ISSN: 2754-477X

Journal of Food Technology & Nutrition Sciences

SCIENTIFIC Research and Community

Research Article

Open Access

Importance of Horticulture in Adoption of Climate Smart Agriculture in Ethiopia Short Systematic Review

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ABSTRACT

This review is assessed in Debre Berhan university and the review mainly focused on the role of Horticulture in insuring climate smart agriculture in Ethiopia. Agriculture is the backbone of Ethiopian economy. Even though agriculture is the backbone of the economy of the country climate variability, change, and related extreme events are adversely affecting agricultural production by resulting in increased variability in precipitation, an increase in temperature and emission of greenhouse gases. Therefore, to bring solution Climate-smart agriculture which is an agriculture that sustainably increases productivity, enhances resilience of livelihoods and ecosystems, reduces and/or removes greenhouse gases emissions and enhances achievement of national food security and development goals is the primary solution. The principle of Horticulture (urban and per-urban agriculture, silviculture, agro forestry of perennial woody fruits with a variety of vegetables) is again has a wonderful capacity to adopt this climate smart agriculture.

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Received: March 08, 2024; **Accepted:** March 18, 2024; **Published:** April 29, 2024

Keywords: Climate Smart Agriculture, Horticulture, Food Security, Ethiopia

Background

The word Agriculture is the most comprehensive word and used to denote the many ways in which crop plants and domestic animals sustain the global human population by providing food and other products. Agriculture is derived from the Latin Ager meaning field and Cultra meaning cultivation. When the two words combined, they give Field cultivation or field or land tillage. Nowadays the word Agriculture has come to include a very wide spectrum of activities that are integral to agriculture and have their own descriptive terms, such as cultivation, domestication, horticulture, arboriculture, and Olericulture, as well as forms of livestock management such as mixed crop-livestock farming, pastoralism, and transhumance. Also, agriculture is frequently qualified by words such as incipient, proto, shifting, extensive, and intensive, the precise meaning of which is not self-evident. Many different attributes are used too to define particular forms of agriculture, such as soil type, frequency of cultivation, and principal crops or animals. The term agriculture is occasionally restricted to crop cultivation excluding the raising of domestic animals, although it usually implies both activities [1].

Horticulture is a part of agriculture which deals about the production, harvesting, processing, marketing, post-harvest management of fruits and nuts, vegetables, flowers, spices, ornamental plants, plantation crops and condiments and which plays significant role in economy, human nutrition, gender mainstreaming and employment. The climate of Ethiopia favors production of a range of horticultural crops as it characterized by Tropical, sub-tropical and Temperate agro-climatic divisions. The country has production of citrus, mango, papaya, dates, potato, dry chilies and peppers, banana, onion, spinach, cabbage and green peas [2].

In Ethiopia agriculture is the fundamental economic sector, in which most population relies on its social and economic development. It is estimated that around 80% of the Ethiopian population is dependent on agriculture. The contribution of agriculture on the national Gross Domestic Product of the country was 46.3% and 90% of the foreign exchange earnings of the country. However, climate variability, change, and related extreme events are adversely affecting agricultural production. Climate changes likely result in increased variability in precipitation and an increase in temperature. The variability in precipitation and temperature increase is due to increases in greenhouse gas emissions into the surrounding atmosphere. Human activities like agriculture have caused climate change; mainly, small-scale farming contributes to greenhouse gas emissions and is a victim of climate change. It is estimated that agriculture and associated land-use changes account for 24% of total global emissions. However, excluding forestry and other land uses, agriculture contributes approximately 12% of global greenhouse gas emissions. Methane and nitrous oxide are the primary greenhouse gases produced by agricultural activities, comprising about 55% and 45% of emissions from agriculture, respectively In Ethiopia, annual greenhouse gas emissions were estimated at 150 Mt CO2e in 2010, with 50% and 37% of these emissions resulting from the agricultural and forestry sectors, respectively. In addition, livestock production accounted for more than 40% of the emissions in agriculture [3-10].

Agriculture is a sector that is very vulnerable to the effects of climate change while contributing to anthropogenic greenhouse

gas emissions to the atmosphere. Therefore, applying Climate-Smart Agriculture technologies and practices that can sustainably boost productivity, improve resilience, and lower greenhouse gas emissions are crucial for a climate resilient agriculture [11].

Climate Smart Agriculture is Agriculture that sustainably increases productivity, resilience (to climate change), reduces/removes greenhouse gases (mitigation), and enhances achievement of national food security and development goals [12].

According to Climate-smart agriculture is agriculture that sustainably increases productivity, enhances resilience of livelihoods and ecosystems, reduces and/or removes greenhouse gases emissions and enhances achievement of national food security and development goals. Climate-smart agriculture includes proven practical techniques such as mulching, intercropping, conservation agriculture, crop rotation, integrated crop-livestock management, agro-forestry, improved grazing and improved water management. Climate-smart agriculture also involves innovative practices such as improved weather forecasting, early-warning systems and climate-risk insurance. Climate-smart agriculture aims to get existing technologies off the shelf and into the hands of farmers, as well as to develop new technologies such as drought-tolerant or flood-tolerant crops to meet the demands of the changing climate. As horticulture is a part of agriculture which deals about the production, harvesting, processing, marketing, post-harvest management of fruits and nuts, vegetables, flowers, spices, ornamental plants, plantation crops and condiments and which plays significant role in economy, human nutrition, gender mainstreaming and employment. That horticulture includes large woody perennial trees to small annual vegetables this systematic review aims to show the importance of this horticulture to facilitate Climate-smart agriculture in Ethiopia [2,12].

