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Forest fires in Ethiopia:

Reflections on socio-economic and environmental effects of the fires in 2000

Assessment Study: June - September 2001[1]

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1 Introduction and background

Ethiopia has a total population of over 65 million with 3% annual growth rate and a density of more than 90 persons per km^2 (CSA, 2001). Most people (88%) live in the highlands (above 1500 m) that constitute 43% area of the country. The country's ecological setting is quite diversified in altitude, climatic and ecological features. Ethiopia had 40% forest coverage before the last three to four decades. Unfortunately, to date forest areas have dropped to 2.7% (2.7 million hectares), of which only about half of this is natural forest, and the decrease is at an alarming and furious rate (Tedla and Lemma, 1998).

Natural forests are mainly found in southwestern Ethiopia. Human interference, mainly for subsistence and economic reasons, is the most important reason for fast depletion and serious degradation of natural resources in Ethiopia. The conventional, futile and unsuccessful protection and guarding of state forests by employed guards rather than empowering and shifting the responsibility to the community has failed to contribute much in this case. The annual loss of natural forest resources, by biotic and abiotic agents, in Oromia Regional State (the region with the biggest forest coverage in the country) reaches up to 100,000 ha (RCS, 1996). In its neighbouring Southern Nations, Nationalities and People's Region (SNNPR), it is estimated that about the same area of forest is lost annually for the same reason.

Ethiopian farmers have been using fire as a means of production or as a farming tool for a long time. Every year, just before the short rainy season, when farmers start preparing their land, it is common to see deliberately set fires. Most of the fires are attended, managed and controlled by the community members who set it. There are also fires set recklessly or accidentally, mostly in lowland savannah grass- and bushlands.

Despite inherent potential risks with fires, farmers consider it as the cheapest and most common tool used for a variety of production activities. However, there have been times when fires have broken out on a large scale and brought about serious economic, political, social and environmental shocks

[1] This study was carried out from 12 June to 9 September 2001 in Oromia (Borana, Bale, Arusi, East and West Hararghe, Jimma, Ilubabor, East and West Wellega and West Shoa Zones), SNNPR (Gamu Gofa, Sheka and Bench-Maji zones) Gambella, Benishangul-Gumuz and Amhara (North Gonder and North Shoa zones) Regional Government States.

and devastation in Ethiopia. Historical evidence indicates that high forests of Ethiopia remain victims of war, conflict and forest fires. Yodit/Gudit (849-897 A.C.) ordered her army and the local people to set fire to forests stretching from Tigray to Gonder and Wello in suspected hiding grounds for the soldiers of Emperor Dilnaad. Similarly, Gragn Mohamed (1527-1542 A.C.) ordered his troops to clear and burn all the forests stretching from the eastern lowlands to the central highlands to make access to battlefields easier and to destroy strategic hiding grounds of the soldiers of Emperor Libne Dingil and clergies (Wolde Selassie, 1998). Whatever the causes may be, fires in different parts of Ethiopia damage every year large areas of forests. Despite the country's long time experience in using fires, there are no available statistics on the causes, risks and extent of damage caused by forest fires.

Prior to the forest fires in 2000, the last major outbreak was in 1984 when the fires damaged approximately 308,200 ha of forests (George and Mutch, 2001). After almost three months of large scale wildfires that consumed over 300,000 ha natural forests, Ethiopia is still not prepared and does not give adequate attention to efficiently protect its last natural forest resources.

Objectives and methodology

The purpose of this study was to assess the effects and impacts of the forest fires in Ethiopia, to gain a better understanding of the causes, to examine the effectiveness of the response and to gauge the preparedness of the government and communities in responding to similar fires in the future. The study also aims to move the discourse surrounding forest fires in Ethiopia away from a focus on training and tools and towards a greater emphasis on fire as a reflection of the social and political processes of the country. The tendency of past analysis to isolate human impact and action must be shifted towards an examination of the entire national context that imposes boundaries and 'rules of the game' on the way humans live and the values they hold (Rahmato, 2001).

Talking to farmers and government officials and visiting fire sites, the study aimed to understand perceptions and concerns at grass root levels of forest fire experience and to gain the necessary knowledge to prevent and efficiently fight future forest fire disasters. Informal guideline interviews with key informants such as government officials, farmers and NGO representatives, transect walks and direct observation constituted the primary information sources. Although the absence of any formal statistics or survey data may leave readers feeling that the study is unfounded, vague or ambiguous, the intention was to create a report that is not just numbers, figures and percentages, but one that weaves a story of an Ethiopian society in the midst of an intense conflict within itself over the future of its forests. The critical data for this study were the attitudes and experiences of those most impacted by the fires, particularly local farmers and communities. The initial fire reports predominantly documented the ideas of experts at federal and international levels, but were relatively silent on the feelings of farmers, those who fought the fires and those who now must be forced to deal with burned forests and scarred communities.

2 Study results: The 2000 forest fires in Ethiopia

The fires started at the end of January and raged for about three months. They were a synthesis of human interference and were exacerbated by a prolonged dry spell and severe drought. Ethiopian fire cycles centre primarily on lowland or midland areas. Perhaps more importantly is that, unlike in the past, the 2000 fires were concentrated in the highlands and high forests. Among the places where forest fires broke out in 2000 were (1) Bale, Borana, Jimma, Ilubabor, East Wellega, East and West Hararghe and Arsi Zones of Oromia Region, (2) Benishangul Gumuz and Gambella Region and (3) SNNPR zones. It is estimated that over 100,000 ha was affected in Bale and Borana zones alone (George and Mutch, 2001). The forest fires that broke out in 2000 are certainly different from previous fires and constituted a serious disaster due to both the scale and type of land they affected.

