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The Coffee-Khat Interface in Eastern Ethiopia: A Controversial Land Use and Livelihood Change Scenario

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Abstract: The aim of the study was to assess the current trend of coffee and khat production as well as the subsequent land use and livelihood change scenario in the area. By so doing, the study tried to identify the impact of both commodities on the socio-economic well being of both the rural and urban communities. These areas, with regard to this particular study, cover all parts of the East and West Harerghe zones of the Oromiya National Regional State, the coffee and khat growing parts of the Somalia and Harari National Regional States as well as the Dire-Dawa Administration Council in Ethiopia. In so doing, the article is partly based on the first hand information gathered especially by the first author during his assigned mission in March 2002 by the institution he was then working for, i.e., Institute of Biodiversity Conservation (IBC), Ethiopia. The study indicates that on top of other biotic and abiotic stress, ever since the first official appearance of coffee berry disease (CBD) in around 1973, there has been a huge shift in land use from coffee to khat with over 63% of the total coffee land being uprooted and converted into the later. As such, the study points out the fact that if the trend continues to keep unabated, it is very likely that the genetic base of the unique coffee type in the area will be similarly further endangered. On the other hand, the study states that the existing reality on the ground is entirely different from what appears to be true in the development or policy theories. Because of the absence of basic and sustainable options for CBD and other biotic and abiotic hazards prevailing in the area, including on other crops, as well as the absence of a fair trade price for their unique quality coffee at international level, farmers have been obliged to switch and increasingly rely on khat as an alternative God blessed commodity given to their locality. Thus, even though there are growing controversies and/or hasty health and social connotations against khat, it is very unlikely to recover the situation back to the origin so easily, as farmers have already gone far away changes in their way of farming and socio-economic set up, or as stated above in their land use and livelihood circumstances. Before a long-term solution is obtained to solve the multifaceted environmental, social and economic problems and explore other sustainable and socially inclusive alternatives, reckless and hasty restrictions and/or impositions can only be unjustifiable, as they will cause overall socio-economic difficulties to all the communities therein.

Key words: Coffee, khat, land use change, livelihoods, Eastern Ethiopia.

1. Introduction

The Eastern part of Ethiopia, with regards to this particular study, is circumscribed by the East and West Harerghe zones of the Oromiya Regional State, the coffee and khat growing parts of the Somalia and Harari Regional States as well as the Dire-Dawa Administration Council.

The mid to high altitude (1,500-2,400 m) landscape of Eastern Ethiopia has been considered as one of the major traditional coffee growing areas in Ethiopia. The landscape is generally characterized by rugged topography and less stable dry agro-climate with a mean annual rainfall varying from 700 mm to 1,200 mm [1]. The type of coffee grown in this part of the country is popularly known as “Harar coffee”, owing to its unique and distinctive agronomic and marketable characteristics. In the international trade, it is recognized as premium blending coffee with medium to long pointed, grayish to greenish, medium acidity, full body and typical moka flavor of

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outstanding cup quality [1].

The Eastern part of Ethiopia is generally known for its cash crop production, predominantly khat and coffee, and food crop deficit [1]. Coffee and khat are largely grown in small agro-forestry and intercropped systems with grain and some horticultural crops. Both are the predominant cash crops in the area. They are both used as commercial commodities and to some extent as local resources for subsistence (firewood, construction, soil protection, traditional medicine, etc.). Farmers' budgets are predominantly relying on incomes generated by businesses based on the two commodities.

However, ever since 1971, this unique coffee type of the area has been under constant threat of genetic erosion [2]. The major factors that have greatly contributed to this problem are coffee berry disease (CBD) (*Colletetricum kahawae*; syn. *C. coffeanum* Noak Sensu Hindorf), unreliable rainfall, declining soil fertility, price fluctuation and displacement by khat (*Catha edulis* Forsk. ex Endl.). Of these, CBD is by far the most important factor causing huge genetic erosion on Harar coffee [2].

As stated by Zenebe and Etana [3], coffee production in the area is still based on about 21 local land races since the nationally released CBD resistant selections failed to adapt well to the environment therein. Every farmer in the area grows three or more of the local varieties as a means of averting the risk of CBD but with only little success. Consequently, as a copping strategy, farmers have gradually integrated the culture of khat into the once coffee-based production system. In fact, currently, khat is also invasively displacing food crops, pasture as well as other massive naturally occurring biodiversity in the area.

At present, the total area covered by coffee in the above stated areas of Eastern Ethiopia is about 20,731.08 ha, while that of khat is about 76,145.61 ha [4]. The trend indicates that ever since the first official appearance of CBD in 1973 [5], there has been a huge shift in land use with over 63% of the total coffee land being uprooted and converted into khat [6].

This signals that if the trend continues unabated, it is very likely that the genetic base of this unique coffee type of the world will be irreversibly eroded in a few decades time [7].

On the other hand, up until the present time, the real approach towards khat has been so biased, in that no one seems to mean what he says or say what he means about it. This is so because the reality on the ground is entirely different from what appears to be true in the development or policy theory [7]. Without much ado, the study suggests that one can better rationalize the peculiarity of the situation in the area simply by looking at the statistical items shown in Tables 1-8. Due to the absence of basic and reliable options for CBD control, farmers have been obliged to switch completely to khat and started to rely on it as a God blessed commodity given to their locality [7]. Thus, even though there are growing oppositions, and health and social connotations against khat, it is very unlikely to recover the situation back to the origin so easily as farmers have already gone far away changes in their way of farming and socio-economic set up [3]. Before a long-term solution is obtained to control CBD and explore other alternative cash crops, the development of khat in the area is a much more reasonable option [7]. Hence, reckless restrictions (impositions) are by no means justifiable and rather seem to cause overall socio-economic difficulties to the growers as well as other communities engaged in the khat business in the area [7].

In the alternative, if CBD and related production problems are effectively addressed, farmers in Harerghe seem to continue to allow both coffee and khat co-exist in the production system [7]. Since both crops have more complementarities than competitiveness [7], farmers and development agents in the area equally perceive that coffee and khat are not rivals in terms of production requirements but peer friends of all time in the neighborhood [3]. The

fact is that, in this part of the country, the difference in terms of real land resource output that one of the crops can do with or without the other is insignificant.

Very recently, the Institute of Biodiversity Conservation (IBC) has established a Coffee Field Gene Bank at Bedesa (West Harerghe zone) and managed to collect and conserve around 1,500 accessions of the huge Harar coffee gene pool [3]. The Oromiya Agricultural Research Institute has also re-established the Mechara Agricultural Research Center with coffee being part of its major research mandate [3]. Nevertheless, to circumvent the possible havoc and/or reverse the situation in a much broader approach, the study emphasizes the need for all stakeholders to come together without much delay and interactively take more rigorous and realistic interventions.

Thus, under the circumstances, the aim of the survey was to assess the current trend of coffee and khat production as well as the subsequent land use change scenario in the area. By so doing, the study tried to identify the impact of both commodities on the socio-economic well being of both the rural and urban communities.

2. Objectives of the Study

The major objectives of the study were: (1) to assess and verify the recent trends of coffee and khat production in Eastern Ethiopia in relation to land use change and impact on the socio-economic well being of both the rural and urban communities; (2) to assess and identify the real factors contributing towards the decline in production, productivity and quality of the Harar coffee, and promoting the production, consumption and marketing of khat; (3) to study the trend of land use changes within the once coffee-based farming system and assess the views of the communities as to whether or not it is perceived as a major threat; (4) to come up with practical recommendations that may help all responsible bodies bring the traditional coffee culture in the area back on track.

