

Review on coffee (*Coffea arabica*) sector challenges in ethiopia and strategies to mitigate them

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Coffee is the most important agricultural commodity, worth an estimated retail value 70 billion USD, crucial for the economy of more than 70 countries and the main income resource for hundreds of millions people worldwide. Despite the largest share in production and economic contribution, the value of coffee exported from Africa, including Ethiopia has declined considerably over the years due to lack of sustainability and poor competitiveness of the sub-sector at the national and international market. In Ethiopia, coffee had been and still contributes to the Lion's share in its national economy being the leading source of foreign exchange earnings. Despite its importance the coffee sector is being challenged by different factors. Among these factors:- low productivity due to lack of improved varieties, diseases and pests, improper processing method, lack of post-harvest handling such as storage facilities, climate change, land degradation, marketing. To mitigate these challenges efforts have been made to some extents. Strengthening the extension in distribution of improved and disease resistance varieties, proper processing methods, construction of storage facilities, developing and adapting varieties for climate change, reforestation and afforestation, discouraging illegal settlement and market regulation are some strategies to be implemented in order to mitigate them.

Key words: - coffee sector, Ethiopia.

INTRODUCTION

Coffee is one of the most important commodities in the international agricultural trade, representing a significant source of income to several countries of Africa, Asia and Latin America. Despite its importance, the value of coffee exported from Africa, including Ethiopia has declined considerably over the years due to lack of sustainability and poor competitiveness of the sub-sector at the national and international market [1]. For example, Africa's production fell by 18.5% and its share of world production fell accordingly and was down by 1.5% for the crop year 2008/09 and 2009/10. This is primarily ascribed to various problems, including inadequate access to improved production and processing technologies. Currently, Ethiopia is a leading arabica coffee producer in Africa, ranking the fifth largest Arabica coffee producer and tenth in coffee export worldwide. Its total coffee production and export respectively increased by 107% and 226% for the crop year 2009/10 and 2010/11 [2]. In Ethiopia, coffee had been and still contributes to the Lion's share in its national economy being the leading source of foreign exchange earnings. Besides, the livelihood of a quarter

of the Ethiopian population depends directly or indirectly on the different processes of production and marketing along the coffee value-chain [3]. Despite its importance the coffee sector is being challenged by different factors.

1.1 OBJECTIVE

To Review On Major Coffee Sector Challenges In Ethiopia And Their Mitigation Strategies.

CHALLENGES OF COFFEE SECTOR IN ETHIOPIA AND STRATEGIES TO MITIGATE THEM

2.1. Challenges in Production

In Ethiopia, there is no formal system responsible for the production and supply of improved coffee seeds from the released and adaptable coffee varieties. As there is no public or private enterprise, all the burdens had been and is still left to the Jimma Agricultural Research Centre. Thus, Jimma Agricultural Research Centre is the only governmental institution that had taken the initiative of multiplying improved coffee seeds and seedlings of the nationally released coffee berry disease resistant varieties since 1987 and distributing all over the major coffee growing areas of the country [1]. From the annual requests for each variety and supplied by the Jimma Research Center, the gaps between the demand and supply was analyzed and compared over years. The experience on the constraints and opportunities for production and dissemination of improved coffee varieties is highlighted and future interventions for sustainable coffee seed system in the country are also suggested.

Hence, more than 95% of the total volume of coffee produced in Ethiopia is contributed by the smallholders whose average holding size is less than one hectare with low average productivity ranging from 200 to 250 kg /ha [4]. Ethiopian coffee is predominantly produced by small-scale farmers using traditional farming system and thus considered as organic by de facto and known for its superior quality. The low-input coffee production system with the occurrences of maximum biodiversity, environmental sustainability and ecological services [5] should deserve due attention and needs to be supported, among other, through smallholder certification and carbon trading. Nonetheless, all these immense opportunities have not yet been fully accredited and exploited, demanding for strong international collaborations in supporting national certifiers and sustainable global coffee initiatives for the development of the coffee sector and thus, maximize its decisive role in improving the livelihoods of the rural poor [5].