The fires also affected many of the National Priority Forest Areas (NFPAs), designated by the Ethiopian government as especially important to Ethiopia's national economy and environment. The Ethiopian Forestry Action Program of 1994 prioritised the conservation of these areas as critical forest resources for a country that currently has only 2.7% forest coverage left. Fires in these areas represent a serious threat to the country's most vital natural resources. The elimination of indigenous species or trees that take hundreds of years to grow does irreparable ecological harm. During visits to many of these fire areas, secondary succession has begun, but this succession is primarily composed of tree species with less commercial value and bushy species different from the original ones. What a fire may destroy in a matter of minutes may be impossible – or take hundreds of years – to replace.

2.1 Causes of wild fires in Ethiopia

Government and local officials all agree that traditional use of fires for agricultural production caused the forest fires in the year 2000. The prolonged drought compounded with wind and the rugged nature of the topography contributed to the spread of the fires. Nevertheless, controversy over the origins of the fires still continues. Many scholars and politicians trace the historical scars and evidence that fires in high forests were used in political struggles and locally to dismiss antigovernment bodies. During this study some of the key informants, including farmers, gave the impression of not wanting to openly comment on the causes of the 2000 forest fires. Using history and interviews as a basis, the possible causes of the fires could be grouped into three categories of activities: (1) various careless and deliberate activities, (2) social and politically affiliated activities and (3) those cited as unknown causes.

2.1.1 Careless and deliberate activities

At the end of the dry season, farmers and pastoralists usually use fires for different agricultural activities. Accordingly, sources of fires within the first category are:

- **To clearing farmlands** including state forests in search of fertile and additional farmlands for better agricultural production and productivity;
- **To get rid of wild animals'** harbouring sites;

- **To induce new re-growth of grasses for pasture** and controlling disease vectors, both for humans and animals;
- In lowland areas where weeds and savannah grasses are abundant (such as in Gambella and Benishangul Gumuz) and flourishing, fast fire is used as a tool **to control heavy weed infestation** and to get access (foot paths) and good sights (views). Fires are not put out unless residential areas are endangered;
- Due to the economic value of charcoal and the relative ease with which it can be produced, it is an extremely attractive source of income for poor community members in rural areas with road networks ensuring marketing. Yet, because it depends upon fire for its production and because large amounts of wood must be burned to generate a relatively small amount of charcoal, a serious fire hazard accompanies this activity. However, evidence of fires related to **charcoal production** is difficult to obtain and hence in most cases it is cited only as a possibility;
- Traditionally **honey** is collected from grooved trunks of trees or from local bee hives that are long, cylindrical objects hung high in trees. Fire in hand, the harvester climbs the tree using a rope, smokes out the bees and then drops the fire down to the ground which, if not put of immediately, could cause fire;
- **Cigarette-caused fires** mostly occur in areas where there is a large amount of traffic, on roadsides, particularly along main trucking routes or in forest areas that must be crossed on the way to major town markets. Cigarette fires are a potential threat in Awash National Park that is transected by the major import road from Djibouti port to Addis Ababa. Herders in Nechisar National Park contend that cigarettes started the fires there, as farmers travelling from the eastern edge of the park to the markets in Arba Minch town carelessly disposed of their cigarettes in the dry, fire-prone grasslands along the roadside[2].
- **Fires caused by cooking** sometimes occur in areas where herders, hunters and farmers cook in the open during the dry season. If not properly extinguished, fires may break out and burn valuable grass and bushland[3].

2.1.2 Politically affiliated activities

Social and political factors are possible causes of wild fires. In nearly every discussion on wild fires and overall forest management, the intertwined and complex relationships between government, land and people in Ethiopia were mentioned. The most important social and political factors influencing forest management and fire prevention are the current land tenure system and land ownership, ethnic and politically based conflicts, illegal settlement, legal and illegal commercial exploitations.

a) Lack of forestry policy and ownership

[2] A report obtained from the SNNPR Bureau of Agriculture (BOA) indicates the possible causes of the fire in the park to be fish trappers who collect fish from Lake Abbaya and also fry up fish right at the edges of the lake. On the contrary, Ethiopian radio broadcasted on 13 March 2000 that the fire in Nechisar National Park was started by Guji and Koira tribes who inhabit the region while clearing bush lands for cultivation. It is difficult to tell which one is right.

[3] A boy 19 years old was detained in Gara Mulata prison and sentenced to 7 years in suspect of setting a cooking-related fire in Kurfa Chale wereda of East Hararghe Zone.

Land tenure is perhaps the most influential aspect of current forest management in Ethiopia and one with an immense effect on the way people relate to the land. The *Derg* government nationalized land in 1975, taking land ownership and management responsibility away from individuals and communities and transferring it to the government. Once land was nationalized, forest-based income went directly to the government without any sharing with the people actually living in or around the forest. They also had no input in land policy decisions, even if those decisions that directly affected the land on which they lived (Rahmato, 2001). Because there is little economic incentive for efficient forest management and conservation, farmers and communities have no interest or reason to conserve forests and protect their environment. Because Ethiopia lacks a formal national forest policy, there is no policy structure under which to operate, manage and conserve forest resources. Without a plan of action, enforcement is nearly rendered impossible and forest resources are continually reduced and depleted. Even if an individual cuts a tree in a forest, that individual cannot be arrested or prevented from engaging in future degradation because there are no laws with which he can be held accountable. Though no official forest policy exists, the government is attempting to move forward on establishing formal forest procedures. The Ethiopian Forestry Action Plan (EFAP), approved in 1994, provides a broad framework for forest management ideology, as well as for establishing 58 National Forest Priority Areas (NFPAs). But it does not clearly establish guidelines for government forest management or for the particular regulations governing these high-priority areas. A draft of a forest policy is currently circulating within the Ethiopian government awaiting approval (Ministry of Agriculture, 1998). But, the policy has been pending for the past five years.