3. Materials and Methods

This article is largely a synthesis of the primary and secondary data gathered from the coffee and khat growing areas of Eastern Ethiopia. Accompanied by a detailed checklist, the field survey was conducted in about 85% of the villages of the stated areas, where field observations were made, and key informant interviews and discussions were held with groups of farmers, agricultural offices, research and academic institutions, traders, and marketing and regulatory institutions who had both a direct and indirect bearing on the production and marketing of coffee and khat in the stated areas. The bulk of the initial quantitative information was later updated by more recent information gathered through extensive reviews of field, market and statistical reports.

3.1 Geographical and Agro-Climatic Conditions

As stated above, the study area is situated in the Eastern part of Ethiopia, where transportation network by road, rail and air to the capital Addis Ababa as well as the neighboring outlets of Djibouti and Somalia are reasonably well developed (Fig. 1). As such, it can be relatively viewed that the area enjoys a more privileged position for cash crop production and marketing, with the trading potential still exceeding the actual production capacity [7].

The general climate of the Eastern part of Ethiopia is dry sub-humid and warm to hot semi-arid [8]. The agro-climatic range includes lowland (30%-40%), midland (35%-45%) and highland areas (15%-20%), with the lowest elevation at around 1,000 m and the highest altitude at 3,405 m [1].

The highlands of Eastern Ethiopia are characterized relatively by rugged topography and less stable agro-climate. The nearby Dire Dawa and Babile-Jijiga areas were also identified as dry lowland agro-climates [9, 10].

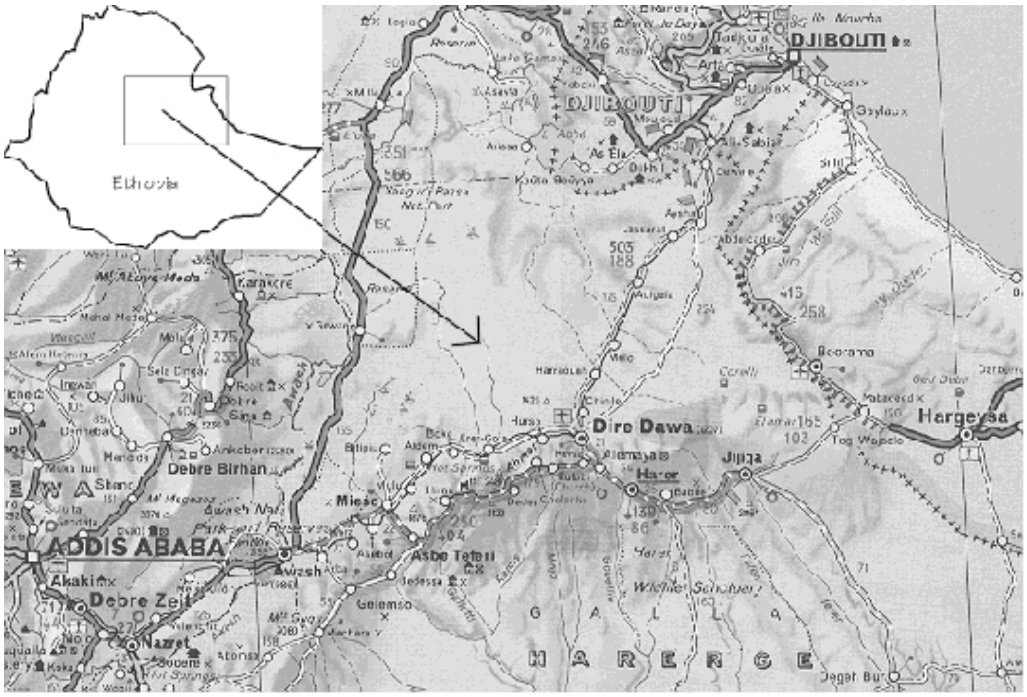

Fig. 1 Partial view of the study area (map adopted from khat (*Catha edulis*)): botany, distribution, cultivation, usage and economics in Ethiopia.

By Dechassa Lemessa (Agriculturalist), United Nations Emergencies Unit for Ethiopia Addis Ababa, June 2001.

The bulk of the Eastern Ethiopia area is generally characterized by mono-modal rainfall pattern, which normally runs during the summer from the months of June to September. However, the highlands, where rainfed coffee and khat are predominantly grown, have a strong bi-modal nature with relatively small rains during the months of March, April and May and big rains during July, August and September [1, 11]. The variability of rainfall from year to year and its often uneven distribution during the growing seasons give place to a wide range of climatic hazards, which farmers have to deal with [1]. Most none coffee and khat growing areas with dominantly semi-arid type climate, such as the areas near to Dire Dawa and Harar-Jijiga, are laid out within a thermal regime above 25.0 °C [1, 8]. Most of the predominantly coffee growing (now khat as a result of CBD) highlands are located between 15.1 °C to 17.5 °C [1].

According to Tamire [9] and Ralph [1], the major coffee and khat growing areas have a sub-humid and warm-temperate to tropical climate in nature. Here, the average annual rainfall is often above 980 mm. It is relatively evenly distributed to optimally support the growth and development of arable crops all the way through March to September. Coupled with adequate soil and water conservation measures, it does also support the production of some horticultural crops, such as potato, onion/shallot, sweet potato, tomato, hot-pepper and a few other leafy and fruit vegetables.

3.2 Agriculture

Agriculture is still the predominant activity in the Eastern part of Ethiopia. As stated by Ralph [1], due to the high population density, i.e., about 80 persons/km^2, especially in the coffee-khat growing midland to highland areas, almost all the available land is cultivated and thus leaves no room for a fallow system. The lowlands are generally too dry for coffee and khat as well as most other crops, except sorghum; although the soils are potentially fertile. Here, livestock keeping is an integral activity of farmers. Relatively large herds of cattle, sheep and goats are kept instead. At least 3.6 livestock units per household

are kept, and the arable land and stubble grazing provide most of the animal feed. Communal grazing land is scarce [12].

As reported by Zenebe and Etana [3], the main cash crops are khat and coffee as perennials, and potatoes, onions/shallots and other vegetables as annuals. The main staples are sorghum, maize as well as sweet potato. Other food crops include barley, wheat, teff and pulses. Sorghum and maize still dominate land utilization in the whole study area. Only about 40% of the farmers do integrate perennial crops and their share does not exceed 30% of the total cultivated area. The major perennial crops are now khat followed by coffee. The number of farmers involved in other crops (e.g., vegetables, fruits, etc.) is estimated to only 6% of the total area. All are grown within their respective agro-climatic zones, with a higher concentration on irrigable plots for vegetables, including potato and sweet potatoes. As stated by Ralph [1], some lowland localities, such as Babile, Gursum, Error and Mieso, also grow groundnut mainly as source of cash. About 20 years ago, some lowland areas, like Mieso and Error-Gota, also used to produce sesame, but meanwhile, its cultivation has culminated for reasons of climatic change. Climatic hazards are increasingly frequent in Eastern Ethiopia, with pest infestations and crop diseases additionally hampering crop production. Coupled with high land pressure, the margin of farmers for agro-economic decisions is progressively narrowing.

3.3 Population and Livelihood

As reported by Ralph [1], the overwhelming majority of the people are rural, with only 11% of urban population. This figure, however, does not include the population enclosed within the much bigger towns of Dire Dawa and Harar. The urban population is mainly active in the trading and service sector, whilst the vast majority of the rural population are living from agriculture, with some pastoralists and/or agro-pastoralists in the lowland areas.

