Exploring Prosopis Management and Policy Options in the Greater Horn of Africa

Proceedings of a Regional Conference

Desalegn Hotel, Addis Ababa, Ethiopia
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Organized by the Pastoral & Environmental Network in the Horn of Africa (PENHA) in partnership with The International Fund for Agricultural Development (IFAD), the Ethiopian Agro-pastoralist Development Association and University College London (UCL)

A Somali woman selling Prosopis pods as animal feed

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PENHA
PASTORAL & ENVIRONMENTAL NETWORK IN THE HORN OF AFRICA

The Pastoral and Environmental Network in the Horn of Africa (PENHA) is a London-based international NGO and research institution that works in the IGAD countries, including Eritrea, Ethiopia, Kenya, Somalia, South Sudan, Sudan and Uganda. PENHA works in partnership with various actors, with a focus on pastoralism, and related issues of food security, natural resource management, capacity building and empowerment, and conflict.

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John Plastow,

Chair, PENHA Board of Trustees

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Acronyms

APARI	Afar Pastoral and Agro-Pastoral Research Institute
APRC	Animal Production Resource Centre, Ministry of Animal Resources, Sudan
APMP	Afar Prosopis Management Project
ASALs	Arid and Semi-arid Lands
BoFED	Bureau of Finance and Economic Development
CBOs	Community-Based Organisations
EAPDA	Ethiopian Agropastoralist Development Association
EARI-FRCI	Ethiopian Agricultural Research Institute Forestry Research Center
EPaRDA	Ethiopian Pastoralist Research and Development Association
FAO	Food and Agriculture Organisation of the United Nations
GIZ	DeutscheGesellschaftfürInternationaleZusammenarbeit
IFAD	International Fund for Agricultural Development
IGAD	Intergovernmental Authority on Development
ILRI	International Livestock Research Institute
IUCN	International Union for Conservation of Nature
KEFRI	Kenya Forestry Research Institute
MARIL	Managing Risk for Improved Livelihoods
NGOs	Non-governmental Organisations
PEAKS	Pastoral Environmentalist Association in Kassala State, Sudan
PDRE	People's Democratic Republic of Ethiopia
PENHA	Pastoral and Environmental Network in the Horn of Africa
spp	Species (plural form)
SNNPR	Southern Nations, Nationalities and Peoples' Region
SUST	Sudan University of Science and Technology
UCL	University College London
UN	United Nations
US	United States of America
WHO	World Health Organisation

1. Introduction

The expansion of Prosopis Juliflora (hereafter Prosopis) has been a serious problem in Sub-Saharan Africa, including in several of the countries of the Intergovernmental Authority on Development (IGAD) region - Djibouti, Eritrea, Ethiopia, Kenya, Somaliland, and Sudan. The species crosses borders and affects entire ecosystems - the environment and natural resources upon which the pastoral, agro-pastoral communities, as well as many peri-urban communities, depend. Prosopis was introduced to the Horn of African countries for various reasons, but in most cases without preliminary long-term impact studies.

Prosopis and the challenge it is posing has become a serious issue in the most IGAD countries, affecting the livelihoods of farmers, agro-pastoral and pastoral communities. It has taken over farm land, browse and pasture, as well as reduced the water supply for people and for livestock in affected areas. Some governments have opted for expensive physical eradication methods which, however, are not proving effective. Others are trying alternative approaches which consider Prosopis as an underutilised resource, rather than just an ecological menace. In 2007, with financial support from Oxfam Novib, PENHA undertook an initiative pursuing this alternative approach. Working with the Animal Production Resource Centre (APRC) of Sudan, PENHA conducted action-oriented research, and subsequently used the evidence obtained to successfully conduct a pilot project.

