



## Review Article

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# Review on determinants for adoption of improved forages in Ethiopia

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## Abstract

This review paper designed to identify determinants that affect farmer's decision to adopt and utilization of improved forage technology in Ethiopia. The purpose of forage production in Ethiopia was mainly for animal feed. Forages offer a sustainable basis of protein which improves the output of diverse classes of animals such as lactating cows, fattening cattle, pregnant cows and calves. As well as using for feedstuff, better-quality fodder species were used for soil and water preservation, improving bared lands, raises soil nitrogen available for nutrition crops because of their capability to fix nitrogen and green manuring, erosion control, live fencing, as a wind breakdown, and sources of nectar and pollen for honeybees. Besides, multi-purpose browse trees and shrubs increases fuel wood resources available to farming households, declining the requirement to use dung as fuel and increasing the availability of dung for use as fertilizer. Even though improved forages have many roles in the livelihood and environmental management, level of acceptance and consumption of better-quality forage technology is very low. The main factors that affect for acceptance of improved forage by farmers in Ethiopia include land shortage, shortage of input/forage seed and planting materials, shortage of capital, lack of awareness, poor extension services, free grazing and poor coordination among stakeholders. Therefore, incorporation of improved forage with crops, and with soil and water conservation structure, rise availability of forage seed for the farmer and creating awareness were the best ways for increasing and extensive accepting of forage technologies. Moreover, it is likely to speed up the level improved forage adoption by provided that farmers with training sessions and recurrent extension advises to encourage them to adopt forage production and pass on their information to other farmers. Hence, research centers, development agents and other concerned stakeholders should provide on farm extension training to fill knowledge and skill gaps in the adoption of improved forages.

**Keywords:** Adoption, Improved forage, Determinant, Ethiopia.

## INTRODUCTION

Ethiopia has the major livestock population estimated to be 59.5 million heads of cattle, 30.7 million sheep, 30.2 million goats, 8.43 million donkeys, 2.158 million horses, 0.409 million mules, 1.2 million camels, 59.49 million chicken and 5.90 million beehives related to other African countries [1]. The varied agro-climatic situation of Ethiopia makes it very appropriate for production of diverse types of livestock [2]. In spite of their huge number and status of their productivity is minimal [3, 4] owing to inadequate amount and quality of feed to achieve the annual demand of livestock [5]. The result of Bashe et al. [6] specified that acceptance and usage of improved forage technology was supposed to be the remedial measure and means of upgrading in output of livestock sector and ease limitation of feed scarcity. However, even during years of good rainy period, forage is not satisfactory to feed livestock [7] for reasons related with land shortage, free grazing, input shortage, poor extension service, and attitude and skill gap of the forage producers [8]. Though there are constraints which hinder the forage segment development there are also numerous chances for its development and unceasing research are essential to challenge difficulties and sustain forage expansion. Therefore, this paper was aimed to review determinants for forage adoption and utilization in Ethiopia.

## Overview the importance of forages in livestock production and agriculture

The purpose of forage production in north western Ethiopia was for animal fodder [9]. They offer a sustainable source of protein which improves the ruminant livestock yield [10]. Farmers apply better quality forage for diverse classes of animals such as lactating cows, fattening cattle, pregnant cows and calves. But maximum priority was given for lactating cows [11].

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Besides using for feed, farmers also use improved forage species for soil and water preservation (desho grass), fence and as a wind breakdown (Sesbania and Leucaena). The same effect has been reported by Shiferaw et al. [9] that farmers in north western Ethiopia use forage for multi-purpose functions. The study conducted by Feyisa et al. [12] showed that forage legumes play a significant role for the sustainable incorporation of crop and livestock enterprises, improving denuded lands, improving soil nutrient status through biological N-fixation and green manuring, erosion control, live fencing, firewood source and as sources of nectar and pollen for honeybees. Likewise, usage of forage legumes often rises soil nitrogen available for food crops because of their capability to fix nitrogen reported by Mengistu et al. [10] addition of forage legumes in the agricultural system has an additional benefit of preserving soil fertility and sustainability of the environment through biological N fixation and protection of the land from erosive forces [12].

Moreover, multipurpose browse trees and shrubs rises fuel wood resources available to agricultural households, lessening the essential to usage dung as fuel and increasing the availability of manure for use as fertilizer [10]. Even though improved forages have numerous roles in the livelihood and environmental management, respondents had problems of skill in production and consumption of forages [6, 9].

