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Review Article

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Common beans research and development obstacles under North-West Ethiopia: A review

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Abstract

The production and productivity of dry beans in Ethiopia is hindered by multiple challenges; among these were biotic, abiotic and socioeconomic factors. Thus, this review paper highlighted and discussed those factors that impose dry beans not to give reasonable grain yield and acceptable quality therebyto identify and discuss the main challenges of common beans under the study area, and to document the information generated from the paper for future improvement of dry beans. A number of peer reviewed papers were critically viewed and reanalyzed based on the current situation of legumes production. Based on the investigation and observations made the author distinguished and prioritized the major threats of beans production for the study area. Via different sources, information generated. The author also identified and prioritized the agents that limit the production of dry beans under the area and means of managing the challenges separately or by integration them. Therefore, the author recommend and suggest that to cultivate our farmlands in sustainable way we have to follow and apply the cropping patterns and systems of rotation with legumes to achieve this we must made bridge between technology generatedwith producers.

Keywords: Dry beans, Pulses, Technology, Factors, Production, Productivity, Grain, Quality

Introduction

Beans, (*Phaseolus vulgaris*. L)are one of the most ancient crops of the world. It is also widely known in East and South East Africa for its multiple purposes. According to [1] report, beans are rich in a number of important micronutrients, including potassium, magnesium, foliate, iron, and zinc, and are important sources of protein in vegetarian diets. They are also source of amino acid lysine, fiber, starch and other essential nutrients. Similarly a review paper generated by [2] indicated that Common beans are recognized as a nutrient-dense, healthy food source due to their high protein, dietary fiber, and minerals content and also being a rich source of resistant and slowly digestible starch.

Another review paper published by [3] described common bean is the most important legume for human consumption worldwide and an important source of vegetable protein, minerals, antioxidants, and bioactive com-pounds. The N2-fixation capacity of this crop reduces its demand for synthetic N fertilizer application to increase yield and quality.

In Ethiopia beans are consumed at household level in different ways; such as preparation of soup, soaking and boiling alone or mixing with other cereals like sorghum, maize, groundnut, rice and other grains.

According to CSA 2019/2020 report the results of the year 2019/20 (2012 E.C.), Meher Season Post-harvest Crop Production Survey indicate that a total land area of about 12,862,778.84 hectares are covered by grain crops i.e. cereals, pulses and oilseeds, from which a total volume of about 335,199,823.90 quintals of grains are obtained, from private peasant holdings.

Pulses are also among the various crops produced in all the regions of the country after cereals. Pulses are grown in different volumes across the country. Pulses grown in 2019/20 (2012 E.C.) covered 12.16% (1,563,768.72 hectares) of the grain crop area and 8.97% (about 30,051,986.62 quintals) of the grain production was drawn from the same crops. Faba beans, haricot beans (white), haricot beans (red), chick peas (red) and chick peas (white) were planted to 3.63% (about 466,697.68 hectares), 0.74% (about 94,789.94 hectares), 1.45% (about 186,293.55 hectares), 1.38% (about 177,160.69 hectares) and 0.25% (about 31,677.22) of the grain crop area. (Table 1).

Table 1. Total Area and Production of Grain Crops for Private peasant holdings, 2019/20 (2012 E.C.), Meher Season

Crop category	Total area in hectares	Share (%)	Total production in quintals	Share (%)
Cereals	10,478,218.03	81.46	296,726,476.94	88.52
Pulses	1,563,768.72	12.16	30,051,986.62	8.97
Oil seeds	820,792.09	6.38	8,421,360.34	2.51
Grain crops	12,862,778.84	100.00	335,199,823.90	100.00

Source: (CSA, 2019/20)

Crop productionis dominant in Ethiopian agriculture as well as in the farming system. Legumes are among the various crops produced in all regions of the country in different volumes after cereals[4]. Furthermore, grain legumes are necessary elements of crop production in Ethiopia[5]. According to [6] report Common bean is the second most important grain legume in thecountry in terms of area coverage and production.

Although the probability of producing common beans under the study area, just like other lowland pulse commodities, is feasible, currently, however, its productivity is decreased.

Therefore, this review paper is designed:

To identify and discuss the main challenges of common beans under the study area
To document the information generated from the paper for future improvement of dry beans

Discussion

Diseases and pests

Currently common beans were under threat due to the ever existing and/or recently happened diseases and pests. The most common and known diseases and pests are angular leaf spot, common bacterial blight, rust, anthracnose, haloblight, bacterial blight, alternaria, web blight and others major pests include beetles, weevils, aphids, thrips, and weeds. Due to these pressures the yield obtained from per hectare penalized and the grain quality reduced from season to season. To support this paragraph a review article highlighted by [7] indicated the important diseases that causes significant yield losses on common beans are angular leaf spot, anthracnose, rust, bacterial blight, and mosaic, halo blight and ascochyta blight. Whereas the major insect pests were bean maggot (Ophiomyia phaseoli), bruchids, Z. subfasciatus, C. maculates, ootheca (Ootheca bennigseni) and aphids (Aphis fabae) [7]. Similarly [18] reported that Anthracnose caused by Colletotrichum lindemuthianum is one of the most critical diseases in the common bean (Phaseolus vulgaris L.).

Market access and fluctuation

When common bean seed growers apply full production packages in to their farmland, obviously they can produce reasonable yield. However, the obtained yield doesn't mean they will consume all the produce; it has to be presented for sale (some amount), but some farmers do not have the nearby market access (transporting issue) and plus to that price of beans grain is seasonal, on pick time the price go up and on the other period the price slightly goes down. This trend may be disappointing seed growers. This statement is in line with a recommendation given by [8].According to [16] research report farmers did, not like varieties that are difficult to harvest, susceptible to excess rains, late-maturing and have low market demands.