The International Fund for Agricultural Development (IFAD) has supported this alternative approach under a project entitled '*Alternative Uses of Prosopis Juliflora for Animal Feed in Eastern Sudan and Somalia*'. This project built on PENHA/APRC's previous experience in Eastern Sudan of producing animal feed from Prosopis. As part of the project's intra-regional learning process, the methods and ideas employed in Sudan were introduced in Somalia/Somaliland, with further input from PENHA's Ethiopian Associates (individuals with experience of similar Prosopis management efforts). The strategy takes the approach of using Prosopis as a resource, while preventing the germination of its seeds. In addition to providing a new and nutritious animal feed, its use can also provide new sources of income to pastoralists and agro-pastoralists. This twin track strategy involves harvesting Prosopis as an alternative feed resource, while also introducing more sustainable control measures at the community level. The project also aimed to address poverty among the pastoral and agro-pastoral communities by boosting incomes, agricultural productivity and resilience in the face of recurrent drought and the impacts of climate change. Nutritious new Prosopis feed would increase animal productivity, while limiting the spread of Prosopis would increase the area of land available for farming by agro-pastoralists and reduce the impact of thirsty Prosopis plants on the availability of water.

Similar work has been undertaken in the other IGAD countries on the issue of Prosopis, by governments, NGOs and the private sector. Thus, a regional conference to draw on this regional experience would add value to PENHA's regional efforts, enabling the participants to explore the experience gained in designing and implementing Prosopis policy of control and use programmes. So, PENHA, in partnership with IFAD, the Ethiopian Agro-Pastoral Development Association (EAPDA), and the Development Planning Unit of University College London (UCL) organised this regional conference on Prosopis, with the theme of '***Exploring Prosopis Management and Use Options in the Greater Horn of Africa***'. The conference was held, over November 26-27 2014, at Desalegn Hotel, Addis Ababa, Ethiopia, with participants from Eritrea, Ethiopia, Kenya, Somaliland and Sudan, as well as from the UK.

The two-day conference brought together representatives of regional bodies, government and non-governmental organisations, academic institutions, grassroots organisations as well as the private sector. The conference was opened by H.E. Dr. Gebreegziyabher Gebreyohanes, State Minister for Livestock Resources, who a gave a keynote speech, outlining the issues and policy options.

1.1 Keynote Speech - H.E. Dr. Gebreegziyabher Gebreyohanes, State Minister for Livestock Resource Development Sector, Ministry of Agriculture, Ethiopia

In his opening speech, the state minister set the scene for the conference very effectively, giving a comprehensive overview of the issues, and assessing the principal deficiencies and gaps in current Prosopis management efforts. He described the magnitude of the Prosopis problem, nationally and regionally. While acknowledging the contributions of different NGOs, he noted that the scale and sustainability of interventions, either to manage its utilisation or to control its expansion, have not been significant in relation to the magnitude of the problem. He also highlighted the lack of coordination among actors, with a duplication of efforts and a failure to share knowledge. Noting the regional and trans-boundary aspects of the problem, he emphasized the need for regional collaboration to deal with it.

Prosopis Regional Conference Participants Group Photo

He additionally highlighted the timeliness of the conference and welcomed the initiative as an opportunity to exchange ideas, assess strategic investment needs and options, and provide input to the ongoing effort to develop a national Prosopis management and control strategy.

The minister emphasized the impact of invasive plants in undermining the adaptive strategy and resilience of the pastoral communities. Although, over the last few years, government and several NGOs have been working on Prosopis control and utilization, the impact of these projects has been

limited, as interventions have often not been sustained, or else have been carried out on too small scale to deal with the problem.

The minister called for coordinated and harmonized interventions, as part of a coherent region-wide control strategy, noting that, regionally, there is no joint programme designed to tackle the problem in the Horn of Africa. He expressed his hope that the conference would come up with technical and policy options that provide for the sustainable control of Prosopis and address the needs of the pastoral communities. The development of new options for programmes and policies can contribute to Prosopis control in Ethiopia and in the Horn of Africa at large.

1.2 Conference Aims, Objectives and Expected Outcomes

Mr. Bereket Tsegay (PENHA IFAD Regional Project Coordinator) set out the aims, objectives and expected outcomes of conference. He noted that this conference constituted part of a two-year IFAD-funded project with an approach based on intra-regional and global learning and experience sharing. The project, and this conference, benefited from field-based and desk-based research conducted by partner agencies characterized by long-term engagement in efforts to improve animal productivity, bolster natural capital and address poverty in pastoral and rural communities. This regional conference aimed to generate new policy ideas and to introduce or promote new practices, as well as to provide a forum in which participants would able to exchange ideas and experiences based on successful interventions, and on challenges faced, across the Horn of Africa and across the globe. The need to learn from experience in Latin America, and elsewhere, would be emphasized. Prosopis should no longer be seen as a local or a national issue, but rather as a regional and global one. The experiences of communities in dealing with and adapting to the spread of Prosopis have shown us that local people are resourceful, not passive, but can benefit from a regional approach that brings to bear lessons learnt elsewhere.