Under the *Derg*, the government played an active role in forest management, using harsh enforcement practices to ensure that the forests were preserved (SOS Sahel, 1999). Knowing that arrest, a prison sentence or even death could result from cutting down a tree or illegally settling in a forest or national park, people refrained from environment-damaging activities. Under strict government control, the forests were preserved. But, this strict *Derg* forest policy had a devastating effect on natural resources in Ethiopia thereafter. During the post-*Derg* years individuals destroyed many forests instead of conserving them because the new EPDRF (Ethiopian People's Democratic Revolutionary Front) government took a far more lenient approach to forest management. Settling in a national forest, while still illegal, no longer brought the surety of serious punishment or imprisonment. Illegal harvesting of trees to expand farmland and to produce charcoal and timber was no longer a risky venture. In Ethiopia the government created a situation in which it owns forests and all other land but lacks control over the use or rather misuse of the natural resources that are on the land. If the government owns the land but cannot fulfil its management duties, the land is essentially ownerless, a property rights scheme that cannot result in effective conservation. Massive investment in forest management and policy enforcement will be required. Without the means or mandate for self-enforcement, the community depends upon the government to protect the forests and to promote responsible fire use. Though current decentralization and lenient enforcement policy is an alternative to the policies of the *Derg*, the results of this approach are neither much different nor very encouraging.

While awaiting a national forest conservation and management policy, alternate means of forest management should be promoted, such as developing informal conservation procedures so that forest conservation can begin before forest resources are completely depleted. Even with a government policy, there is no guarantee that nominal policy will become grassroots reality (Rahmato, 2001).

b) Ethnic and politically based conflicts and wild fires

Wild fires can be started as a means to chase away armed opposition groups hiding in impenetrable forests. This tactic is commonly employed in a number of countries at war, but for Ethiopia no evidence so far has been established to support this argument of negative forest management. The study team could not collect any valuable information on this obviously politically very sensitive issue. For obvious reasons, government officials and farmers alike were reluctant to provide any politically sensitive information concerning forest fires.

c) Illegal settlements

People in rural areas – and illegal migrants in particular – consider forests to be free, unoccupied areas and settle there to grow crops. It is likely that the number of illegal and unofficial settlements has been rapidly increasing, particularly since 1995. Apparently, government officials at all levels are aware of the illegal settlement problem but are unable to act and to stop the process. Migrants usually negotiate with local government officials and then build small huts as a holding and to mark land utilization. Migrant and local populations usually disagree on land and tree management in the sense that the local population utilizes natural resources in a more sustainable way than their migrant neighbours.

d) Legal and illegal commercial exploitations

In different parts of Ethiopia, legal and illegal commercial exploitation of natural forest resources is taking place. Normally, federal and regional government officials in consultation with the relevant government departments and the respective experts decide on land contraction to private investors for commercial use. Nevertheless, there are cases where the provision of forested areas for commercial exploitation was effected without consulting the responsible official experts. Especially when experts are suspected of resisting such projects, they can be by-passed and the land contracted without their consent. In Oromia and SNNP Regions, forest land was provided to investors without adequate feasibility studies in the name of free market and agricultural investment. The vast natural resources of Oromia and SNNP Regions make them areas of enormous economic potential. From coffee to timber to gold, the land offers immense opportunity for income and wealth. Therefore, different types of commercial investors are interested in using and exploiting the available resources. This can be exemplified in the case of MIDROC Ethiopia in Shakiso Woreda of Borana Zone in Oromia Region where the enterprise is operating a gold mine. MIDROC Ethiopia is also operating new coffee plantations in Anderacha Woreda, and the East African Agricultural Industry has commercial agricultural plantations in Masha Woreda of Sheka Zone in SNNPR. These areas used to be densely covered with high forests, but were cleared for commercial exploitation. Shakiso Woreda in Borana Zone was a major fire site in 2000. The area attracts private investors mainly for gold mining such as the MIDROC company that operates a gold mine. Illegal miners use fire regularly, either as a light to see in the darkness of a deep hole or for cigarettes. Because the area is heavily forested, the chance of starting an uncontrollable fire is high.

2.1.3 Unknown causes of wild fires

Some causes of fires remain unknown and a puzzle. In 2001, wild fires broke out and ravaged Awash National Park (East of Addis Ababa) on two occasions in June and November (Addis Tribune, 2001). About 5 ha and 6 ha of forest and grassland burned, respectively. The causes of the fires remain unknown.

2.2 Inappropriate institutional structure and communication channels

The decentralized federalist system intends to give more control to local authorities to implement policies, hence, to better address needs at the grassroots level. The region coordinates with the zone, woreda and, at the lowest level, the peasant association. The problem is that the federal government is separate and independent from regional, zonal and woreda governments and that within this institutional structure a clear delineation of responsibilities is missing. The latter inevitably causes constraints for efficient communication that in the end creates a system that is slow, often ambiguous and uncertain in terms of communication, implementation and monitoring of activities. When disasters such as forest fires strike, the reaction is slow because relaying information to higher governmental levels with greater capacity for mass mobilization of resources and manpower takes time. In the case of the forest fires in 2000, the structure and communication system in place slowed the fire fighting and suppression effort as long periods elapsed between the start of the fires and the time it took for reports from the local level to reach the national level.

Since 1995, Natural Resources Development and Protection has only achieved "Unit" status in the Ministry of Agriculture in nearly all regions and even at the federal level. As the Ministry of Agriculture (MOA) concentrated on agricultural extension packages to increase farm production, forests throughout the country were rapidly deteriorating with seemingly inappropriate attention paid to the imminent environmental disaster that lies ahead.

Possibly in response to the 2000 forest fires, on July 1, 2001, the Oromia Region split its Regional Bureau of Agriculture into three divisions: the Bureau of Agriculture (BOA), the Agricultural Research Institute and the Natural Resources Development and Environmental Protection Authority (NRDEPA). By giving natural resources "authority" status, the issue gains much more prominence and power within the regional system. Regional government officials are optimistic that more resources and attention will be devoted to natural resources. But even with the split, the budget for each of the three divisions remains the same. A stagnant budget will significantly limit the amount of increased attention that may be afforded to natural resources. In general, the level of attention given to natural resources is minimal at all government levels.