Despite the wealth of ecological and coffee diversities, the national average coffee yield level is low by the world standard. This could be attributed to several factors, including insufficient credit and input distribution mechanisms for coffee producing farmers, predominant use of unimproved local coffee landraces, as well as conventional husbandry and processing practices, which in turn seriously hampers the overall national coffee production and productivity of the smallholder coffee farmer in the country [5]. Hence, it is crucial to promote the recommended best coffee technologies at each geographical area and production zone. This requires, among others, strong stakeholder linkages at all levels and aggressively transfer the improved coffee varieties, improved agronomic practices, harvesting and post-harvest management technologies. In Ethiopia, the current Government support for the production and export of market-oriented quality coffees, among others, contributed a lot to benefit from the encouraging premium coffee prices [1].

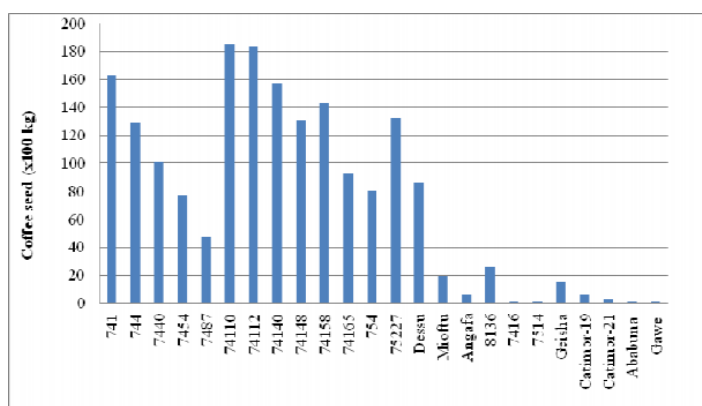


Figure 1. Multiplication and distribution of improved coffee seeds prepared from the released arabica coffee varieties by the JRC over 32 years (1997-2010)

Source: [1].

The maximum values for the compact coffee varieties could be associated to the increasing

requests, particularly from the Illuababora zones where they thrive best and have been collected. In contrast, some of the released coffee varieties are less demanded and calls for research to collect feedbacks on their drawbacks for improvements. The average annual results, however, depicted considerable variations from year to year, perhaps due to the biennial nature of coffee trees, number of varieties involved and their land holding size, as well as the prevailing climatic and field management conditions. The results also depicted unstable coffee seed production and

supply by the Jimma Research Centre. Accordingly, the maximum average capacity of coffee research centers had only reached as high as 14,762 kg in the 2006 crop year (Figure. 2). The analyses also revealed that the demand surpasses with the increasing gaps over years (Figure. 3). The demand shares in most years are more than 80 %, indicating the untapped opportunities for the interested private and public institutions to involve in the coffee seed business.

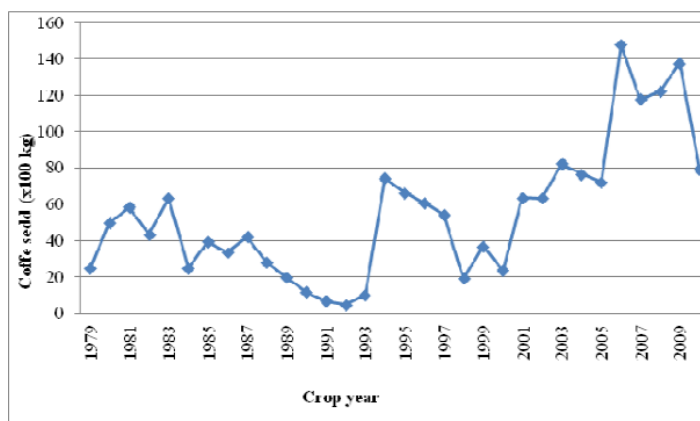


Figure 2. Annual patterns of improved coffee seed production by the JRC over the last three decades

Source: [1].