Bringing together a total of 45 policy makers, public servants, academics and representatives of civil society organizations, from Eritrea, Ethiopia, Kenya, Somaliland, Sudan and the UK, the conference had the following goals and objectives:

Conference Goals

- To identify the gaps in current efforts to manage and utilize Prosopis, and to promote intra-regional and global learning based on experiences gained in these efforts, and;
- To identify alternative policy and practice options relevant to the IGAD Region, with a focus on strengthening livelihoods in pastoralist and agro-pastoralist communities, by providing opportunities to exploit Prosopis as an underutilized resource.

Conference Objectives

- To facilitate and encourage the transfer and dissemination of experience on policy and practice, and know-how for exploiting and controlling Prosopis with innovative approaches.
- To share evidence-based research outputs, based on literature and local knowledge, with a view to influencing policy, think tanks and academic circles.
- To engage policy makers, public servants and other actors in promoting awareness around the control and use of Prosopis in their respective countries.

- To build partnerships and cooperation among various stakeholders and also to promote the concept of a Regional Prosopis Task Force involving various partners.

Conference Deliverables

- A set of alternative policy options, based on the use of Prosopis as an unexploited natural resource in the Horn of Africa
- A set of recommendations for community level and large-scale management of Prosopis, including its commercialisation
- The establishment of a Regional Prosopis Task Force, with a view to establishing a centre of excellence on the use and management of Prosopis.
- Published conference proceedings
- A set of research studies available as a digital resource

2.0 Summaries of Research Papers and Presentations

Researchers and practitioners gave research-based and project-based presentations, covering Eritrea, Ethiopia, Kenya, Somaliland and Sudan. Dr. Zeremariam Fre, presenting a paper written with Nick Pasiecznik (of Agroforestry Enterprises) as well as Simon Choge, gave a regional and international perspective, outlining his "global reflections" on Prosopis. Presenters took questions from participants, and the presentations, which took up many of the issues touched upon in minister's keynote speech, served as the basis for lively discussions, as well as the subsequent group work.

2.1 Prosopis: A Growing Resource for the Greater Horn of Africa - Turning a "Foe into a Friend"

Dr. Zeremariam Fre, PENHA and University College London (UCL), and Nick Pasiecznik, Agroforestry Enterprises

Prosopis was introduced to Africa and Asia fairly recently, but the indigenous knowledge from the Americas on how to use and manage it was not introduced at the same time. So Prosopis was left unmanaged and underutilised, and quickly spread. People in countries where it arrived several decades ago came to think that Prosopis was just a thorny, troublesome weed, and even to think that it is poisonous. A similar situation occurred with another plant originally from the Americas – ''the potato''. It was almost a century after it was introduced before it started to be used as a food plant in Europe. At first people ate the fruit and unripe tubers, becoming sick and believing it to be poisonous. Only much later did it begin to become one of the most important foods in the world. Like the potato, Prosopis pods have the same potential to become an important source of food and animal feed, for use by many millions of people in the dry areas of Africa and Asia.

This paper gives an introduction on the different Prosopis species, their utilization around the world, and how they could be used in the Horn region. It provides concrete evidence of tried and tested management practices for Prosopis as a valuable resource in African dry lands.

Prosopis was first planted in the Greater Horn of Africa in the early 1900s, noted first in Sudan in 1917 (Pasiecznik et al., 2001), as a drought tolerant tree to combat desertification and for shade, fuel and fodder. It proved to be very well adapted to local conditions, but was left unmanaged and

little used, as in many other countries. It is estimated to have now invaded some five million hectares, and it continues to spread. The figure for the world as a whole is likely to be ten times that number.

During the great Sahel droughts in the 1970s and 1980s, there was a second wave of Prosopis introductions as a response to the droughts in many parts of Africa. Large plantations were established by international organisations in many dry areas across the continent to control desertification and to provide much needed fuel wood, and to improve the environment and make it habitable for man.