2.3 The 2000 forest fire response

2.3.1 International response

The international response to Ethiopia's forest fires in 2000 can be defined as informal and inconsistent. There are no legal obligations or formal processes through which disaster assistance is provided. Hence, international disaster response is still undetermined and unpredictable. One of the goals of this study is to expose the paradox between the arbitrariness of international aid and the need for it to be dependable, timely and consistent.

A German project coordinator for the German Agency for Technical Cooperation (Deutsche Gesellschaft für Technische Zusammenarbeit – GTZ), who works within the Ethiopian Federal Ministry of Agriculture, heard reports of forest fires on 18 February 2000. Uncertain of how to advise the Ethiopian government on fire response, he conducted an internet search for information

related to forest fires and stumbled upon a site for the Global Fire Monitoring Center (GFMC), an international fire research organization based in Freiburg, Germany. GFMC then quickly became the leading coordinator of the response. The organization's efficiency, knowledge and established contacts with response organizations throughout the world resulted in the most successful international efforts in containing and suppressing the fires.

Seeing that the fires were becoming more and more beyond their control, the Ministry of Agriculture appealed for international assistance at a press conference on 26 February (*Ethiopian Herald*, 26 February 2000). Nevertheless, international assistance was virtually none-existent until the GFMC director's arrival in Ethiopia on 1 March. Under his guidance, an Ethio-German surveillance team was dispatched to the fire sites on 3 to 5 March[4]. South Africa was the best pick for external assistance due to their resources and dispatch capacity. South Africa rejected GFMC's initial call for assistance (27 February 2000) because it was still involved in assisting flood victims in Mozambique. On 4 March, however, a South African team was able to join the Ethiopian-German unit.

An International Fire Emergency Advisory Group was established and on 6 March it issued "Recommendations for Wildfire Response," an overview of the suggested procedure for the suppression of the fires. It also set up an Incident Command System for coordinating fire response. The group was composed of experts from Germany, South Africa and the United States. South Africa played an extremely important role in fire fighting efforts, sending fire fighters, trainers, technicians and crew leaders. South African specialists trained ground crew leaders in the Goba (Bale Zone) area and oversaw the aerial fire fighting operation. The helicopters used in the aerial operation were Ethiopian, but nearly 50% of the crew were South Africans. South African assistance to this operation was particularly important due to the extremely dangerous nature of the work.

On 15 March, Ethiopia broadcast its official request for international assistance in a fax from FAO to the joint UNEP/OCHA Environment Unit. This appeal resulted in a UNEP cash donation of US$ 20,000 on 21 March. Other nations such as Canada and the United States also assisted the fire fighting efforts, though their contributions were minimal. Canada supplied fire-fighting tools including water tanks, fire axes, hoes and shovels. Though these tools obviously possess immense potential benefit for Ethiopia's suppression efforts, they arrived when most of the fires had already been suppressed. Heavy rains suppressed the fires in Bale and Borana on 23 and 24 March 2000. The United States provided satellite images of fire conditions. The images helped federal authorities identify problem areas so that suppression efforts could be directed where they were needed most.

Analysis of the international response efforts must first acknowledge that the response was almost entirely coincidental, dependent upon an NGO employee who used his free time during the weekend to see if the internet contained any relevant information on forest fire suppression. Depending on luck will be problematic for future disaster management. The timeline of events from the initial reporting of the fires to their eventual suppression in late March and early April 2000 offer a valuable resource for evaluating the problems and successes of international disaster assistance.

[4] Unless otherwise cited, all material from this section obtained from Goldammer, 2000.

2.3.2 National response

The national government played a relatively small role in the fire response. Compared to the local level at which there was opportunity for community mobilization and the international level with extensive resources and expertise, the national government was essentially impotent in coordinating an effective response. They had negligible resources, no experience in forest fire management and an extremely minimal capacity for action. In addition, there was no focal point institution in Ethiopia to address forest fire disasters. Slow lines of communication delayed the transmission of fire reports from the local level to the federal government. When the federal Ministry of Agriculture finally received fire reports on 18 February, the fires had already been raging in Odo Shakiso woreda for more than three weeks (Goldammer, 2000). The national government's most significant action in the fire response was its call for international assistance. The absence of a strong national presence in the 2000 response foreshadows devastating future disasters unless substantial preparedness measures improve the quality of the government's fire fighting capacity. Without such measures, similar occurrences will be beyond the government's control and the international community will once again be the principle actors in controlling and containing forest fires. The Ethiopian government provided helicopters and in addition an allocation of about 1.5 million Birr (~ 190,000 US $) for fighting the fires.

2.3.3 Local response

Due to the delays in the government's response and the minimal resources available to it, the most effective fire fighting tools were the community members themselves. In nearly all areas that experienced serious fires in 2000, the communities either mobilized themselves or were mobilized by the local government to use whatever tools and resources were available to them. Because the fires potentially threatened the lives and economic well-being of the communities, they had a significant interest in suppressing the fires as quickly as possible.

Despite the lack of resources, the communities used whatever means were available: shovels, sticks and wet tree branches. The fire fighting efforts were innovative because they were unable to rely on a steady supply of tools and resources. Perhaps more importantly, local suppression strategy often depended upon indigenous local knowledge, not external input. While the "high-tech" method of aerial fire fighting was proving ineffective in Bale, communities on the ground were using such simple techniques as wet tree branches or cutting the leaves of trees at the periphery of the fire as containment tools.

Community knowledge proved to be relatively successful in controlling the fires, an indication that such knowledge should be afforded a greater degree of respect in the future. The forest management knowledge developed over thousands of years of living on the land should be respected as a valuable resource.

Arba Minch provides an excellent example of the successful community fire fighting effort. The local Administrative Council facilitated a mass mobilization effort to encourage people in the town to combat the fire in Nechisar National Park. Over 5,000 residents assisted in the effort (BBC Monitoring, 13 March, 2000). Without waiting for assistance from the federal or regional governments, the community successfully organized itself to use many of the available vehicles in town to transport people to the fire site. Within four days, the fires were suppressed.