According to Zenebe and Etana [3], khat as a highly perishable commodity, is predominantly cultivated close to good roads and not too far from the main markets and/or outlets. Vegetables are grown in a much wider geographical area with local concentrations depending mainly on irrigation possibility. Coffee, as a relatively non-perishable commodity, is grown within its agro-climatic limit and with much better concentration in far remote areas with poor or no access roads at all. As mentioned earlier, groundnut is also produced in certain pocket lowland areas of Babile, Gursum and Error Gotta as a common cash crop [1].

In general, the development trend for cash crops over the last few decades is clearly positive, with khat being the leading crop, followed by coffee and some vegetables, such as potato, onion/shallots and tomato [3]. On the other hand, coffee generally marks a diminishing development trend, although it is the only cash crop of hope for some of the far remote areas from the main roads [3].

Invariably, all better located farmers interviewed about their planned strategies for the future responded that they would increase their khat production. Conversely, farmers in far remote areas, with difficult access to main roads, are still interested in coffee, except that CBD is forcing them to change their interests [3].

Increasing population density coupled with the lack of alternative employment opportunities leads to progressive land pressure and subsequent shrinking of individual landholdings [1]. Likewise, arable land has to be used intensively, leaving practically no room for fallowing [3]. Under actual conditions, crop rotation and fallow are no longer practiced as dictated by land shortages and climatic hazards. During a bad year, the crops to be planted on individual plots will have to be selected according to the expected length of growing period. In this context, short cycle crops other than sorghum, maize and finger millet are increasingly gaining importance [3].

The already limited arable land, including farmers'

individual holdings, is still undergoing a critical stage of fragmentation [3]. With a population growth rate of about 3% a year, the prevalence of extreme land pressure has already resulted in vast deforestation and the reclamation of unsuitable slopes in the highlands and mid-highlands, causing severe environmental damage [1]. Under the circumstances, the future prospects of arable crop agriculture are looking very bleak [1].

This has led farmers to respond to the worsening situation by progressively increasing their cash crop production, mainly khat, with a subsequent shortage of staple food crops. Such a deficit in food crops is increasingly offset by the purchase of food crops originating from the neighboring surplus producing areas of Arsi, Bale and to a lesser extent the Eastern Shoa zone of the Oromiya Regional State [3].

4. Results and Discussion

4.1 Situation of Coffee and Khat Production and Marketing in Ethiopia

As shown in Table 1, cereals are still the most important food crops grown in a predominant scale followed by pulses and oil crops. In addition to their domestic food value, some of these crops, especially pulses and oil crops are among the principal export commodities of the country. Although the domestic consumption of vegetables and fruits is still relatively limited, quite a number of them are exported to Djibouti via Dire-Dawa. In the case of coffee and khat, various studies indicate that almost the same quantity of the production of each is consumed locally as is exported [3]. Ethiopia is both the center of origin and diversity of the two commodities, hence their longstanding culture of production and domestic consumption [1]. About 98% of the production of the two crops is still taken care of by small-scale farmers on their smallholdings, often less than 1 ha. Tables 1-4 and Fig. 2 indicate the relative share of the two commodities (i.e., coffee and khat) in Ethiopia.

As indicated in Tables 1-4, the production of khat is stretching out to all parts of Ethiopia (Fig. 2).

4.2 Situation of Coffee and Khat Production and Marketing in Eastern Ethiopia

As discussed earlier, coffee and khat are the predominant cash crops largely grown in small agro-forestry and intercropped systems with certain

Table 1 Crop area and production in Ethiopia (average means over 2004/05-2007/08).

Crop	Numbers of holders	Area cultivated		Production	
		Share in total (%)	Level (ha)	Share in total (%)	Level (tons)
Cereals	11,156,837	73.6	8,230,211	68.3	120,629,720
Pulses	6,377,027	12.6	1,384,499	8.5	14,955,470
Oilseeds	3,127,131	6.9	767,655	3.0	5,317,540
Vegetables	4,936,741	1.0	106,585	2.4	4,248,250
Root crops	4,757,733	1.6	174,826	8.3	14,732,920
Fruit crops	2,658,415	0.5	51,078	2.3	4,034,590
Khat	2,068,262	1.3	141,881	0.7	1,264,270
Coffee	3,049,120	2.7	305,940	1.2	2,106,710

Source from Ref. [13].

Table 2 Estimated khat and coffee area coverage and production in Ethiopia, 2006-2007.

Crop	2006-2007	
	Area (ha)	Production (tons)
Khat	147,804.68	151,723.63
Coffee	295,237.96	241,482.38
Total	443,042.64	-

Source from Ref. [14].

Table 3 Area coverage and production of coffee and khat, 2010/11.

Regional state	Khat				Coffee			
	Area (ha)	%	Production (tons)	%	Area (ha)	%	Production (tons)	%
Tigray	*	*	*	*	41.63	0.01	*	*
Afar	*	*	*	*	*	*	*	*
Amhara	3,886.69	2.63	3,723.18	2.45	4,942.80	1.69	2,718.64	1.13
Oromia	106,276.06	72.02	115,322.75	76.01	194,382.40	66.33	173,535.55	74.86
Somali	7,895.57	5.35	2,867.37	1.89	*	*	*	
Benishangul-Gumuz	105.61	0.07	110.07	0.07	*	*	231.07	0.10
S.N.N.P.	25,761.32	17.46	28,625.44	18.87	91,233.12	31.13	64,997.12	23.92
Gambela	39	0.03	*	*	2,308	0.79	*	*
Harari	2,674.95	1.81	*	*	29.19	0.01	*	*
Addis Ababa	*	*	*	*	*	*	*	*
Dire Dawa	923.40	0.63	1,074.84	0.71	101.59	0.03	*	*
Total	147,562.6	100	151,723.63	100	293,038.73	100.00	241,482.39	100.00
East Hareghe zone	36,452.16	24.70	35,066.97	23.11	4,995.21	1.70	3,581.57	1.48
West Hareghe zone	30,103.43	20.40	17,851.33	11.77	15,575.04	5.32	7,974.42	3.30
Total	66,555.59	45.10	52,918.31	34.88	20,570.25	7.02	11,555.99	4.79

Source from Ref. [15]. *Means data not available.

Table 4 Ethiopian exports by commodity (2009/10).

Rank	Major commodities	USD value	% share
1	Coffee	528,306,953	26.4
2	Oil seeds	358,515,300	17.9
3	Gold	281,388,856	14.1
4	Khat	209,525,313	10.5
5	Flowers	170,195,147	8.5
6	Pulses (beans, peas, lentils, etc.)	130,100,321	6.5
7	Live animals	90,739,762	4.5
8	Hide skins	39,739,170	2.0
9	Meat and meat products	33,999,375	1.7
10	Vegetables	27,242,256	1.4
11	Textile and garments	22,860,780	1.1
12	Spices	18,567,793	0.9
13	Leather and leather products	15,760,381	0.8
14	Mineral products	13,363,246	0.7
15	Natural gum	12,681,896	0.6
16	Others	11,777,487	0.6
17	Cotton	10,611,606	0.5
18	Cereals	4,800,538	0.2
19	Animal fodder	4,658,244	0.2
20	Fruits	4,223,767	0.2
21	Food	3,031,224	0.2
22	Scrap metal	2,450,816	0.1
23	Natural honey	1,889,305	0.1
24	Beverage	1,685,393	0.1
25	Bees wax	1,598,914	0.1
26	Animal products	891,907	0.0
27	Tea	881,699	0.0
28	Hides	880,124	0.0
29	Flour	762,013	0.0
Total		2,003,129,585	

Source from Ref. [16].