However, Prosopis is expanding at an alarming rate in the Horn of Africa region, and a mathematical model estimated that the species has been expanding at a rate of 50,000 hectares per year in the last ten years in the Afar region of Ethiopia alone (Tilahun and Asfaw, 2012). The same model further projects that if the tree species is used for productive uses such as energy and consumed at a rate of 90,000 hectares per year, the invaded land could be restored effectively in 15 years' time. Furthermore, the model proposes that by end of the 15 years, Prosopis would be contained within 200,000 hectares and could provide 26,000 hectares of wood per annum sustainably for productive uses (Tilahun and Asfaw, 2012).

Within the Greater Horn of Africa context, Prosopis trees have become probably the most significant new natural renewable resource in the region. However until now, it has been largely seen as an increasing threat, as an invasive weed and has earned itself all sorts of derogatory local names. But recently there have been efforts to see this plant for what it is – a plant with huge potential for pastoralists, agro-pastoralists, farmers and the urban-peri-urban poor, as a source of fuel, food, animal feed etc., throughout Africa's' dry areas.

The authors conclude that we need to 'take the bull by the horns' (as the expression goes), to go forward in a determined way, in order to overcome the many constraints, from the lack of knowledge at many levels, to the lack of political will at national and regional level, and the lack of private investment. The authors also make a strong case for global cooperation in information exchange, research and replication of good practices, among other things. Prosopis should be seen as a ''blessing in disguise'' for rural and urban communities across the board and, by taking the Prosopis branch ''by the thorn'', and this tree can be turned into a source of natural gold for those most threatened by threats to their food security.

We strongly call for a serious change of attitude in the region and for seeing ''invasive Prosopis'' with new eyes – as a valuable resource for exploitation, and not as an ecological disaster to be eradicated. Efforts should be made to overcome the current negative views of this tree, and to apply knowledge and experience from other countries in the region, and the world, to finding the most appropriate means for making use of Prosopis.

We call for this conference to make the case for turning Prosopis from a ''foe into a friend''.

2.2 Prosopis Control and Management: The Ethiopian Experience

Beruk Yemane, Livestock Feed and Rangeland Management Specialist

Prosopis Juliflora, which was introduced in the Gewane area of Afar region as part of the Derg's "Green Campaign" policy in the aftermath of Ethiopia's 1970 drought, became invasive in the 1990s. At present, different sources estimate the rate of invasion in 18 woredas/districts of Afar region as reaching between 700,000 to 1,200,000 hectares. It is also estimated that the rapid

expansion of Prosopis has reached the alarming rate of 50,000 ha/year. The impact of Prosopis invasion has brought significant socio-economic, environmental and health risks to people in Afar region. Likewise, the rapid expansion of Prosopis into the primary grazing and irrigated farm areas of Somali; Southern Nations, Nationalities, and Peoples' Region (SNNPR), Oromia and bordering areas of Tigray and Amhara with Afar has aggravated the problem and threat.

Even though there are mixed feelings about the pros and cons on Prosopis, the problems outweigh the advantages. Cognisant of the problem, Farm Africa in collaboration with woreda administrations and the Afar Pastoral and Agro-Pastoral Development Bureau initiated the APMP-I and APMP-II (Afar Prosopis Management Project) projects in Amibara and Gewane woredas, through community participation. The projects were a major breakthrough and led to bigger collaborative interventions by research and development institutions.

The lessons and good practices achieved by Farm Africa's APMP-I and APMP-II projects opened up an avenue for other meaningful Prosopis control-by-management interventions. Key research institutions involved included, the Ethiopian Agricultural Research Institute Forestry Research Center (EARI-FRCI), which made a total of 12 different trials to develop comprehensive Prosopis control measures and techniques for adoption. Out of the total of 12, three trials, namely: i) cutting and burning, ii) girdling and debarking and iii) stand management, have shown encouraging results. The Afar Pastoral and Agro-pastoral Research Institute (APARI) has conducted feed trails on Afar sheep and goats using crushed Prosopis pods mixed with additional ingredients. The results indicated that mixing Prosopis pods in the required amount resulted in improved body condition/weight, milk and meat production.