The effectiveness of local fire fighting response and the communities' willingness to devote time and effort despite endangering their own lives demonstrates the immense value the Ethiopian people place on land. The strength of the local response is also an indication of the capability and desire of the local people to play a greater role in forest management. The fire response revealed that when given the responsibility, the communities who live on the land – those who know it, care for it and have an interest in its conservation – will fulfil the responsibility of ownership.

Students throughout the country participated in the fire fighting. Students from Addis Ababa University volunteered to assist in the Borana and Bale fires, and students from other local colleges, such as Wondo Genet College of Forestry, contributed the bulk of the human resources in combating local fires. At Addis Ababa University, over 240 students demanded mobilization to fight the forest fires. The government accepted the request for mobilization on 29 February and deployed the first students on 3 March (*WIC*, 1 March and 4 March 2000). The Addis Ababa University students inspired other students throughout the country to make similar demands. Students at Ambo senior secondary school, Alemaya University, Kotebe Teachers Training College, Awassa Agricultural College and Jimma Agricultural and Teachers Training colleges also requested mobilization (*Ethiopian Herald*, 12 March 2000 and *WIC*, 1 March and 4 March 2000).

2.4 Wild fire damages

2.4.1 Economic damage

For a country almost exclusively dependent on subsistence agriculture for economic sustenance, large fires and the destruction of many critical highland forests means a substantial loss of economic potential. Forest products represent 2.5% of Ethiopia's GDP (George and Mutch, 2001). Considering that this income is generated by forested area that covers less than 3% of the country's land area, even a relatively small reduction of the forested land has a serious impact on GDP. Considering that there are approximately 1,343,800 ha of natural forest area in Ethiopia, the 151,500 ha burned in 2000 represent over 11% of the total forest economic potential. In terms of GDP, this means that the single fire disaster of 2000 affected 0.28% of Ethiopia's GDP. Clearly, these statistics emphasize the value of each hectare of forested land to the country's economic welfare.

Except for the high forests burned in Bale and Borana Zones of Oromia Region, there was no study conducted on the economic dimension of Ethiopia's forest fires in 2000. The total economic damage caused by the forest fires in Bale and Borana zones of Oromia Region alone amounted to approximately US$ 39 million (331,179,405 ETB; see Table 1 below).

Aside from highland forests, the fires also burned food and cash crops like coffee. Whereas the burning of the highland forests reduces the potential for future economic gain, the elimination of large sections of cultivated land has an immediate effect. Farmers who are economically dependent on their crops, as most are, suffer extraordinarily when their agricultural production is reduced.

Livestock killed or lost during the fires represent another type of economic damage. While the fires burned, some livestock fled the area in search of safer land, though some were not so lucky and were caught in the flames. Wild animals escaped or were killed as well, including in national parks such as in Nechisar and others.

Table 1: Magnitude of the forest fires damage in Bale and Borana Zones of Oromia Region

Property	Amount damaged	Economic value of damage (in Birr)
Forest area	100,000 ha	252,000,000
Wildlife	669 heads of animals	45,609,744
Domestic animals	353 heads of animals	46,460
Houses	112 farm house units burned	396,200
Agricultural food crops	167.20 Mt	2,508,000
Forest coffee	1226 ha	30,065,000*
Coffee berries	613000 in kg	
Beehives	300 units	240,870
Honey	24087 in kg	240,870
Wax	2400 in kg	72,261
TOTAL	N/A	**331,179,405 Birr**

*Economic value of damage to both forest coffee stands and coffee berries.
Source: Wirtu D (2000) Forestry and Wildlife Protection Department, Oromia Region

This approximate summary to quantify damages is only a fraction of the damage inflicted on the country as a whole because it only includes information from Bale and Borana zones. The March 4 *Monitor*, for example, reports that 685 houses were destroyed and 5,000 people rendered homeless by a fire in Korahe Zone of Somali Region (*Monitor*, 4 March 2000). The BBC reported that more than 13,000 beehives were burnt in total by the fires (16 March 2000).

Another critical aspect of the economic impact of the 2000 fires is the opportunity costs that accompany the suppression efforts. Officials estimate that the fire fighting used more than 169,589 person days (George and Mutch, 2001). Diverting these people from their normal occupations, such as farming or the operation of a local business, disrupts the economy and slows production. If it is true that "time is money," then the enormous amounts of time and effort required for fire suppression exhausted resources that could have been used elsewhere.

2.4.2 Environmental damage

Fire always affects the environment in which it burns and may alter the ecosystem, which may have both negative and positive impacts on the land. The negative environmental impact of forest fires is caused by the release of carbon dioxide and the consumption of atmospheric oxygen, the disruption of energy flow and the cycling of nutrients upsetting the ecosystem functions and, the pollution of the atmosphere and water bodies contributing to the impaired health of organisms. Furthermore, forest fires affect soils physically, biologically and chemically. Because they have such a comprehensive impact on soils, fires may radically change the environment, which significantly affects an ecosystem's biodiversity. In Michata woreda of West Hararghe Zone, for example, lowland areas were flooded and crops washed away after the watershed lost its vegetation cover due to the heavy fire-induced degradation of vegetation from Chaffe Anani watershed.

In Adola woreda in Borana, secondary succession has already begun, but different species are replacing those destroyed by the flames. The high canopy and large, old trees of a mature forest have disappeared, filled in by giant "weeds," as they were called by local experts and farmers. The

"weeds" have grown out of the ashes because they are well adapted to fire, more resistant to heat than the original species. They do not, however, adequately replace the ecological importance of the previous species. Adola is a prime example of an area in which the noticeable growth that has occurred in the short amount of time since the fire is environmentally insufficient. Despite the re-growth, the environmental degradation of the forest fires has resulted in the loss of many valuable indigenous trees.