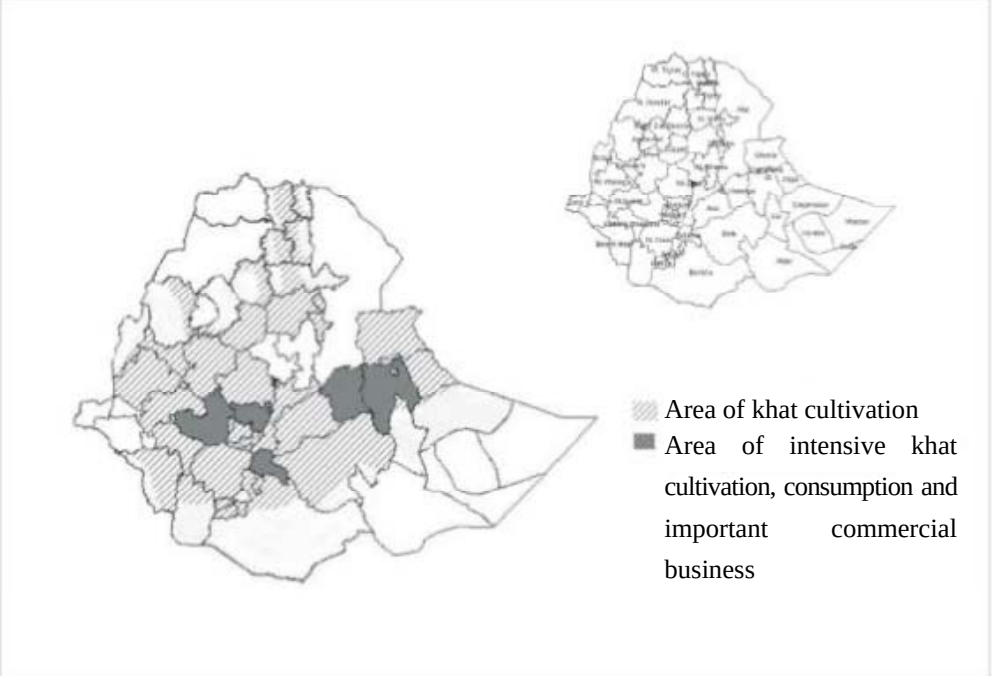

Fig. 2 Map showing the distribution of khat (*Catha edulis*) in Ethiopia: botany, distribution, cultivation, usage and economics in Ethiopia.
By Dechassa Lemessa (agriculturalist), United Nations Emergencies Unit for Ethiopia Addis Ababa, June 2001.

Table 5 Comparison of food and cash crop income opportunities.

Subject	Food crops		Cash crops			
	Sorghum	Maize	Coffee	Khat	Potato	Onion
Yield (qt/ha)	7-12	10-13	4-7	14-20*		35-80
Production costs	low	low	low-high	low	high	high
Average net income	low	low	medium	high	medium	medium-high
Risk factor: climatic hazard	medium	medium-high	medium-high	low	high	high
Pest and diseases	low-medium	low-medium	high	low		

*****Assuming rainfed production and two harvests a year**.**

food crops, like maize, sorghum, pulses and sweet potato. Fruit species, like orange, guava, bullock's heart, peach and white sapote (*Casimiroa edulis*), or locally "Aboka" or "Casmir" are also haphazardly included in the association partly as shade trees for coffee. Although both are cultivated in some pocket areas of the neighboring Somali and Harari Regional States as well as the Dire Dawa City Administrative Council, the major growing localities are found in the two zones of West and East Harerghe in Oromiya Regional State (Table 2). In all areas, both crops are used as commercial commodities and to a limited extent as local resources for subsistence (firewood, construction, soil and water conservation, traditional medicine, etc.). Farmers' budgets predominantly rely on businesses and incomes generated from the two commodities. The towns of Dire Dawa and Harar/Jijiga are the major outlets to Somalia and Djibouti. The relatively well-developed transportation network by road, rail and air provides excellent opportunity for the overall domestic and export marketing of such cash crops, more specifically khat [3].

Table 5 gives an overview of income possibilities from the major food and cash crops in the area grown under rainfed conditions. It indicates the importance of the respective production costs and main risk factors. Here, it is important to understand that with risk factors

high for climatic hazards and/or pest and diseases, the overall risk increases considerably with high production costs. On the other hand, risks are much lower for crops cultivated under irrigation, alongside with a higher yield expectation (e.g., potato, vegetables and khat) and better producer prices [3].

In addition to the above, the majority of the farmers do not possess enough land even to cover their minimum subsistence, especially when they depend only on food crop production, not to talk about some necessary additional minimum capital to invest in farm inputs in order to increase the farm income generating capacity over time. This shortage of cultivable land is becoming more and more severe in the face of an ever increasing population, especially in the midland to highland areas, and the land resource tends to fail to support food crop production. Table 5 indicates the fact that farmers obtain a much higher productivity in terms of cash value from cash crops as compared to food crops. This helps rationalize the situation that the ever increasing land pressure forces farmers to cultivate more and more of their arable land with cash crops in order to subsist and eventually realize some growth [3].

In fact, mixed farming systems of food and cash crops, including livestock and off-farm activities, often result in both higher cash and food security. Cash crop economy is widespread in the mid altitude areas with most farmers having adopted a mixed farming system and using a progressively increasing part of their arable land for the production of cash crops. However, in most highland localities where part of the farmers produce crops, like potatoes, onion/shallots, subsistence (food crop) farming is still predominant and cash crops are generally grown for complementary income. In the low altitude areas, cash crop production, if any is usually limited to groundnuts and some khat for local or own consumption. Based on a rough estimation, one can assume that 70% of the rural population of Eastern Ethiopia is directly involved in the cash crop economy and another 10% on a complementary base [1].

4.2.1 Situation of Coffee

4.2.1.1 Production

Harar coffee is one of the Arabica coffee (*Coffea arabica* L.) types that belong to the family Rubiaceae [17]. In Eastern Ethiopia (Harerghe area), coffee is generally grown at altitudes ranging from around 1,700 m to 2,000 m, the lower limit being determined by the availability of supplementary irrigation (up to 1,000 m) and the higher by the ambient temperature (best growth with average daily maximum temperatures of 24 °C). It is generally grown in pure stands with intercropping only during the young stage. The production is predominantly backyard or garden type under relatively intensive management systems. The average holding range is 0.2-0.5 ha [18]. Although variability studies may bring less or more varieties, the heterogeneity of Harar coffee, as described by the growers themselves, is immense. Farmers grow three or more types in their individual plots as a means to avert risk from biotic (mainly CBD) and abiotic stresses [3].

As reported by Zenebe and Etana [3], Harar coffee is also grown mostly under rainfed conditions, and sometimes reinforced by water conservation structures in more arid localities. Coffee seedlings are mostly purchased from government nurseries, with only a few farmers producing their own seedlings. The plants are planted in pits enriched with manure at a spacing of 3 m to 4 m.