Poor extension system

In terms of crops technology and information dissemination the trend is not strong and sustainable. The linkage from the source to end users is not properly buildup. Due to this, the generated technology and/or information related to beans don't create expected impact on the general income of small-scale farmers under the study area. To consolidate this paragraph more a review article generated by [8] indicated that although beans are produced in widespread manner and had multiple benefits, the production and productivity of grain legumes in Ethiopia is below potential due to below usage of agricultural inputs, limited availability of seed, market problems, and poor extension system.

Land share (coverage by other field crops)

The study area is good for the production of major field crops including dry beans. However, currently the land allocated to cover by beans is relatively small when it is compared with maize, rice, soybeans, and groundnut.

Labor force (shortage of mechanization)

It is clear that our farming practice is mainly dependent on labor. To manage vast farmland by labor force is somewhat tedious and time consuming. To handle the overall farm activities, it is necessary to use and practice mechanization. Because when we apply mechanization on farmlands simultaneously, we can save time, produce enough and quality product grains, reducing or no loss of postharvest practices. According to [17] findings finance, transportation, information source, age, family size, dried beans farming experience, and family labor force variables were determined as the most important factors effecting on producer decision.

Low soil productivity

Currently the productivity of our farmlands reduced in one and another way. This can be manifested by different factors. One of the major constraints is the productivity of the soil is getting

low and low from time to time. For this not only common beans but also other field crops (such as maize, rice, soybean, groundnut, sesame, and other crops) productivity is declining. Extra information generated by [9] indicated that even though common bean as a crop has the potential to play role in achieving food security, its productivity is low due to constraints such as low plant-available phosphorus (P) and limited moisture in soil are among the major limiting factors.

Socio-economic factors

The price of almost all agricultural inputs is increased, thus it is difficult to purchase the inputs what the farmland needed. This phenomenon is worst for small scale farmers now, because they do not have sufficient money to buy and apply the inputs. The other factor is gendering; some areas of the study only men household members are participating actively whereas in some place's women household members take part, thus it creates gap on the full participation of farming practices. To support this idea a research implemented by [14] revealed that poorer households and women farmers achieved lower yields than wealthier households and male farmers. Another factor is culture and religious issues; some areas of the study site producing and consuming dry bean grains is part of their daily lives, but unlikely to other places, due to religious beliefs some parts of religious followers engaged on agriculture almost every day farming activities others do not implement the routine farming practices.

Shortage of standardized storage

The produced agricultural product needs proper and well standardized storage house. Unfortunately, majority of bean producing small scale farmers do not these standardized storage house. Due to this, the stored product may be exposed for different pest and disease attack and thereby may lose its quality, viability, purity and other seed measurement parameters. In addition a study conducted by [10] suggested that postharvest handling and storage of dry beans is an important aspect in providing high quality products. Another research report indicated that, seed coat discoloration and insect infestation can occur if beans are not stored at optimum conditions [11]. A study conducted by [12] indicated, in Ethiopia, like in other developing countries post-harvest losses, including storage losses is estimated at 5-26%.

Use of traditional threshing method

Because of lack of modern threshing machine, our farmers still practice traditional threshing their field crops. The frequently use of this threshing method not only consuming time, labor and other challenges but also reduced the quality of the grains and lose the yield. According to [13] report traditional threshing methods are also tedious, time consuming and labor intensive.

Less attention of beans nutrition-based importance

We know that the source of nutrition comes from different items. To have a balanced diet one has to incorporate variety of food items. Among these were beans, because they contained proteins, carbohydrates, oils, fibers, and other important ingredients essential for humans' physical body and mental development. However, most of our seed growers do not have sufficient information about the importance of beans as nutrition. Similar research result done by [15] indicated that farmers did not value the importance of invisible traits such as nutritional value (Fe and Zn) and canning quality probably due to the unfamiliarity with the nutritional and health benefits.

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Opportunities: Some of the opportunities include participation of farmers on the adoption and use of crop technologies getting improved, the establishment of government owned

agricultural research centers, installation of various agro-processing factories, conducive agro-ecology for the cultivation of crops, the nearby establishment of commodity exchange (ECX), enormous availability of natural resources such as virgin land, excess water source, fertile soil, cheap labor force, direct involvement of youth groups for agricultural works, close follow-up of agricultural experts, and others.

Conclusion: This review paper targeted the assessment of major factors that now days become constraints for the production of dry beans. Although, the multiple effects of factors tends to decrease the production of common beans, the current study area North-West Ethiopia is favorable for the production of legume crops including dry beans. The main threats for the production of lowland pulse crops under the study area specifically metekel zone screened, documented and to be forwarded for further evaluations. Opportunities of the study area could beindicators for improving dry beans and thereby to complete self -food security even improve the daily lives of the society.

Significance statement

This review paper highlights the challenges that directly or indirectly limit the production and productivity of dry beans in different ways, the possibility of intercropping or rotation of dry beans for the study area and similar ecologies of the country. This study will help researchers to explore more important information about dry beans to increase the productivity of dry beans and improve the quality in general. Furthermore, small scale farmers, teachers and students, policy makers, business workers, agro-processors, investors and other stakeholders can be beneficiary by using and applying the information and/or technology generated by this particular review paper and other related findings.

Conflict of interest: The author declared there is NO conflict of interest at all

Author's contribution: Developing proposal, setting objectives, collection of relevant information from different sources followed by interpretation, writing manuscript for review and finally submission of the paper for publication under reputable journal.

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