2.4.3 Social damage

Measuring the social damage caused by the fires is difficult if not impossible. Many people were arrested and imprisoned, and others still await the conclusions of their trials. Students protested throughout the country, with demonstrations turning violent in Dembi Dolo and Ambo. And perhaps above all, people in all regions of the country were appalled at the unrelenting destruction of precious forestland, fearful of the day when a once-heavily forested country will be completely denuded. Communities fear that the land on which they depend is degrading so quickly and that they have little control over this disaster. Unable to enforce conservation laws in a country in which forestry policy is absent, uncertain whether they have any control over the fate of land that they do not even own, they are frustrated about the future of Ethiopia's natural resources.

The arrests made by the government in the fallout from the fires also inflicted social damage. Besides those arrested in protests, many people were detained for suspicion of starting the fires. A March 17 press release reports that 186 people were arrested and scheduled to appear in court, approximately three weeks after their arrest (*AFP-Mail*, 17 March 2000).

The damage incurred by the forest fires in 2000 exacerbated social tensions that lay dormant beneath the surface of daily activities of Ethiopian life. As students explained in Ambo and Dembi Dolo, the fires were an opportunity to voice protest. The fires burned the land, but they fractured the nation socially.

2.5 Fire disaster preparedness in Ethiopia

The country was caught completely unprepared in 2000, which is one of the main reasons the fires posed such a serious threat to natural resources. Had there been adequate fire awareness and basic fire fighting equipment, the fires could have been controlled much sooner, reducing the impact of the disaster. Because of being so unprepared, the country was unable to fight on its own, instead depending on external assistance to provide financial resources, manpower and expertise. When the fire was raging, many discussions at all levels in the country (mass media, government and the community) were about the forest fires. However, immediately after the fire was put out, the issue faded away completely, even at government level. Even though over a year and a half has elapsed since the forest fires were finally suppressed by rains in March and April 2000, Ethiopia's preparedness and fire fighting capacity is almost the same as it was before the 2000 fires. Project implementation always takes time and with the fragile political climate that reigned in the beginning of this year and all the other post-drought and -war related problems the government had to face, only a few fire-related projects were considered for implementation.

The highest profile project actually on a path towards implementation is a US$ 252,000 project proposed by FAO (TCP/ETH/0065). The project is resource-focused, aiming to improve the tools and training available to Ethiopia's fire fighters. By improving Ethiopia's fire fighting expertise, the project seeks to strengthen future suppression efforts and thus limit the potential extent of future forest destruction. What this type of project fails to realize is that because Ethiopia's fires are almost exclusively anthropogenic, no amount of fire fighting tools or training will provide a long-term solution to the size, frequency and impact of fires in Ethiopia. To decrease the risk and disaster potential of future fires, projects must tackle the political and social factors that precipitated the fire disasters of 2000.

2.5.1 Technical preparedness

The major initiative to come out of the 2000 fires, though it was not purely technical, was the Round Table Conference on Integrated Forest Fire Management in Ethiopia sponsored by MOA/GTZ and GFMC, held in Addis Ababa on 19 and 20 September 2000. The conference intended to provide a forum in which stakeholders could discuss issues that arose from the 2000 fires and hopefully move towards an integrated forest fire management system, incorporating lessons learned with a careful review of the needs and goals of the country. The conference also aimed to unite experts and policy makers from various regions and levels of the country, as well as several international participants. Though the diversity of views at the conference and the complexity of the issues made it nearly impossible to develop any single panacea for fire use and environmental degradation, the conference represented an important step forward in placing forest fires on the national agenda. However, sustainable forest management and fire use will not occur until attitudes are changed at the grassroots level. Because a top-down approach does not affect the way local people relate to land, fire, government policy and each other; it can only be a temporary solution.

2.5.2 Fire awareness creation

Nearly all government officials contacted during the fieldwork for this study cited "awareness creation" as one of the principle preparedness measures taken since the 2000 fires. Theoretically, awareness-based programs are informal interactions between experts and local farmers, providing these farmers with technical advice on how to better manage forests and fires. These programs assume that farmers do not understand the potentially disastrous consequences of fire use and forest degradation, and that with the input of government officials and experts, the farmers will change their agricultural practices. Such programs are problematic for two reasons. First, farmers are often very well aware of the dangers of using fires and the economic and environmental damages of forest degradation, but "awareness" is not necessarily the primary determinant of land use practices. Ethiopia has been inhabited for thousands of years. Traditional land use practices have managed historically to conserve the land. Although given intense population pressure and the difficulty of making a sustainable income, environmental considerations are not the foremost consideration for most farmers. Often they engage in activities that destroy land due to economic necessity, choosing to feed their families rather than conserve trees. Historically, government conservation policy has focused on economic values over environmental ones: "Imperial policy makers paid little heed to resource degradation which they did not see as a major problem or a serious handicap to economic development (Rahmato, 2001). Because economic stability renders the environment a low priority, nothing prevents rapid land degradation.

Some experts contend that awareness creation is a necessity because rural communities lack the expertise to properly manage land. They recommend abandoning traditional agricultural practices in favour of those that are more technologically advanced. But many others argue that the deterioration of traditional practices – often due to government policy – is responsible for the present land degradation, pushing communities away from the practices that sustained the land in the past: "Successive agricultural and tenure reforms have undermined traditional farming practices, and this has weakened the conservation element of land husbandry" (Rahmato, 2001). Ensermu Kelbessa, an associate professor at Addis Ababa University, argues that "the community is well aware of the danger, but it is the government machinery which is actually unaware…The problem of forest fires resulted because of the interference of regional bureaus with the rights of the people" (Ministry of Agriculture with GTZ and GFMC, 2000). When government policy breaks down systems that have worked in the past, communities are left without their traditional systems of conservation.