Zenebe and Etana [3] also stated that unlike most other coffee growing areas of Ethiopia, Harar coffee is mostly grown under the open sun, with sporadic shading only practiced in a few areas. One of the reasons is that farmers are commonly practicing intercropping. This was observed to cause overbearing and dieback in coffee due to cumulative increases in leaf temperature. Although not customary with coffee, some level of biannual bearing problem may also be observed as a result. In some cases, the condition also increases the risk of soil erosion and hailstorm. The common shade trees observed, which are seldom used,

are “Korch” (*Erythrina burana*), “Wanza” (*Cordia africana*), “Sesa” (*Albizia* sp.) and “Girar” (*Acacia albida*). Farmers do not generally practice coffee pruning and this may also create a favorable microclimate for CBD development.

Eastern Ethiopia farmers are generally used to more advanced system of agriculture and far more improved farming and crop management systems [3]. They have traditional land preparation methods for coffee planting that effectively conserve moisture in the farm and around each individual plant. They practice a technique called **“**katara” which is similar to ridging and tie-ridging. In the lower altitude areas where the climate is relatively dry and unstable, farmers employ a practice known as “zuga”, which is similar to soil mulching, whereby soil cracks are regularly covered, as they appear with soil mist as to reduce evaporation and consequently conserve soil moisture [3, 18].

Some innovative farmers also bury plant leaves and other succulent plant materials, such as maize and sorghum stalk and chopped banana leaves around or in between seedling beds and coffee trees. These practices help to supply moisture for the seedlings or growing coffee plants by releasing water slowly from the buried plant parts. Once decomposed, these materials will also increase the level of organic matter as well as soil microbial activities. As such, farmers are able to raise seedlings and grow coffee under relatively dry fields. Such longstanding moisture conservation techniques indicate the traditional innovative and imaginative capability of the Eastern Ethiopia farmers [3]. Manure is also applied every year according to availability, whereas chemical fertilizers are used intermittently, whenever financially possible. Farmers in the drier areas use soil mulch more frequently than organic materials. This is so mainly due to the shortage of organic mulching materials in the locality. Weeding and harrowing is done two to four times a year. Pruning is generally rarely practiced by some farmers located in better moisture areas. Such farmers often prune older coffee trees to rejuvenate [3].

As reported by Zenebe and Etana [3], farmers in Eastern Ethiopia use exceptionally very wide inter-row spaces (3-4 m), and this allows them to intercrop their coffee with other crops and thus utilize their limited holdings more intensively and efficiently. The inter-spaces are usually used for intercropping such crops, like maize, sorghum, sweet potato and beans. Coffee and khat are known to have similar rooting nature and so utilize soil nutrients and moisture at the same strata. So, although usually not a proffered candidate, khat is also considered in the intercropping association by certain farmers, but usually only until it reaches a certain stage of development. At a later stage, khat tends to stretch out to both sides of the row and poses serious competition with coffee both for space and soil resources. This practice is usually employed by farmers when they plan to gradually replace their coffee plants with khat.

Coffee in Eastern Ethiopia is planted mainly on gentle slopes. Sometimes it is also grown on flatlands with reasonably fertile soil. Harvesting is normally performed from October to January. The average yield/ha amounts to 400-700 kg of clean coffee beans, with big variations between years, depending on climatic conditions and severity of CBD [3].

Zenebe and Etana [3] reported that although the CBD problem is more pronounced in Eastern Ethiopia than in the other parts of the country, farmers are still trying to keep a strong attachment with their traditional coffee by making use of the local land races. Farmers stated during the assessment study that planting of the CBD resistant selections was not successful due to adaptability problems. The absence of strong research work that focuses on the development of cultivars suitable to the area could also be taken here as part of the overall setback. Farmers respectively grow 14 and nine major local cultivars/landraces in East and West Hararghe zones as identified for certain desirable agronomic, yield, CDB tolerance and quality characteristics (Table 6).

Table 6 Major coffee land races cultivated in East and West Hararghe.

S. No.	East Hararghe types	West Hararghe types
1	Meyira	Abadiro
2	Torbi	Buno-Kubaniya
3	Shek-Hussieno	Tikur Buna,
4	Wegare	Gara Guracha
5	Buna-Buracha	Shumbure
6	Buna-Adi	Buno-Kela
7		Buno-Guracha
8	Aliha	Buno-Jima
9	Gamu	Cherchero
10	Shenkuye	
11	Fendisha	
12	Abadino	
13	Olcha	
14	Hariro	

Source from Ref. [6].

Farmers explained during the assessment study made by Zenebe and Etana [3] that land races such as “Abadiro” and “Buna Kubaniya” of West Harerghe, which are known for their high liquor quality, are exceptionally very susceptible to CBD and are facing extra danger of extinction. For the low altitude areas, where CBD is less of a problem, but there is high temperature and shortage of moisture, farmers grow more adapted land races, such as “Shimbure”. In the CBD prone areas, they also grow less susceptible cultivars, such as “Buna Guracha”, “Shumbure” and “Buna-Kela”, although such cultivars are known to be inferior in terms of their productivity, bean size, pulp-seed ratio and total quality attributes.

Currently, the total area covered by coffee in the two zones of Harerghe, parts of the National Regional States of Somali and Harari as well as the Dire-Dawa Administrative Council is about 20,731.08 ha, while that of khat is about 76,145.61 ha [4]. The trend indicates that ever since the first official appearance of CBD in 1973, there has been a huge shift in land use with over 63% of the total coffee land being uprooted and converted into khat. Khat production in the whole area has then increased by over 900% [6]. In 1948 exports amounted to 2,000 tons, in 1957 it was 14,000 tons [1] and in 2008 it was already 640,560 tons; one can imagine to what extent the trade has expanded. This actually implies that, if the trend continues unabated, it is very likely that the genetic base of this unique coffee type of the world will be irreversibly eroded in a few decades time [3].

The main problems with coffee production mentioned by the farmers were the high incidence of diseases, high price for imported agricultural inputs like chemical fertilizers and pesticides, and price fluctuations on the global coffee market. As main diseases on coffee, farmers mentioned above all CBD was followed by dieback and leaf rust. CBD is causing severe damage and important yield reductions every year and is attributed invariably by all interviewed farmers and agricultural experts to the main factor for the increasingly declining interest in coffee as a cash crop. Actually, fungicide applications are mostly not profitable, as expenses generally exceed the benefit from yields [3].

4.2.1.2 Marketing

Harar coffee is known as premium blending coffee and internationally recognized as medium to long pointed, grayish to greenish, medium acidity, full body and typical Moka flavor of good cup quality. Harar coffee is auctioned in Dire Dawa and exported through Djibouti, mainly to Middle East countries and Japan [19]. According to the stated branch office [19], Harar coffee is highly quoted and usually sold at about double price of the other coffee types in Ethiopia. Merchants have to pay a tax at woreda level, which reportedly amounts to 7,000-9,000 Birr per truck load of about 120 quintals.

Zenebe and Etana [3] reported that farmers sell their coffee directly to coffee merchants, who are generally established within the coffee producing woredas. The coffee is either brought by the farmer or collected by the merchant from the villages. All coffee goes through natural dry processing, i.e., after harvest the coffee cherries get sun dried and then hulled, either by hand or with a huller. Most coffee producing farmers in Eastern Ethiopia process their coffee on the farm to

Table 7 Area coverage and production of major export crops in Eastern Ethiopia, 2008/09.

Type of commodity	Area coverage (ha)	Production (tons)
Coffee	20,731.08	12,555.99
Khat	76,145.61	64,055.95
Cereals	508,112.51	848,698.61
Pulses and oil crops	64,882.09	78,171.32
Other horticultural crops	14,314.00	115,711.90
Total	587,308.60	1,106,637.78

Source from Ref. [20].