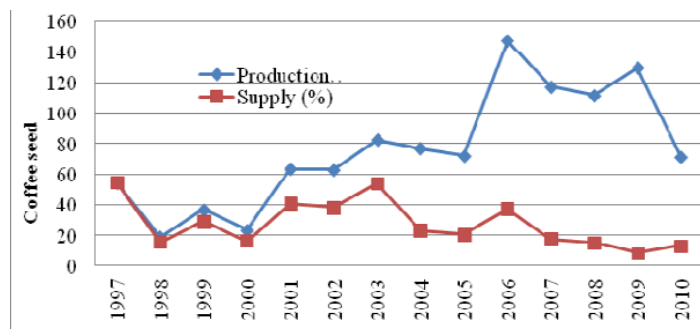


Figure 3. Trends of improved coffee seeds produced and supplied by the JRC

The Jimma Research center cannot meet the rapidly growing demand for improved coffee varieties in the country as described by [7]. To circumvent the shortage of planting materials, the informal coffee seed system is also practiced by the varied private and public coffee farms in the major coffee producing regions of the country. This includes production of uncertified coffee seeds from the released and adaptable coffee varieties by small-scale farmers, private investors and state coffee farms, who produce and use for themselves, on top of transferring to other users in their vicinities. Among others, the big coffee state farms, namely, Limmu, Teppiand Bebeke of the coffee plantation development enterprise (CPDE) had produced and supplied a total of 59,287 kg of coffee seeds to different users between 1997 and 2000. They depend on the improved coffee berry disease resistant selections initially obtained from the Jimma research center [1]. Likewise, the recently established modern private coffee farm of Medroc Ethiopia, the Gemadiro coffee farm of Agriceft Ethiopia, has also played a significant role in the production and supply of coffee seeds from the selected coffee berry disease resistant varieties (Table 1). The production from these large coffee farms is also augmented by the relatively smaller quantities of coffee berry disease resistant coffee seeds (1,000 to 2,000 kg) produced and supplied by some private coffee farms of smaller scales found in the southwestern parts of Ethiopia.

Due to the high opportunity costs, the farmers may include some coffee seeds and seedlings from disease susceptible local

landraces they consider and prefer good. Hence, it is essential to establish farmers' coffee seed/seedling producers group with pertinent technical and practical training supports. This indicates that large-scale coffee farms have more experience than the other coffee seed sources. The technical and resource capacities of the large-scale coffee seed producers (state farms and private investors), as well as those of smallholders can help to trigger rapid expansion of improved coffee technologies and contribute a lot to boost coffee production and productivity in the country. This would be successful if their activities are technically supported through all rounded regular trainings as well as field inspection and certification schemes as it is true in the case of other cereal seed systems [1].

Since the past few years, the Ethiopian government had given a very serious attention for the expansion of the coffee plantations, which in turn entailed large scale multiplication and distribution of improved coffee seedlings. This can be witnessed from the ever increasing plan for the total coffee area coverage every year through expansion of new coffee plantations, accompanied with allocation of adequate budget, which in turn created a significant boost in the demand for improved coffee seeds all across the country. There are also small financial supports provided by some non-governmental organizations that have coffee components in their projects, which thus give assistances for the purchase of coffee seeds to be supplied to the smallholder farmers. In line with this, [8] reported the considerable contributions made by the coffee improvement project of the European union (EU) that supported establishment and running of coffee nurseries in different parts of the country, viz. Oromia, South nations and nationality, Gambella and Amhara regions, thereby enhancing expansion of new coffee plantations using coffee berry disease resistant coffee varieties, till the project phased out in December 2009.