The second problem with awareness creation programs is that they are rarely implemented. An effective awareness creation campaign would be a formal, concrete project with a definite plan of action and a set of desired objectives and outputs. Creating awareness could potentially have a positive impact on the way farmers use fire and manage land. Becoming more aware of the way action impacts environment and the long-term consequences of this action could result in a reduction in the rate of degradation. To be successful, these programs must be more structured and ambitious in reaching out to farmers and they must be respectful, not critical, of traditional agricultural techniques. Claiming "awareness creation" without backing it up with serious formal programming represents no step forward in the forest fire preparedness of the government and the people.

In the wake of repeated unsuccessful attempts at reducing environmental degradation and improving the relationship between environment and people in Ethiopia, several NGOs such as WWF, SOS-Sahel and GTZ, all of which are engaged in natural resources oriented projects in Bale and Borana zones, have begun pilot projects in Participatory Forest Management (PFM). These projects recognize that top-down, expert-level approaches frequently fail to change the actual land use practices of those at the grassroots level. Making new laws or strengthening government enforcement will not change the state of the environment without an accompanying change in the attitudes of the local people. PFM projects recognize that slowing the pace of environmental degradation requires more work at the local level. PFM projects aim to provide a mechanism through which communities can both benefit from natural resources and have an input in decisions regarding the way they interact with the land. In an evaluation phase that typically serves as the backbone for implementation, the projects typically use forums or workshops as a means of understanding community needs and desires. They use the community as the basis for the goals of the project, incorporating expert-level environmental concerns with community needs to obtain a synthesis that meets the objectives of both groups.

2.5.3 Material preparedness

Due to budget constraints, the government is unable to make significant material improvements independent of international aid. Although one of the principle shortcomings of the 2000 disaster was a lack of rudimentary fire fighting tools like shovels, the only major material advancement since 2000 is the FAO project. The FAO project provides for nearly US$ 88,000 in equipment and supplies, ranging from fire fighting gloves and goggles to climbing ropes and axes. Few of the NFPAs even

have roads. Hardly any forests have firebreaks regularly maintained or any other mechanism of slowing a rapidly spreading fire. Even fire towers, and radios for quick communication are rare in rural areas where fires pose the greatest potential danger.

2.5.4 Institutional preparedness

Several small institutional steps have been taken since the 2000 fires to improve preparedness, but the extent of their impact remains uncertain. The coming years are critical to evaluating whether national and international institutions are more capable of preventing fires and responding effectively when they do occur.

One of the principle institutional measures taken was the establishment of forest fire committees at all government levels. By establishing these committees, the government intends to give adequate attention to fire prevention and response by providing a formal body to deal with fire-related issues. The committees also represent an effort to coordinate many different sectors of government, from education and legal offices to natural resources and the police. By incorporating representatives from several different government offices, the committees recognize that fires are not simply the responsibility of the Bureaus of Agriculture, but instead reflect the interrelatedness of all sectors of Ethiopian society in disaster relief and prevention. Although they provide the institutional structure to give more attention to forest fires, the committees have not produced a substantial improvement in attention given to the issue. The heads of the committees – with the exception of the federal and regional level – are the chairmen of the Administrative Councils. These chairmen typically have a large amount of responsibility aside from their forest fire committee duties. They give priority to political activities and are therefore unable to direct adequate time and effort to fire issues.

Another institutional improvement in the wake of the fires is the split between the Natural Resource Development and Environmental Protection Authority and the Ministry of Agriculture in the Oromia Region. Although this is only one region and the budget for natural resources remains the same, the new division represents at least a symbolic step towards giving natural resources more government attention. The impact of the split is certainly limited by budget constraints that curtail finances and manpower, but by focusing more directly on land degradation issues, perhaps the government will respond to and suppress future fires more quickly and efficiently.

The final institutional improvement is the improved lines of communication with the international community regarding fire disaster response. While this is not a formal action taken, it still represents a significant improvement since 2000. Because the country experienced the process of seeking international aid and now knows the relevant organizations, experts and individuals to contact should a similar disaster reoccur, the time between the initial fire reports and international assistance will be significantly reduced. The process for receiving international aid remains somewhat ambiguous, but at least the process will no longer rely on a coincidental success.

3 Conclusions and recommended actions

Due to the combination of Ethiopia's underdevelopment and dependence on subsistence agriculture, fire is an integral part of daily life. Fire is one of the most important tools used by people in rural communities to impact the land around them. The 2000 forest fires manifested the complex problems

in Ethiopian development as they touched nearly all parts of Ethiopian society, from ethnic tensions to land tenure insecurity to socio-economic status. The ramifications of the fires even extended beyond Ethiopia's borders, alerting the international community about the potential devastation of precious land and endangered, indigenous species.

Because Ethiopia's forest fires are primarily human in origin, the prevention of future fires is a difficult, daunting task. Fires will continue to burn the precious remaining forests unless there is a fundamental and dramatic alteration in the way people relate to the land, in the way the government manages and protects it and in the type of value the nation as a whole places on the environment.

Understanding the problems associated with fires – and the problems that arose as a result of the 2000 fires – requires the incorporation of sensitivity to the discrepancy between expert and grassroots perspectives. Devising solutions or recommendations should consider the pluralism of interests that must be satisfied by action taken.

Sustainable recommendations must focus on improving the quality of life for those who interact most with the land, which means giving attention to the interests of farmers and rural communities. These stakeholders are not principally concerned with environmental conservation. They do not only perceive the principle problem of the 2000 fires as poor forest management and irresponsible fire use. Those at the local level are rather frustrated that they see few of the benefits from the land on which they work. The reduction of future fire emergencies depends upon sensitivity to community ideology and a strengthening of traditional practices that have succeeded in the past. To prevent fires similar to those of 2000 and to reduce the pace of environmental degradation, communities must benefit from the land on which they live. Unless the local people who are living around the Bale Mountains National Park are sharing for example benefits from income generated from an Ethiopian wolf (tourism), this wild game is by far less useful and less important to the farmer than his sheep, which also needs to graze in the park.