#### **Determinants for the adoption and use of improved forages in Ethiopia**

Despite many years of effort on forage research and extension activities, the adoption and consumption of improved forages by farmers is very low [13] owing to many reasons of which land shortage, lack of improved forage seed/planting material and poor extension services were the most restrictive influences in Doyogena District of Kembata-Tembaro Zone, Southern Ethiopia [14]. The outcome is in agreement with the result of Salo et al. [15] from Anelemo woreda in which farmers do not accept improved forage technology due to land shortage, shortage of forage seed, lack of awareness and poor extension services. Similar to this result, Mekete [16] also reported that the main reason for not establishing improved forage was shortage of land on which to graze livestock or produce forage, absence of nearby adaptable improved forage seeds/seedling, insufficient extension provision service supplies, shortage of human labor targeted in the production and use of improved forages, lack of access to credit, occurrence of forage pests, weeds invasions, deficiency of fertilizers, scarcity of animal labor and forages plant diseases. According to Assefa et al. [11] shortage of land, lack of awareness and the increased price of forage seed were the highest limitations that delay the adoption of improved forage in Shashogo Woreda of Hadiya zone.

Likewise, roundtrip distance to Development Agent's (DA) office; access to extension services; training attended; number of adult males in family; nitrogen fertilizer used; number of equines owned; and cash income had a negative effect on adoption of improved forages [17]. The study in wolaita zone, southern nations and nationalities peoples state of Ethiopia conducted by Bashe et al. [6] showed that family size, farm size, topography and distance from farmers' home (residence) to farmers training centers were the main factors which meaningfully affect the adoption of improved forage technologies. Capacity building and extension system on forage technology packages is very weak [14].

#### **Land shortage**

Land shortage is the most dangerous problem for adoption of improved forage production [16, 18]. Similar problems were reported in diverse parts of the nation as most limiting factors to encourage forage production. For

instance, in *Nekemte* and *Bako* areas Geleti et al. [19] observed low improved forage production attributed mostly to the inadequate land allocation and the same result was reported by Melese et al. [20] in Libokemkem District, Ethiopia. This result agrees with a study showed by Beshir [21] in north east highlands of Ethiopia; in which farm size had a positive and important effect on the implementation of forage technologies.

Average land holding is small and most farmers do not have extra land for forage production [22]. The shortage of arable land is increasing from time to time due to the ever-increasing human population and it is critical problem for both crop and livestock productions [23]. The shortage of land is also aggravated by poor soil and undulated topography which simply exposes the soil to erosion [8]. As reported by Assefa et al. [11], only a minor area of land was assigned for forage expansion owing to land scarcity in Shashogo Woreda, Hadiya zone, Southern Ethiopia. Those of farmers who have greater farm size also prepares private grass land by their individual and have access to get crop residue and store it for the subsequent dearth periods in order to overcome feed shortages. So that this by itself damagingly affects improved forage acceptance [6]; whereas land shortage and lack of planting materials related with high cost in *Wolaita Zone* southern Ethiopia are obstacles for forage production [24].

#### **Shortage of input/seed and planting materials**

The nonexistence of amount and quality seed and seedling material confines the huge development of improved pasture and forage growth specially around the dairy farming and fattening areas [25] which is in agreement with statement of diverse authors in Ethiopia [14, 20, 22]. Moreover, the shortage of input (seeds/seedlings) is the factor to adoption of improved forages which is in contour with report of Yadessa et al. [5] in the Meta-Robi district, west Shewa zone, oromiya regional state of Ethiopia. The study conducted in Northeast Highlands of Ethiopia was discovered that only 1.3% of the total cultivated land is enclosed with improved forage seeds [26]. The higher number of farmers with forage planting material scarcity in some places might be related with the limited forage seed source. Hence, making available quality seed or vegetative planting material appropriate to a given agro-ecology and farmers' need for livestock production is crucial [14].

#### **Shortage of capital**

Besides, land shortage and input shortage, lack of money to cover the higher prices of developing improved forage species was raised as reason by the farmers [8, 11]. High price of forage seed production by government agencies are factors of forage production [10]. Cash income of the families showed a positive connection with forage adoption, as families with high cash income showed higher chance of being adopters. A possible clarification for the positive effect of cash income on forage adoption is that families with additional cash can purchase feed from the market place, allowing extra land to be allocated to forage crop production rather than food crops [17]. One of the reasons for inadequate forage growth is the limited financial incentives or the return is not immediate since the production of improved forage crops did not link with productive animals [8, 14].

#### **Lack of awareness**

Lack of knowledge or awareness is one of the main constraints identified by Assefa et al. [11] as a problem with improved forage adoption. Farmers' awareness for improved forages and forage seed production practices is very low [14, 15, and 20]. They don't use efficiently their land in the borders, terraces and homestead for the production of forages owing to limited

information and knowledge gap on improved forages [8, 22]. Few farmers assign land for forage farming which might be because of lack of awareness [5, 9]. Access to training had an extremely important and positive effect on forage adoption. It is not amazing that increasing the knowledge of farmers concerning newly released and adapted forage technologies, and viewing them in what way to use them, improves the probabilities of forage adoption [17]. However, according to the outcomes of Assefa et al. [11], around 37.5 % of the questioned households have access to training on improved forage development, its use and utilization whereas the rest of the respondents did not get the chance of training. So that it is likely to encourage improved forage adoption through awareness formation of farmers with large land size [6].