Table 1. Quantity of improved coffee berry disease resistant coffee seeds produced and supplied by private and state coffee farms in southwestern Ethiopia

Coffee farms	Annual Seed Production (kg)					
	2007/08	2008/09	2009/10	2010/11	Total	Mean
State Farms						
Limmu	12,000	12,300	13,725	6,200	44,225	8,845
Teppi	2,000	2,593	5,026	5,443	15,062	3,766
Private Farm						
Ethio-Agricelt	546	591	1,157	1,221	3,515	879
Total	14,546	15,484	19,908	12,864	62,802	4,497

Table 2. Achievements of the specialty coffee multiplication and distribution plan (2009/2010)

Specialty coffee	Variety number	Amount of seed (kg)			Number of seedlings		
		Planned	Achieved	Percent	Planned	Achieved	%
Wellega	6	1,020	681	67	3,565,800	810,000	23
Harar	7	420	203	48	1,470,000	800,000	54
Sidama/Yirgacheffe	8	1,507	1,087	72	5,271,950	3,093,000	59
Limu	9	421.0	255	61	1,473,000	1,000,000	68
Total	30	3,368	2,225	66	11,781,250	5,703,000	48

Source: [1].

2.2. Challenges in Processing

A number of constraints are associated with coffee processing in

Ethiopia. Among these are lack of drying beds, shortage of hand pulpers and central coffee washing stations and high costs of drying materials (Table 2). Farmers also reported that the coffee prices were lower than what they expected. In addition coffee prices were not based on quality of coffee produced.

Table 3. Percentage of farmers reporting constraints according to processing method

Description of constraint	Sun-dried processing	Wet (washed) processing
Lack of adequate drying beds	8.5	34.0
Shortage of hand pulpers	0.0	22.0
Shortage of central washing stations	0.0	9.0
Lack of technical know-how	3.5	3.0
Low prices of processed coffee	1.0	1.5
Poor drying due to heavy rainfall	4.0	2.5
Long distance to the washing stations	0.0	13.0
High costs & lack of materials for drying beds	83.0	15.0

Source[9].

Whereas the farmers are aware of drying coffee on raised drying beds they were constrained by the high costs of materials such as wire mesh, jute, plastic sheets and tidernet used for constructing the raised drying beds. Lack of technical know-how for coffee processing and lack of funds to undertake processing are other constraints faced by the small scale coffee farmers in Ethiopia. Due to the shortage of processing facilities farmers interested in washed coffee are forced to walk long distance to the coffee washing station. In order to improve coffee processing in Ethiopia farmers should be empowered to construct more drying beds. The government should provide loans to the coffee growers so that they are able to purchase the coffee processing inputs such as wire mesh, covering materials, plastic sheets, storage bags and hand pulpers. It may also

be necessary for the government and non-governmental organizations to pool resources and provide credit for this endeavor in the short run. In the long run and for purposes of sustainability farmers would have to purchase materials and construct the drying beds. Materials for construction of drying beds should be made available so that the capable farmers are able to purchase[9].

More hand pulpers need to be provided on communal basis, meaning that a few farmers can pool resources to purchase hand pulpers. In the short run some facilitation through the government is required for the purchase of hand pulpers and construction of the coffee washing stations. To this

end formation of viable interest groups is necessary. It is imperative that some training on proper harvesting, pruning and coffee processing is provided to the farmers. Farmers require encouragement to use ladders for harvesting the tall coffee trees and selective picking of red

cherries for wet processing. This should be accompanied by proper husbandry practices so that in the long run farmers have proper size coffee trees for ease of harvesting[9].

2.3. Genetic erosion

Among the factors that contribute to the erosion of coffee genetic diversity in Ethiopia, the more noticeable is deforestation. About 16% of the Ethiopia land area was estimated to have

been covered by high forest in the early 1950s, which declined to 3.6% in the early 1980s and further