Other development institutions engaged in the control of Prosopis are mainly focused on the utilisation of Prosopis trees, branches and pods and for commercial purposes. The experience of Ethio-Feed, a private commercial feed processing company, indicates that use of crushed Prosopis pods, mixed with other relevant ingredients have improved body condition, milk, meat production, and has also facilitated quick recovery of drought affected cattle in Afar and Borena area.

As part of commercial utilisation of Prosopis the wood properties research team under the Ethiopian Agricultural Research Institute (EARI) produced ten different household products, with high potential to produce small furniture items, tool handles and various handicraft products that can be easily manufactured locally. It is also thought that there will be strong demand for the products in the domestic and international markets.

The other significant avenue in the control of Prosopis is the production and marketing of briquettes as a convenient form of feed. The experience from the Gogle metalwork and fuel-saving stoves production team enterprise indicates that two types of briquettes, namely, agglomerated and beehive briquettes are produced at commercial level. The potential for large-scale briquette production and marketing for domestic and international market exists.

The lessons and good practices from Prosopis control by management deserve regional level attention, and the Afar regional council approved Prosopis control regulations, issuing a proclamation in 2012. At present, all regional bureaus have institutionalised the regulations in their development plans. Simultaneously, attention has been given at federal level to Prosopis control through large-scale interventions. In 2012, the Federal Republic of Ethiopia's Ministry of Agriculture produced, as part of the productive safety net programme, the Pastoral Areas Public Works Guidelines, for implementation in all pastoral and agro-pastoral areas of the country. The

guidelines will be used as a resource and a tool to implement large-scale, concerted Prosopis control work in the country. The guidelines could be taken up as useful tool in neighbouring countries - Kenya, the Sudan, Somaliland and Djibouti - that are suffering similar problems of Prosopis invasion. Large-scale public works and humanitarian (cash-for-work or food-for-work) programs exist in these countries and could be, similarly, used to implement Prosopis control measures. The combination of control and utilization measures offers the best way forward.

2.3 Farm Africa's Experience in Managing Prosopis in the Afar Region of Ethiopia

Hirut Kassa, APMP Project Manager, Farm Africa Ethiopia

The Afar region, located in the north eastern part of Ethiopia, has a predominantly arid and semi-arid climate. It has a population of some 1.4 million people, and the overwhelming majority are pastoralists, constituting over 90% of the population (Bureau of Finance and Economic Development, BoFED, Government of Ethiopia). Prosopis was introduced in Ethiopia from India in the 1970s and was planted in Dire Dawa, and then after that in the Afar region, using food-for-work schemes from 1986 to 1988.

According to a recent study, it has invaded 1.1 million hectares of the Afar region. The key problems associated with the specie include: encroaching/overtaking of irrigable crop and pasture land and reducing its productivity; loss of indigenous trees, which used to be used during the dry season with pasture in the Awash River basin; blockage from access to roads and water points for both humans and animals; high cost of clearing land for agro-pastoralists, private firms and others; and also physical damage to humans and animals caused by its large thorns. Additionally, both intestinal obstruction and jaw problems of the livestock result from feeding on unprocessed seed.

Farm Africa has been intervening through its three projects: the Prosopis Marketing Project; the Afar Prosopis Management Project Phase One and the Afar Prosopis Management Project Phase Two. It has also completed 10 experiments and research projects in researching the best way to manage Prosopis. The projects produced a supply of palatable and high value feed, used as a means to improved incomes and job opportunities in the communities and also contributed to the control of Prosopis spread. Furthermore, five thousand hectares of land were reclaimed and the project also developed briquette-making activities. Farm Africa has also worked on an awareness campaign, and the development and production of regional regulations and guidelines on Prosopis.

The main challenges facing the Afar communities in relation to Prosopis are the aggressive nature of the tree; limited development of research-based technologies; the reliance on labor-intensive technology and the misuse (over-exploitation) of local trees in charcoal production.

The way forward involves several elements:

- promoting control through utilisation and management,
- strengthening the policy framework and practices,
- using better technology,
- disseminating and using research findings,
- enhancing institutional capacity, and
- engaging the private sector.