### Poor extension services

Poor extension services were other causes for adoption of improved forages which desires to be improved [11, 20]. Extension service is vital to increase adoption of forage technology but study result by Salo et al. [15] in Anelemo Woreda, Hadiya zone specifies that only 51% of respondents have access to extension service. This can contribute to low delivery of information to farmers. The result is in agreement with the finding of Abebe et al. [17] exposed that better access to extension services is linked definitely with forage adoption. The positive association among extension services and forage adoption shows that increasing access to extension services increases adoption among households, strengthening the result of Beshir [21] that agricultural extension services are a main source of information concerning forage technologies for farmers. If the household has access to extension services, the chance of adoption of improved forage varieties enhance by 42% [17]. The tendency of improved forage utilization calls for actual extension service to encourage farmers to produce improved forage species [11]. Farmers closer to Development Agents office have better access to information on improved practices and other extension services as well as to supply of forage seeds [17].

### Free grazing

Free grazing is the one bottleneck of the farmers in the adoption and utilization of improved forage crops; especially after crop harvest [8]. This can concur with the report of Ahmed *et al.* [27] in the central highland parts of Ethiopia. Free grazing has become a challenge for the survival of forage plants [22]. But the timely decreasing rate and increasing knowledge of farmers to free grazing can be promising to the future [8]. Legumes can have poor persistence (particularly under continuous grazing) and low tolerance to poorly drained soils and low soil fertility [28].

### Poor coordination among stakeholders

Poor coordination among research organizations, governmental and non-governmental organizations and farmers is one constraint for the poor distribution, production and utilization of the forage technology by the farmers. Owing to lack of good coordination there is loose link among research and extension services. Researchers did not get sufficient response which might have aided them to design their research actions based on the interest of farmers. So, most of the time, plans are proposed based on locally perceived problems [8]. Kebede *et al.* [28] also showed that linking forage technologies with a range of value chain issues in livestock enterprises was found to be indispensable for positive adoption of forage technologies by farmers.

### Marketing challenges

Lack of participation of the private sector on the forage seed production and supply is also main constraint that caused absence of forage seed

marketing [29]. The existing forage seed market is very much dispersed with weak linkages among suppliers and buyers, and an overall nonexistence of market information [30]. There is no direct marketing connection amid traders and farmers. There are also no forage seed traders. Low forage seed production, poor quality forage seed, poor seed management (handling and storage), and changeable demand for forage seed, lack of quality control system and lack of working capital are some of the challenges for forage seed marketing [14].

### Family size of household head

This is an unceasing flexible which absolutely and meaningfully affects chance of adoption of improved forage technologies [6]. The fact that number of adult males in the family had a positive effect on the probability of adoption of improved forages was not amazing as improved practices are labor intensive and households with more family labor are in a better position to adopt forage technologies than households with fewer family labor units [17]. Similar findings have been reported by Beshir [21].

**Nitrogen fertilizer** application may directly or indirectly affect adoption of improved forages. The positive influence of fertilizer application on adoption of improved forages might be an indirect one. Crop intensification and increased crop yields/ha following use of fertilizer can free up some cropping land for forage production [17].

### CONCLUSION

The general objective of this review paper was to identify the major determinants affecting the adoption and use of improved forages in Ethiopia. Improved forage crops are very significant to soil and water preservation activities, natural restoration of the degraded areas and maximize and sustain productivity of livestock in diverse methods. Adoption of improved forage technology support farmers to exploit and sustain output of livestock. However, Ethiopian farmers do not extensively adopt improved forage technology owing to land shortage, shortage of input/forage seed and planting materials, shortage of capital, little awareness or technical know-how, poor extension services, free grazing, poor coordination among stakeholders and little support from governmental and non-governmental organizations on what these technologies are, how to cultivate the plants and where to find the planting materials. Moreover, extension services on forage is not strong specially follow-up which resulted in low adoption of forage crops by farmers. Therefore, increasing availability of forage seed and making awareness on importance and possible means of incorporation in farming system is important for wide adoption of improved forage technology in Ethiopia.

### Recommendations

- Use of integrating high yielding and high value forage crops with other food crops through under-sowing and over sowing approaches also essential to be given strong attention by both governmental and non-governmental organizations that can resolve the land shortage problem.
- Extension service in the utilization of improved forage need to be encouraged.
- Research on forage species that acclimatize to diverse agro-ecological zones need to be conducted.

- Establishing and organizing forage seed manufacturer groups in the form of co-operatives have significant role in increasing accessibility of forage seed production in sustainable way.
- Undertaking continuous studies on determinants of improved forage adoption and seed production is supposed to increase the sectors productivity.

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