Table 8 Harar coffee and Harar khat export, 1995-2008 (via the Eastern Ethiopia or Dire Dawa outlet).

Year	Coffee		Khat	
	Quantity (ton)	Value (in million Birr)	Quantity (ton)	Value (in million Birr)
1995	2,115	16.1	208	3.9
1996	3,839	61.5	2,781	82.2
1997	5,946	113.6	3,496	114.2
1998	6,861	171.8	4,255	163.1
1999	8,781	189.1	4,035	169.7
2000	9,214	202.0	3,659	171.8
2001	8,880	242.0	3,677	132.6
2002	13,735	322.9	11,748	337.5
2003	12,692	253.0	16,033	546.0
2004	11,435	222.0	11,648	438.9
2005	15,315	365.8	22,125	8,85.1
2006	17,639	424.1	22,667	928.1
2007	17,078	524.7	22,407	1,083.1
2008	12,556	-	64,056	-
Total	146,086	3,108.6	192,795	4,264.2
Mean	10,363.23	239.1	13,771.07	328.01

Source from Ref. [21]. A substantial quantity of both commodities, but more dominantly that of khat, is illegally exported (smuggled) to Somalia & Djibouti. The above table does not include these [3].

sell clean coffee beans. The producer price for clean beans is normally 2-3 folds higher than for the sun dried cherries. Farmers usually sell 80%-90% of their production, whereas the remaining is kept for home consumption. As the coffee price is generally lowest immediately after harvest, some farmers prefer to store their produce for sometime awaiting a better price, whenever they can afford it. The dried pericarp recuperated after hulling is also sold, fetching much lesser price. It is used mainly by the locals to make a coffee-like beverage locally called “Keshir”.

4.2.1.3 Introduction and Development of CBD in Eastern Ethiopia

Eastern Ethiopia farmers recognize CBD (*Colletetricum kahawae*; syn. *C. coffeanum* Noak Sensu Hindorf), followed by branch dieback and coffee leaf rust (*Hemilleia vastatrix*) as the major stresses on their coffee [22]. In fact, CBD is by far the most important menace responsible for the declining coffee culture in the area. To make things worse, CBD attack is more severe on the coffee types most known for their high cup quality, which are adapted to the relatively high altitude areas [23]. The incidence of CBD on Harar coffee was first officially reported in 1973 [5]. Ever since this time, Harar coffee cultivation has been increasingly affected by the wide spread of the disease, which decreased the annual coffee production by an average of 47% [24]. Within its territorial limits in the area, the severity of CBD is much greater in the higher altitude and moisture or level of rainfall area.

CBD, an anthracnose of green and ripening berries, was first reported in Western Kenya in 1921 [2]. Though it has since spread to a number of countries where it poses a serious threat to coffee production, it is still confined to Africa and only on Arabica coffee [3]. In Ethiopia, various reports indicate that CBD has been the single most devastating disease of Arabica coffee, and has been jeopardizing the coffee industry ever since its first occurrence on record in 1971 around the then Kafa province [3]. The current annual national average production loss on all land races due to CBD, is estimated to 24%-30% [25]. But, according to Yilma [5], the intensity of the damage is much more than this figure, which ranges in about 20%-80% or more depending on the coffee type and agro-climatic conditions. The severity is all-alike under large and small-scale farms, in forest coffee and whether it is grown with and without shade, except under low altitudes. Under drier climates and lower altitude areas, CBD may naturally become less problematic but it often gives its way to coffee leaf rust (*Hemilleia vastatrix*).

Survey conducted on CBD in 1997 and 1998 indicated an average severity of 32%, whilst the average national yield loss due to CBD was estimated to 24%-30%. Tefestewold [25] later reported losses ranging from 52.5% to 100% in some individual farm plots of the area. The wide distribution of some of the susceptible Harar coffee varieties to other parts of the country, especially to the major coffee growing areas in the South and Southwest, is also known to have further aggravated the spread and severity of CBD in the country [26].

In fact, cognition of the situation, especially to the problem associated with genetic erosion of coffee germplasm in the area, Jima Agricultural Research Center, the national center of excellence for coffee research, in collaboration with other stakeholders had undertaken rigorous collection of coffee germplasm from the coffee growing districts of the area. As such, four collection missions were carried out between 1998 and 2005; and accordingly 2,500 accessions were collected and conserved *ex situ* at Jima and Mechara Agricultural Research Centers. After rigorous evaluation of the first batch of the new accessions, four varieties were nationally released in 2010. Following that, near to three million seedlings were distributed to the growers in the area. The remaining batches of the accessions are still under evaluation for various traits of agronomic interest.

4.2.2 Situation of Khat

4.2.2.1 Production

As stated legendarily, the cultivation and use of khat in Ethiopia goes back to the 14th century [3]. According to Karl [27], its use in Africa and Arabic peninsula goes back to as long as the 13th century. Dalu [28] also stated that "originating in Ethiopia, khat now also grows in Somalia, Kenya, Djibouti, Malawi, Uganda, Tanzania, the Congo, Zambia, Zimbabwe, South Africa, Afghanistan, Yemen and Madagascar." However, its commercial production, mainly in the Eastern part of Ethiopia, is of recent phenomena in that it accounts to only 50 to 60 years [29]. Although khat is grown in several parts of Ethiopia, the Eastern part of Ethiopia is still the principal part where the culture of khat production, marketing and consumption is highly specialized. As shown in Table 2, this area alone produces about 46% of the total khat produced in Ethiopia.

Khat (*Catha edulis* Forsk. ex Endl.) belongs to the family Celastraceae. The active ingredients of khat are said to be cathinone, cathine, cathidine and cathinine, which produce psychotropic, euphoric, metabolic and cardiovascular effects similar to amphetamine [28]. It is also known to contain a high concentration of vitamin C, which is believed to minimize some of the commonly expressed negative effects.

It is naturally a tree crop that can grow up to 15 m or more if left alone. But it is often kept to 1.5-4 m when cultivated as a cash crop. It performs best in the midlands between 1,500 m and 2,100 m, although some land varieties do also well in the higher areas of Eastern Ethiopia as high as 2,600 m [30]. It is usually planted or transplanted in August by vegetative propagation from suckers or branches. The wood of khat is used by farmers for local cabinet, fuel wood and house construction as termites do not attack it, while different parts of the tree are used as local medicine, too.

Because of khat's better tolerance to drought than coffee, farmers grow it in relatively drier areas as well. With supplementary irrigation and strong moisture conservation measures, it is as well grown down to 1,000 m. Irrigated production comprises only less than 20% of the total khat production in the area [31]. Supplementary irrigation is known to increase yield and numbers of main harvests, and also improves quality. Rainfed khat gives a maximum of two main harvests towards the end of the rainy seasons, while under irrigated condition, 3-4 main harvests can be realized. Under irrigated condition, harvesting can also be timed to fall into a higher price period. On the average, khat in Eastern Ethiopia yields around 700-1,000 kg/ha every harvest. But inferior or lower

quality khat is normally harvested almost all year round, sold on local markets or used for home consumption.