2.4 Prosopis Juliflora in Ethiopia: Reflecting on Government Policy, Institutional Framework and Working Modalities – The Case of Afar Region

Ahmed Seid Ali, Afar Pastoral and Agro-Pastoral Research Institute (APARI)

Although there is no precise written document setting out why, when, where, and by whom Prosopis Juliflora was introduced into Ethiopia, the local people of the Amibara district of Afar National Regional State, claim that Prosopis was introduced by an English person in 1970s through the Middle Awash Irrigation Project and was planted over a large area in 1980 as wind breaks, shade and shelter around their villages. Currently, the plant has occupied a large area of potentially arable land along the Awash River banks of the Afar region and is still expanding to other parts. These lands were basically life-supporting units for Afar pastorals through providing pastures for their livestock and ecological goods such as traditional medicines, wild fruits and materials for house construction. Dry and wet season grazing lands, agricultural lands, riverbanks and settlement areas of Afar region are increasingly facing the threat of Prosopis invasion. Apart from its direct effect on livelihoods of the Afar pastoral communities, Prosopis is one of the five drivers of biodiversity loss together with habitat loss, over exploitation, climate change, and pollution. Research results reported by the Afar Pastoral and Agro-Pastoral Research Institute (APARI) indicated that the invasion has reduced the availability of palatable indigenous rangeland species and indigenous trees. Their reports further showed that the plant is invading the rangeland, with negative impacts on the regeneration of native flora, and the productivity and diversity of the herbaceous layer. Inhibition of grasses and forbs is more pronounced under a high Prosopis canopy than in open areas. The negative impact is not only due to dense shading, but is also the result of negative allelopathic effects. Generally low plant diversity in Prosopis invaded areas was observed as a result of the combined effect of its allelochemicals and shade effects together with its extensive and deep root system.

The study conducted by APARI on control methods clearly indicates that superior results can be obtained with a combination of stumping and herbicide application with high concentration. The stumping of Prosopis trees at a depth of 10 cm below the ground level had the greatest stump death without application of herbicides. However, this method is labor intensive and expensive to apply in the vast rangeland of the region. Stumping Prosopis at 10 cm above and at ground level and with no herbicide treatment produced a large number of sprouts and was not effective in killing the stump. An efficient control method was stumping Prosopis at ground level and applying 20% triclopyr with diesel oil, followed by 2, 4-D. Application of glyphosate at ground level stumping depth was also effective in killing Prosopis stumps. The evidence would indicate that the cut-stump treatment of Prosopis with triclopyr, 2, 4-D and glyphosate allows for sufficient absorption and subsequent translocation or diffusion to roots. The response of Prosopis to the herbicides used appeared to be dependent upon the physiology and phenology of the plants at the time of application. There were some limited discrepancies in the studies. The response of Prosopis to herbicide applications was somewhat erratic in magnitudes of effectiveness, but clearly appeared to be more effective than stumping treatments alone.

Prosopis has high coppicing ability and produces many sprouts after cutting, and stumping the tree, alone, will not help to eradicate the weed, unless it is done some distance below the soil surface level. The findings reported by APARI and the Ethiopian Institute of Agricultural Research (EIAR) showed that Prosopis invasion can also be minimized by using crushed pods as livestock feed. Feed supplementation of ground Prosopis pods for Afar sheep improved feed intake, growth performance and carcass parameters. Verified results indicate that the inclusion of ground pods is

potentially valuable and can be considered as a cheap alternative feedstuff to commercial concentrate mix. In addition, the milling of Prosopis pods would be effective in the destruction of seeds, thus reducing their abundance in the soil seed bank. Other institutions have reported that Prosopis tree density can be partially controlled by targeting the plant for fuel wood, as well as in livestock feed supplementation. Subsequently, litter accumulation and the resultant litter allelopathy would be reduced and negative invasion impacts mitigated.

Experience in Afar region has shown that the problems associated with the invasion of Prosopis require holistic interventions, involving all stakeholders (pastoral and agro-pastoral communities, policy makers, researchers and extension officers). It has come out clearly that control of the invasion of Prosopis can be comparatively efficient in a technical sense, but issues related to market value chains for the products that utilize the plant and for equipment supply can affect the sustainability of Prosopis management efforts.