Climate Change and Horticulture

The Ethiopian economy is based on agriculture. In Ethiopia agriculture is the fundamental economic sector, in which most population relies on its social and economic development It is estimated that around 80% of the Ethiopian population is dependent on agriculture. The contribution of agriculture on the national Gross Domestic Product of the country was 46.3% and 90% of the foreign exchange earnings of the country. However, climate variability, change, and related extreme events are adversely affecting agricultural production. Climate changes likely result in increased variability in precipitation and an increase in temperature. During such situation the science of Horticulture has a significant role to make agriculture smarter [3-5].

Cities are often unable to provide sufficient employment opportunities to their growing populations which lead to a rapid increase in urban poverty rates and food insecurity. These urban poor often lack the money to purchase food or the land to grow it. It is estimated that these individuals spend up to 60 percent of their incomes to buy food. Although cities will continue to largely depend on rural agriculture, urban and peri-urban agriculture is providing significant quantities of food (especially of perishable horticultural items) and improving food security of the urban poor. According to it is estimated that up to 15 percent of the world's food is produced by urban agriculture and 70 percent of urban households in developing countries participate in agricultural activities. Vegetables, fruits, mushrooms, herbs, meat, eggs, milk and even fish are being produced in community gardens, private backyards, schools, hospitals, roof tops, window boxes and vacant public lands (including at the side of roads and rail tracks) [12].

This home production of horticultural crops in Ethiopia in the year 2002 makes up to 1.51% of the total business establishments and 4.28% of the total gross value of income from urban informal sector. The concept of Urban and peri-urban production not only greatly improves nutrition it also allows families to spend more of their incomes on other expenses, such as education and health. In addition, urban and peri-urban agriculture also generate micro enterprises such as the production of compost, food processing and sale and greening of cities, improving air quality, and lowering temperatures [13].

According to Like in many cities in developing countries, food security in Ethiopia's capital city Addis Ababa is compromised by rapid population growth, youth unemployment, environmental degradation and climate variability. People living in poverty, particularly female-headed households, face immense challenges in meeting their households' food demands as well as non-food requirements such as housing, healthcare and clothing. Soaring costs of living are rapidly depleting the purchasing power of low-income households, further worsening their low level of food and nutritional security. Urban sprawl and associated environmental pollution are also growing problems in the city. In response to these challenges, Farm Africa, in collaboration with the Ministry of Planning and Development trialed urban agriculture as a means to improve the food security and incomes of low paid civil servants and households living in poverty, 83% of whom were female-headed. With funding from the Embassy of Sweden in Ethiopia, a 15-month urban agriculture pilot project was implemented to improve the livelihoods of 100 low-income households living in Woreda 02, Gulelie sub-city of Addis Ababa city [14].

Figure 1: Farm Africa Urban Agriculture in Addis Ababa

Figure 2: Farm Africa.org

Figure 3: Farm Africa Urban Agriculture in Addis Ababa

Climate Smart Horticultural Practices in Ethiopia

Climate-smart agriculture is expected to play a key role in tackling these climate-related challenges to agricultural livelihoods and food systems by supporting the transformation of Ethiopia's agricultural systems. The concept of Climate-smart agriculture rests upon three foundational pillars of sustainably boosting agricultural productivity, building resilience and adaptive capacity to climate change, and reducing greenhouse gas emissions to mitigate climate change where possible. Such an approach will be critical in ensuring climate-resilient food systems that lay the framework for a food and nutrition secure Ethiopia [15].

Urban agriculture in Ethiopia in the contexts of the present and expected dynamics of the country. It particularly highlights how urban agriculture serves a unique opportunity to diversify employment, income and dietary options for urban households, and to recycle and reuse urban wastes thereby contributing to sustainable urban development. A range of measures to raise urban households' awareness on waste management and their reuse in homestead gardens are highly needed. Overall, the sector deserves a due place in the sectoral and macroeconomic plans of the country. In the study of Addis Ababa city in 2023 in the last five years, vegetable cultivation has increased dramatically, and it has emerged as a source of food, income, and employment in city. This change is attributed to its high level of acceptance and adoption by the vegetable producers. The cultivation of vegetables is done by all social groups, but for the majority of households, vegetable production is a primary occupation [16,17].

The other measurement of climate smart horticultural practices in Ethiopia is the application agro- forestry systems and mixed approach of farm and landscape level roadmaps centered on climate adaptation and mitigation, boosting productivity and creating enabling environments, can support climate-smart agriculture mainstreaming across Ethiopia. According to the application agro-forestry of perennial woody fruit trees with different vegetable varieties is one of the roadmaps in Addis Ababa Ethiopia [15].

Future Line of Work

Even if agriculture is the backbone of Ethiopian economy of the country climate variability, change, and related extreme events are adversely affecting agricultural production by resulting in increased variability in precipitation, an increase in temperature and emission of greenhouse gases. Therefore, to bring solution Climate-smart agriculture which is an agriculture that sustainably increases productivity, enhances resilience of livelihoods and ecosystems, reduces and/or removes greenhouse gases emissions and enhances achievement of national food security and development goals is the primary solution. The principle of Horticulture (urban and per-urban agriculture, Silviculture, ago forestry of perennial woody fruits with a variety of vegetables) is again has a wonderful capacity to adopt this climate smart agriculture. The importance of conservation agriculture as a key climate-smart practice for Ethiopia has to be recognized among high-level policy-makers and decision-makers as well as government and civil society organizations in the country. A solid awareness-creation programmed of conservation agriculture technology should be provided to all stakeholders at federal and regional level [18].

Funding Statement

This research did not receive any specific grant from funding agencies.

Conflict of Interest

The author declares that there is no conflict of interest for the work.

Acknowledgments

The authors would like to acknowledge Dagmawi Teshome for his valuable ICT supports.

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