Khat is cultivated in homesteads, home-farmsteads as well as field conditions both under monoculture and polyculture. In the later case, khat is produced as a major agro-forestry system grown in an intensive production system across hillsides in rows along contour lines on level bunds, in association with different grain and horticultural crops. On reasonably fertile soils, khat is intercropped with such crops, like maize, sorghum, onion and sweet potato; whereas on steep slopes and dry-infertile marginal lands, it is predominantly grown in pure stands. It is planted in wider inter-row spaces (up to 4 m) where the major crops in the area are planted in between. Under certain circumstances, it is also found row-intercropped with coffee, although the coffee is supposed to be uprooted in due course [32]. As such, khat plays undeniably a key role in controlling soil erosion, which is a real threat under largely hilly and sloppy landscapes of Eastern Ethiopia. The main problems of khat production as mentioned by the respondent farmers were the shortage of manure, high price for chemical fertilizers, lack of credit facilities and low availability of irrigation possibilities.

Khat in Eastern Ethiopia is not highly affected by pests and diseases. Only some fungal diseases can be observed during the rainy season, but their damage is far below the threshold level. Whereas insect pests are the main cause of damage, farmers normally apply locally produced remedies, such as a mixture of crushed tobacco leaves, garlic and soap to control them. In some cases, farmers also spray commercial insecticides.

Although the level of genetic diversity of khat in Eastern Ethiopia is not yet studied, several eco-types and/or agro-types are known both to producers and consumers with striking variations in their morphological and agronomic characteristics as well as chemical intensity. Four traditional cultivars are commonly recognized as differentiated mainly by their leaf colors and stem cut end. These are known as “Dimma” (red), “Dalota” or “Dalacha” (whitish or gray), “Hamarcot” (between the two color) and Abo Mismar. Others are also named after the major areas of production and level of agronomic practices, as Aweday, Gelemso, etc..

Khat in Eastern Ethiopia has a considerable social value and a special place in the socio-cultural life of the people. The most accepted social value of khat in Ethiopia is related with religious rites and has been used by elder Muslims, Shiekhs and Muslim spiritual scholars. It is socially acknowledged to produce excitation, promote social interaction, recreation and pastime, as well as banish sleep, enhance job efficiency, dispel fatigue and suppress hunger. It is also known to play a dominant role in all male activities and social celebrations, such as marriages, business proceedings, meetings, mourning, weddings, and other ceremonies as well as collective labor works. The khat ceremony has its own associated services, like use of incense, sandal, soft drinks, cigarettes, tea/coffee, sugar and milk. Khat users locally call the chewing ceremony “Bercha”, “Kima” and the like.

4.2.2.2 Marketing

Khat has clearly been the most lucrative cash crop in Eastern Ethiopia. It is similarly the fastest growing export commodity in Ethiopia. Ethiopia is the world’s largest producer and Eastern Ethiopia khat is perceived as the first quality-class type in the world [33]. Khat is well known for its local and foreign exchange earnings being exported to various countries, such as Djibouti, Somalia, UK and the Middle East. More recently, the khat market is becoming familiar to more distant countries, such as America, China, India and Australia [33]. Elsewhere in those countries, khat market goes under different names, like Chat, Qaadka and Miraa (Kenya); Tohai, Tschat or Chat (Somalia); Qat (Yemen); Quat, Catha, Gat, Kuses-salahin, Kat, Kus-es-Salahin, Mirra or khat (UK); Catha, Quat, Abyssinian tea, African tea and African Salad [28, 29].

Besides, since khat is the most taxed commodity in the country, the government collects huge revenue every year [32]. There is virtually no other agricultural product as high tax income as khat. Farmers and traders in Eastern Ethiopia commonly complain that tax imposed on khat is usually excessively high and unjust.

Khat is generally harvested either early in the morning or late afternoon and transported to the trader or the road side, where it gets collected. In some distrcits, like Habro and Kuni, traders directly negotiate with the farmers while the crop is still standing on the farm, which then gets harvested by workers hired by the trader. Khat is either bought or sold directly or through a broker, whose cost may be paid by the trader or the producer, depending on the area. Some traders purchase, process (local packinghouse operations) and export it by themselves, and others buy and transport it to processing centers, like in the nearby towns of Aweday, Gelemso, Bedesa and Chiro, which is the most common. Generally, over 90% of the total khat produced is sold and the rest is used for own consumption.

With regard to division of labor and decision-making, the main harvest of high quality khat destined for export is usually marketed by the head of the household (usually the husband), while the one sold for local consumption is handled by the wives.

The market demand and price of the different agro-types is determined mostly by their morphological and organoleptic resolutions. As such, local farmers classify the major khat types into eight quality grades, as Matta, Uratta, Quda, Quda-Uratta (young and tender Aweday khat), Hadar (more matured leaved Aweday khat), Harko, Tachero and Chebala; and they are put in descending order according to their grade levels [34]. These are further graded into varied levels during selling. For example, the Aweday “Hadar” is further graded into three based on age, as Hadar qart (younger Hadar), Hadar quad (high quality and older one) and Hadar hafa (the lowest quality and oldest one) and based on color, as Hadar dalota and Hadar dimma [33].

Main problems with the marketing of khat mentioned by farmers are the excessively high perishable nature of the produce which not allowed storage and the ever increasing tax rate that consequently lowers producer prices.

4.3 The Changing Scenario of the Land Use and Livelihood System in Eastern Ethiopia

4.3.1 Comparative Advantages of Coffee and Khat Production

Because of the increasing CBD threat, the once coffee obligate farmers have been gradually urged to switch to other crops, predominantly in favor of khat. For farmers in Eastern Ethiopia, basically, the income from khat has long been a survival strategy. The major reasons of farmers to consider khat as a sole substitute of their traditional coffee and as a basis for their livelihoods are:

(1) It fetches premium price both in the local and export markets;

(2) It is regarded as a poor man’s crop—a low input-high cash output commodity (does well under small scale management);

(3) It is less attacked by pests and diseases as well as other environmental stresses (e.g., drought and low soil fertility);

(4) It is considered a life saver—comes to harvest two to four times and at any time of the year (coffee seasonally and only once every year);

(5) It is locally/traditionally chewed nearly by every household;

(6) It is at times valued as medicinal plant against various ailments, including sexually transmitted diseases (STDs);

(7) Being a deep-rooting perennial plant, it is unarguably acknowledged for soil and water conservation (SWC) under such rugged/undulating topography;

(8) Given the very problem in the area, it is widely

used for fuel wood, fencing and construction purposes;

(9) Its leftover leaves and twigs are also fed to animals, like goats and sheep;

(10) Unlike coffee, it has lower investment or production cost and does not necessitate basic processing before marketing;

(11) Farmers have a comparative advantage in terms of proximity to major export outlets of the major consumer or export markets (also better infrastructure).

But on the other hand, it does not mean khat production in the area is without any problem. Farmers do not normally want to risk their traditional coffee for khat, if it is not for CBD. Some of the demerits of khat expressed by farmers in comparison to coffee are:

(1) It is a highly perishable ("dead crop") unless being marketed soon enough after harvest;

(2) It is less handy to be transported safe to distant markets;

(3) Unlike coffee, it is not sold all at once in local markets, i.e., it is sold on piece-meal basis and they cannot take it back if it is not sold at all;

(4) Due to its highly perishable characteristics, it needs a more sophisticated marketing system with a well functioning transportation network for distant markets;

(5) It is a highly taxed commodity and consequently lower producer prices—less bargaining power for producers;

(6) Market uncertainty is due to increasing international pressure.

Table 9 illustrates some of the comparative advantages and disadvantages of the two cash crops in the area.