down to 2.7% in 1989 (EFAP, 1994). In south-west Ethiopia, approximately 38% of the highland plateau was covered by 1,158,000 ha of closed high forest at the beginning of the 1970s, and, by 1997, only 556,700 ha were left, resulting in a loss of 52% of the natural coffee habitat in less than 30 years [10]. This population growth results in increasing land pressure and conversion of forest to farmland. The situation is also being exacerbated by population migration policies and government settlement programs for food security reasons. In 1997, Ethiopia has defined its own environment policy and conservation strategy, emphasizing the need to conserve, develop and utilize forest resources in a sustainable manner [11]; however, according to [10], "the absence of respective government organs to implement the national conservation and environmental policy at regional level makes impractical the realization of such policy". In some areas, the interest of farmers in coffee growing decreased in the past recent years due to economic, climatic or agronomic factors, leading to partial abandoning of coffee trees in forests or gardens. Very low prices paid to farmers, particularly during the 'price crisis' between 1999 and 2004, resulted in the drop of producers' revenues [12] and shifting to food crops or to the more lucrative khat5 cultivation after uprooting coffee plants [10].

The collection arising from the ORSTOM mission at the end of 1966 was successfully established at the Melko station near Jimma and called the 'French Collection'. Since that date, 47 other collecting missions have been conducted over the last 40 years by JARC researchers within Ethiopia and, in total, 5,537 samples have been collected [13].

The Jimma Research center gene bank comprises 3 types of collections, not exclusive from each other: collections geared towards the search for traits immediately usable in the breeding programme, such as coffee berry disease resistance; those intended to capture the genetic diversity existing in the different agro-ecologies of Ethiopia; and lastly those designed to rescue coffee tree populations threatened by erosion [14].

2.4. Climate change

The coffee plant is highly sensitive to climate. Unpredictable rainfall, extended drought periods and extreme weather. Result in shifts in the incidence of pests and diseases [15]. In Ethiopia coffee cultivation will shift from the lowermost optimal cultivation areas now at 1000 m to 1800 m within the next 70 or so years. Most important coffee growing region in the country, could be reduced by as much as 30%. Coffee diseases will certainly become more severe. This resulted decrease in coffee genetic resources in the country.

The ICO has aimed at establishing itself as a focal point of dissemination of relevant information on the challenges faced by the world coffee sector in the face of environmental concerns. Whereas climatic effects have always been the main factor responsible for fluctuations of coffee yields in the world, climate change, as a result of global warming, is expected to

result in actual shifts on where and how coffee may be produced in future.

Several adaptation and mitigation strategies for coffee producers have been put forward in response to the challenges facing the sector. Short-term adaptation strategies include improved farming practices and better post-harvest processing. Longer-term strategies, include, capacity-building, improved monitoring of climate data, enhancing soil fertility, introducing or preserving different production models, and developing drought and disease-resistant

varieties. In more extreme cases, the solution may be to shift production to more suitable areas. Mitigation strategies include: calculating and reducing greenhouse gas emissions on the farm, and facilitating the creation of carbon sinks [16]. Conservation of coffee genetic resources in the country. Intensive but well planned reforestation programme. Coffee varieties better adaptation to a range of adverse growing conditions [17].

2.5. Land Degradation

Tolera and Gebermedin, (2015) [18], study showed that average land holding size of households were less than one hectare which indicated that land scarcity is major problem. Due to increased extraction of timber and non-timber forest products. Conversion into agricultural land and settlements, expansion of eucalyptus etc.

2.6. Disease and pest

Coffee berry disease, coffee wilt disease, coffee leaf rust, coffee stem borer and coffee berry borer are big challenges [19].

Table 4. Major coffee diseases in West Hararge Zone, 2013

No.	Diseases name	Frequency	%
1	Coffee Berry Disease (CBD)	78	45.8
2	Coffee Branch Dieback	50	29.4
3	Coffee Leaf Rust (CLR)	38	22.4
4	Coffee Wilt Disease (CWD)	4	2.4

Source: [20].

Farmers also indicated that due to severe disease impact especially Coffee Berry Disease on coffee production; they forced to replace their coffee farm with *Khat edulis* which is not affected by disease and highly drought resistance than coffee [20]. Integrated pest management and select landraces adapted to the ecology, resistant to diseases and reasonably productive.

