on cassava crop improvement in different agro ecological locations of the country and two out performing varieties were found and officially released in 2005 (MoA, 2005). But the varieties were late maturing and the numbers were low to provide additional alternative to the farmers and increase genetic diversity. To alleviate the problem and provide farmers other alternative varieties, Hawassa Agricultural Research Center, in collaboration with Jimma and Sekota Agricultural Research Centers, also conducted evaluation of cassava clones and two clones with the highest storage root yield and dry matter content were promoted for variety verification. The two selected varieties were AWC-1 (MM96/7151) and 191/0427 (TMS 191/0427) which yielded more than 45 t/ha on both research managed and on farmer managed conditions (Tesfaye et al., 2018). In addition, there have been some reports in development of protocols for mass propagation of some cassava varieties in Ethiopia. (Dawit, 2010) reported on in vitro propagation of two cassava varieties (Kello and Qulle) from meristem culture and also Demeke et al. (2014) develop efficient in vitro mass propagation protocol for two elite cassava clones, 44/72-NR and 44/72-NW using nodal segment.

Cassava Processing: Utilization of cassava root as a food source and as industrial raw material is limited because of the rapid postharvest deterioration which starts within two days after harvest (Iyer et al., 2010). This situation shortens the shelf-life of the root, leading to postharvest loss, and poor market quality of fresh root and minimally processed cassava food products such as gari and flour (Van Oirschot et al., 2000). Moreover, a toxic compound associated with cassava root also contributes for limited utilization of this crop as foods. Different researchers have been shown that processing techniques such as peeling, fermentation, soaking and drying can detoxify and reduce the cyanide content, improve palatability and add value to the root (Cardoso et al., 2005; Burns et al., 2012). Therefore post-harvest processing of cassava into value-added products can greatly impact its commercial viability through producing shelf stable products and reducing toxic compounds associated with it.

For Ethiopians, the consumption of cassava as food is immense importance and regarded as the food security crop for millions of people (Abebe et al., 2014).Therefore, there should be development of processing technologies for enhancing the nutrient content and also reducing the anti-nutrients without adversely affecting the acceptability of the crop (Alamu, 2019).

Despite the importance of cassava to agricultural-led economic growth, there have been few studies that have investigated the evolution of processing and utilization of cassava in Ethiopia. Most recently there are some reports on detoxification methods and to use cassava flour in traditional food making.

According to (Aweke et al., 2012) processing methods such as washing, boiling, drying and fermenting with flour of cereals were best to increase nutritional content of and reduce cyanide level of cassava. But solar drying and fermentation were best methods in totally removing the cyanide content of cassava, and also cereal blends improve nutritional quality of cassava based foods. Abebe et al., 2014 also reported that among different processing techniques fermentation of cassava roots for 72 hours sufficiently reduced HCN content to safe level of human consumption. Sun-dried and boiling also had significant effect in reducing anti-nutritional factors of cassava such as phylate and tannin. Another work done by Megersa D. (2019) showed that cassava based food products like cookies and porridge prepared from 50% and 20% of cassava recipes respectively had better acceptance.

Cassava Diseases and Pests: Cultivation of cassava is hampered by several biotic constraints, of which cassava mosaic disease is currently the most important factor limiting cassava production in Ethiopia. It is caused by viruses belonging to the genus Begomovirus in the family Geminiviridae (Hong et al., 1993).

In Ethiopia, available data from surveys and field assessments are limited, but the data that has been collected from farmers' fields, generally shows that yield reduction were attributed by cassava virus disease which causes yellowing of cassava leaves at early stage of development which leads to reduced plant growth and yield (Tesfaye et al., 2013). Cassava scale insect (Aonidoytilus albus), Cassava green mite (Mononychellus tanajoa) and Red spider mite (Tetranychus spp) also are the most important insect pests which attribute for low cassava productivity in the country.

Postharvest Losses: Cassava is one of the most important root stable crops in Africa. It is a perennial woody shrub with an edible root, which grows in tropical and subtropical areas of the world. Cassava is a food security crop in many countries, but it is also one of the most suitable crops for processing into industrial raw materials such as starch (Nweke et al., 2002). Despite its agronomic advantages, cassava roots are far more perishable than the other staple food crops. Cassava has a shelf life that is generally accepted to be of the order of 24 to 48 h after harvest (Andrew, 2002). Therefore, fresh cassava roots must be processed into various forms in order to increase the shelf life of the products, facilitate transportation and marketing, reduce cyanide content and improve palatability (Neweke et al., 1994). In addition packaging and storage are the most major factors in postharvest handling that ensures food security and safety of the final product (Daramola et al., 2010).

CONCLUSION

Ethiopians farming system was dominated by cereal crop production but productivity is still low. There is a huge investment in agricultural extension program to increase the

production and productivity of major cereal crops. However, the demand of major cereal crops in domestic crops also rising and government has been import cereal crops especially wheat to for the past ten years to balance the domestic market. Despite, a huge work by a government to attain food security of the nation, there is a huge number of nations population is at a risk of food insecurity. in this regard, institutional and policy reforms, further investment in research and development in other crops especially in root crops can be viable to improve food supply chain of the country.

Root crops are plants yielding starchy roots, tubers, rhizomes, corms and stems and contribute important to income and food security in developing countries. In Ethiopia, root crops cover not more than two percent of the area under all crops in the country. Cassava is a perennial woody shrub with an edible root. It is rich in carbohydrates, calcium, vitamins B and C, and essential minerals. But cassava production in Ethiopia is not significantly used in many areas. The crop is hardy and can survive adverse conditions such as infertile soil, drought, pests and diseases and plays several important roles in Africa such as serving as a rural staple food, famine-reserve crop, cash crop for households and as a raw material for feed and industrial manufacturing. Despite its importance at household level, cassava production and productivity is low as compared to other crops. It is mainly cultivated by small resource poor farmers on small holding plots of land and used as a food security crop; however, cassava can be used as a source of industrial raw material for the production of starch, ethanol, bio-plastics, high quality flour, and glue and confectionery products among others.

This review indicates important institutional and operational reforms should be taken for improving the constraints and utilization of cassava crop in Ethiopia. Among them, improve processing technologies for cassava flour to achieve desired attributes, promote value addition activities, diversify consumable cassava products, made more attractive and competitive products in the market are the most important ones.

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