3.1 Short-term recommendations

Although the impact of workshops is limited and though the notion of "awareness" may be problematic, attempting to influence local practices and ideology offers many potential benefits. Providing farmers with conservation techniques that also increase production, for example, would simultaneously benefit the farmer and conserve the environment. These measures are also important because many Ethiopians do not see the environment as valuable in itself, but instead identify it as resource to be exploited for economic benefit. Increasing awareness at the local level may slowly help to change this perception by increasing local understanding of the long-term benefit of environmental conservation.

With the focus in most Bureaus of Agriculture on agricultural extension projects and with most disaster agencies or government offices focused on famine, natural resource management and environmental conservation are overlooked. Workshops and awareness creation shift the focus towards human environmental impact and raise the level of attention given to the issue at the community level. Successful workshops and awareness creation programs must go beyond the informal or nominal programs currently in existence. "Awareness creation" should not be synonymous with inactivity.

Though some experts are arguing that roads are among the enemies of forests in that they facilitate poaching and illegal transporting of forest products, road construction is critical to improving forest management and emergency response capacity. Because many of the NFPAs are extremely remote and therefore difficult to access, monitoring of forest use and prevention of illegal harvesting is difficult. In terms of emergency response, roads provide access that is vital to quick suppression. Roads allow manpower and equipment to be transported rapidly to places that need it. Roads are also critical to insuring human safety because they provide routes to transport injured fire fighters or quick evacuation if a fire blows up beyond the control of the workers.

The construction of firebreaks and fire towers are additional material measures that offer the potential for substantial improvement in prevention and response capacity. Firebreaks are both desirable and problematic. Desirable because they contain a fire once it is out of control and limits the damage incurred, problematic because they are expensive and need extensive and regular maintenance besides disrupting the environment in areas that are often environmentally sensitive. Fire towers help with early fire detection.

Despite GFMC's critical role and vast international fire fighting expertise, they became involved in Ethiopian fire suppression only through coincidence. By formalizing contact procedures and strengthening the relationship with GFMC, Ethiopia should be able to use international assistance more effectively.

The verdict on participatory forest management (PFM) projects is yet to be determined. Still in their nascent phases, there is not enough concrete data to evaluate their effectiveness. But despite the uncertainty, the theory of PFM seems the most promising in terms of developing sustainable land use practices and improving the relationship between government management and the local land user.

Ethiopia does not have the resources to invest in the most recent technological advances in fire fighting. Besides being extremely effective, such technology is often not well suited to the particular fire conditions of Ethiopia. In 2000, for example, the aerial fire fighting operation was controversial because dense forest cover often renders it ineffective and extremely costly in combating ground fires. To make material improvements, the country must focus on rudimentary tools that are successful in fire fighting operations despite their low cost. Though basic, shovels and radios could make a substantial difference in fire fighting capacity provided fires are detected early.

3.2 Long term recommendations

Land tenure is perhaps the single most important factor in natural resources management, environmental degradation and fire use. Because the state continues to own the land and because benefits from forest production rarely go to the communities, farmers abandon conservation in favour of maximum exploitation for immediate economic gain. Without changing ownership either literally or symbolically to give local communities a greater sense of investment in the land, environmental disasters will continue and the 2.7% of the country that is forested will rapidly diminish.

Though transfer of land ownership is the most effective means of improving the current environmental situation, it is not the only option. The principle issue for most communities is that there is no incentive

to conserve. They will not benefit from saving a tree, so why not cut it for firewood? Amending the benefit structure would not require the massive policy changes necessary in order to transfer ownership of the land from the state to the people.

While transferring ownership requires a constitutional change, regional governments, involving less bureaucracy and political struggle, could implement local benefit sharing. While this certainly is not a comprehensive or final solution to the problems of land ownership, giving communities a significant final portion of revenues generated from the land and natural resources on which they live, would give them an incentive to use sustainable agricultural practices that conserve the land.

To strengthen traditional systems of governance, land use and forest management as opposed to a top-down, expert approach is one of the options that should be followed in the future to increase popular participation in governance.

As many forest products such as charcoal are consumed largely in urban areas, looking for alternative energy sources, which are relatively more available in urban areas, is another potential solution to be considered. Urban dwellers could be encouraged for example by subsidizing prices for burning gases and electricity, to decrease charcoal consumption for various domestic activities and hence it would be possible to slow down deforestation.

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4 Annex

Abbreviations

AAU	Addis Ababa University
AFP	Agence France Press
BBC	British Broadcasting Corporation
BCFM	Borana Collaborative Forest Management
BOA	Bureau of Agriculture
CSA	Central Statistical Authority
DGIS	Directorate General for International Cooperation, The Royal Netherlands Government
EPA	Environmental Protection Authority
EPDRF	Ethiopian People's Democratic Revolutionary Front
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GFMC	Global Fire Monitoring Centre
GTZ	German Agency for Technical Cooperation (Gesellschaft für Technische Zusammenarbeit)
MIDROC	Mohammed International Development Resource and Organisation Company
MOA	Ministry of Agriculture
NFPA	National Forestry Priority Areas
NGO	Non-Governmental Organization
NRDEPA	Natural Resources Development and Environmental Protection Authority
OCHA	Office for the Coordination of Humanitarian Affairs
ODPPB	Oromia Disaster Prevention and Preparedness Bureau
OLF	Oromo Liberation Front
OSSREA	Organization for Social Science Research in Eastern and Southern Africa
PFM	Participatory Forest Management
RCS	Red Cross Society
SG2000	Sasakawa Global 2000
SNNPR	Southern Nations and Nationalities People's Region
SOS Sahel	Save Our Soils Sahel
TCP/ETH	Technical Cooperation Programme
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-EUE	United Nations – Emergencies Unit for Ethiopia
WIC	Walta Information Center
WMERDP	Water, Mineral and Energy Resources Development and Protection
WWF	World Wide Fund for Nature

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