2.7. Challenges in wild coffee certification

Certification without enhancement of the quality will not be successful. Difficult for the smallholder producers to access the different niche markets and negotiate premium prices, no specific scheme has been developed to stress the uniqueness of wild coffee. Farmers often collect coffee from different areas with a range of management practices, cultivation intensities and genetic diversities [21]. Certification does not guarantee a higher coffee price and higher gross coffee revenues due to Cooperative sell to private merchants instead of cooperatives and there is no significant price difference between the certified and noncertified. Market information is not freely transmitted to

the producers to successfully participate in upgrading activities [22]. Certification is not actively promoted nor understood by those who are certified [23]. Providing extension and training. Development of a biomolecular approach for genetic fingerprinting.

2.8. Environmental pollution

Coffee waste is challenge due to caffeine, free phenols and tannins (polyphenols) which are known to be very toxic to life. Commonly disposed by dumping in to the natural water systems, piling up on to nearby agricultural or grazing land in Ethiopia [24]. Health challenges to coffee farmers (spinning sensation, eye, ear and skin irritation, stomach pain, nausea and breathing problem). Pulp also affects crop through acid formation and local heat generation in the process of its fermentation, Death of the animals and of the plants [26]. proliferation of undesirable microorganisms, non-potable, inadequacy of water for the domestic and industrial use, proliferation of bad odors, attraction of flies ,insects and deterioration of the landscape. Careless disposal of the wastes without pretreatment should be discouraged.

2.9. Challenges in Storage

Because this study reflected that 57.6% of coffee producers sells their product immediately after harvest due to lack of storage facility. Even though some farmers store their coffee to six month/ one year for better price, most households encountered yield loss. About 67% of households sell their coffee product at village market to retailer and collectors. Because of poor

access to market information, farmers reported that retailer and collector decide price for their product. This indicated that farmers sell their product to lower price as they did not have any alternative actors to whom they sell their product in the area [20]. Farmers should be empowered to construct store for their coffee.

2.10. Challenges in Market

New York and London largely determine coffee prices, making it difficult for producing countries, except for major producers [27]. Ethiopian coffee, accounting for only 4% has almost no influence over international prices. Large price fluctuations had damaging effects on the welfare of farmers [28]. Price of coffee dips, they tend to be poorer, Poverty, Leading to distress sales of assets such as cattle, Uprooting coffee and replacing them with annual food crops or cash crops such as Chat [29], Giving up traditional shade coffee production for inter cropping and diversification [30], Unable to pay for their children's education and for basic medicines. Cut back on food consumption (malnutrition), Migration to urban centers, Unemployment [31]. Because of poor access to market information, farmers reported that retailer and collector decide price for their product. Farmers sell their product to lower price as they did not have any alternative actors to whom they sell. Rural position of the farmers and their low knowledge of market functions prevent them from searching and accessing markets. Chain from producers to retail stores consists of many middlemen who all need to make

a profit [32]. Dependence on one cash crop is associated with the risk of income loss and market price variability over time. Cooperative activities supporting farmers by supplying Price information, Capital and Transportation, Stronger negotiator than an individual farmer in the international market, cut the chain from producer to consumer by selling coffee directly to an international trader.

CONCLUSION AND RECOMMENDATION

In Ethiopia, coffee sector is being challenged by different factors. Among these factors:- low productivity due to lack of improved varieties , diseases and pests, improper processing method, lack of post-harvest handling such as storage facilities, climate change, land degradation, marketing are the major. To mitigate these challenges efforts have been made to some extents. Strengthening the extension in distribution of improved and disease resistance varieties, proper processing methods, construction of storage facilities, developing and adapting varieties for climate change, reforestation and afforestation, discouraging illegal settlement and market regulation are some strategies to be implemented in order to mitigate them. In addition, there should also be a capacity building programs for stakeholders involved in the coffee seed value-chain. This is because, production and supplying traceable coffee seeds and planting materials in perennial plants like coffee, and it is a long-term investment that requires strong collaborations among the national and international coffee actors.

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