4.3.2 Change in Land Use and Livelihood

Zenebe and Etana [3] broadly analyzed and reported the land use change situation in Eastern Ethiopia. The current shift to khat cultivation basically has socio-economic and environmental reasons. Food crop production in the area is becoming more vulnerable due to unreliable rainfall, weed problem (especially *Striga* on sorghum—the major food crop in the area) and declining soil fertility. Coffee production has also been heavily affected by CBD,

Table 9 Comparison of coffee and khat production in Eastern Ethiopia.

Criteria	Coffee	Khat
Agro-climatic range (without irrigation)	Mid altitude areas within 1,700-2,000 m altitude and 1,000 mm rainfall	Low to high altitude areas (1,400-2,600 m); can withstand dry period better
Soil conditions	Well drained, deep and fertile	High range of soils, but well drained
Drought tolerance	Moderate	High
Establishment (till full first harvest)	Normally 3-4 years	2-3 years
Cultivation area	Even in distant and inaccessible areas depending on agro-climatic range	Should at least be near good secondary roads and not too far from markets and market outlets (except for own and local markets)
Production/management	Complex	Relatively easy
Agro-forestry use	Not adapted for its extensive shallow feeder root systems	Well adapted
Vulnerability to pests and diseases	High, especially for CBD	Generally low, except some mild infestations by insect pests, like leaf hoppers
Harvest	Only one times a year, which is often low yield due to CBD and poor soil fertility and management	2-4 times main harvest a year depending on moisture availability; plus regular harvest for local market (non-export standard produce)
Storage possibilities	Reasonably for long period	Completely a dead crop
Price	Comparatively high, depending on the fluctuating of world market prices	Often high, depending on quality, restrictions and level of domestic tax charges
Cost of production	High	Comparatively low to medium
Net income	Medium	Comparatively high to very high

coffee leaf rust, Nobel coffee branch dieback, drought and global price fluctuation. The situation is rather becoming more severe in the face of the ever increasing population in the area, and the land resource tends to fail to support the farming communities even under very poor living conditions.

This economic challenge has then led farmers to respond to the worsening situation by integrating and promoting the culture of khat production into the once coffee-based farming system. Thus, especially ever since the first official appearance of CBD in 1973, over 63% of the total land previously occupied by coffee, has been converted into khat; it makes possible for khat production to expand by over 900% [3, 6]. In fact, as mentioned earlier, khat is all the same displacing huge areas once occupied by food crops, pasture as well as other massive biodiversity.

Besides, with improving infrastructure, especially access roads, more and more farmers have become attracted towards khat and become willing to allot more of their land at the expense of coffee. Gradually, coffee has become pushed away and obliged to be confined to more distant and less accessible localities in the area.

Socio-economic (e.g., population growth and economic trends) and biophysical changes (e.g., climate changes and disease incidences) also influence coffee land use changes. When family size increases and farmers are unable to produce enough monetary output from their plots, they normally tend to shift towards more economical crops. A case in point is that when drought and CBD problems become serious on coffee, those farmers who have khat plantation are always much better off.

Additionally, changes in the global market, such as the current coffee price decline, has also contributed to the land use change in favor of khat expansion. The growing demand for khat in the big towns, like Dire Dawa, Harar, Jijiga, Nazareth and Addis Ababa, has as well dramatically influenced the coffee-based land use by stimulating khat production.

Generally, the khat-based economy with its important cash flow is offering a wider range of on and off-farm income possibilities as compared to coffee and other crops, thus having a positive impact on vulnerable households by improving their capacity to cope with adverse situations. As roughly estimated by the East and West Harerghe zones Agriculture and Rural Development Offices [6], about 70% of the rural population of Eastern Ethiopia is directly involved in the cash crop economy (largely khat) and another 10% on a complementary business.

5. Conclusions

Ever since the first official appearance of CBD in 1973, over 63% of the total land previously occupied by coffee, has been converted into khat, and thus makes it possible for khat production to expand by over 900%.

Khat in the area is all the same displacing huge areas once occupied by food crops, pasture and other massive biodiversity.

With improving infrastructure, more and more farmers have become attracted towards khat at the expense of coffee.

The current shift (change) in land use and overall livelihood from coffee to khat basically has rational socio-economic and environmental motives:

(1) Food crop production is becoming more vulnerable due to unreliable rainfall, weed problem (e.g., *Striga* on sorghum) and declined soil fertility;

(2) Coffee production has been heavily affected by CBD, coffee leaf rust, Nobel coffee branch dieback, drought and global price fluctuation;

(3) Socio-economic (e.g., population growth and economic trends) and biophysical (e.g., climate changes and disease incidences) changes also influence the land use.

Global market price decline of coffee coupled with the growing demand for khat in domestic towns as

well as foreign countries also contributed to the land use and livelihood change in favor of khat.

Generally, the khat-based economy with its important cash flow is offering a wider range of on and off-farm income possibilities compared to coffee and other crops. With about 60% of both the rural and urban population in those areas directly or indirectly involved in the khat-based business and/or economy, it is not hard to imagine how they have gone far away changes not only in their production systems but also overall livelihoods.

From agricultural, ecological and economical point of view, khat is the only agro-forestry plant perfectly well adapted to the needs of farmers in the study areas, such as its hardiness, drought tolerance, low impact on neighboring/intercropped crops, stabilization of SWC structures, etc..

Farmers in the study area are market-oriented and are interested not on the total volume they produce but on the net income. Khat has already become an ideal plant for them to push it further forward since it enables a stable and substantial cash return.

Without an appropriate substitute for khat to fulfill all the economic, social and ecological benefits, reckless impositions (restrictions) would only cause overall economic impairments and severely affect the majority of the communities in the study area. This goes in strong alliance with what the Ethiopian late Premier Meles Zenawi once told the British Broadcasting Corporation (BBC) “our farmers have to make a living somehow and growing khat has been forced on them by unjust international coffee trade laws” .

6. Recommendations

With a vision to reverse the situation in a broader approach, the following interventions are recommended:

Integrated policy measures need to be adopted and strengthened to solve the prevailing threat from CBD;

Research on the development of resistant coffee varieties and improved cultural and management practices ought to be intensified;

Since the broad genetic base of the Harar coffee is dwindling at an alarming rate, the present germplasm collection and conservation program should be further strengthened;

To reverse the worsening cultivable land shortage, land use as well as livelihood change scenario, more workable improvements in crop and livestock productivity as well as other feasible innovations towards creating off-farm business/employment opportunities should be put in place in those areas as a matter of utmost urgency/priority.

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Annexes

Below are some pictorial illustrations of the declining production and genetic resource base of coffee in relation to the growing khat business, and the subsequent land use and livelihood change scenario in Eastern Ethiopia.

Annex Fig. 1 Partial view of khat markets in Eastern Ethiopia.

Annex Fig. 2 Partial view of the displacement of the once coffee and food crops based land use system in Eastern Ethiopia (left) and the current khat-based farm land near Lake Haramaya, East Harerghe Zone (right).

Annex Fig. 3 Partial view of sloppy and pasture land biodiversity being reclaimed or displaced by khat in Harerghe area.

Annex Fig. 4 Partial view of a fruiting healthy Harerghe coffee (left) and coffee stands affected by CBD and moisture stress in Harerghe area (right).

Photo adopted from François Piguet, United Nations Emergency Unit for Ethiopia (UNEUE), March 2003.

Annex Fig. 5 Partial view of Dengogo, i.e., the junction where khat gets its way through to the major domestic and export markets (left) and khat bundles ready for shipment to major markets (right).