With a view to bolstering control efforts, on 7 July 2011, the Afar National Regional State has issued the Regional Proclamation No. 5, a set of regulations intended to control, manage and eradicate Prosopis in the region. It points out that Prosopis is invading the region rapidly, and it is inflicting serious impacts on the communities and on biodiversity. The proclamation further emphasized the effect of the thorns of the plant on humans and livestock, and the urgent need to halt its expansion, including through its utilization. The regulations also emphasized the issues of scope and scale in Prosopis control, and the need to carry out a study to determine the size of the area affected. The proclamation established penalties for people who cut indigenous trees (discouraging their use and favouring the use of Prosopis) and set out the steps that are required in the utilization and transportation of Prosopis products, in order to protect un-invaded areas. The policy also defined appropriate management measures for areas that have been cleared of Prosopis, requiring the uprooting and eradication of sprouts from newly infested areas and the collection of Prosopis pods and their milling for livestock feed, in order to control its further expansion. The proclamation also determined at what depth to cut Prosopis in order to control its sprout production (15-30 cm below the soil surface), where and how to produce charcoal from Prosopis and the penalties for illegal activities.

2.5 The Ethiopian Government's Strategy in the Control and Eradication of Prosopis

Dr. Kidane G/Meskel, National Prosopis Control Task Force member

This contribution describes the process of and progress in, the development of a specific policy on Prosopis by the Federal Government of Ethiopia. The Ministry of Agriculture has set up a Pastoral and Agro-Pastoral Directorate and it focuses on the five pastoral areas: Afar, Somali, Gambella, Benshangul and Borena. The aim is to bring these regions to the same development level as the Amhara, Tigrai and other regions, in line with the government's policy that Ethiopia should become a middle-income country by 2025. The Directorate, for the past five to six years, has been giving support with capacity building and technology promotion.

These high priority areas have, in particular, tried to tackle the issue of Prosopis. There has been piecemeal activity by government bodies, NGOs and others. In the Directorate's own work, it started by clearing Prosopis from its own compound which was completely infested. This served as a demonstration for people in the area. The exit strategy was demonstrated at regional and national level. They approached the Ministry of Agriculture with a range of documentation - as it was a natural resource ministry. The idea was that the project would be sustainable with the

resources of the ministry. However there was no one available to lead the project and there has been no action.

As part of its mandate, the Livestock Office visited the rural areas and found that there was local dissatisfaction in all areas because of the official policy of the government with regard to Prosopis. Over the past five to six years, the pastoral areas have been completely covered with Prosopis. These areas will become seriously degraded, with the possible emergence of sand dunes, unless urgent attention is given to them. In a series of five to eight documents, covering technical and policy issues, the problem was brought to the livestock, agricultural and natural resource ministries. The problem was particularly of relevance to the pastoral areas.

The livestock ministries then proceeded to plan consultative workshops for all relevant groups from the affected parts of Afar. However about six months before the planned event, a Horn of Africa regional workshop arranged by GIZ (the German development agency) and IGAD was held - so the Afar workshop was postponed. This delay afforded space for further reflection. When the Afar workshop was held, there was agreement to set up a committee with a wide range of members, including representatives from NGOs, universities and government, to develop an action plan. This did not encompass further research, as it was felt that there was no need for more research, given the substantial body of work already carried out. The committee is preparing a draft "National Strategy on Prosopis Control and Management". This draft policy document would benefit from contributions from this PENHA conference.

The contents of the draft policy paper include the following:

- *Background - highlighting Prosopis invasion*
- *Strategic directions in Prosopis management and control*
- *Importance of trans-boundary issues*
- *Strategic objectives and action*
- *Control and management - dealing with areas of low, medium and high levels of infestation*

The aim is both the eradication of Prosopis and it use for productive purposes. This covers the following: *Initial prevention of Prosopis invasions*; *Containment of spread*; *Integrated control by chemical, mechanical and biological means or by fire*; *Restoration of previously infested areas and Prevention of the spread of Prosopis by management, equipment hygiene, etc.* However, the aim should be to have integrated natural resource management, which includes Prosopis - and experience should be gained from other countries. Finally, though the programme for producing the policy document has completed, the policy has not been issued as it is awaiting feedback from government and other stakeholders.

2.6 Prosopis Juliflora Management and Use in Sudan

Abdel Gabar Babiker, Shadia A. Omer, Maha F. Albalula, Sudan University of Science and Technology (SUST), and Nuha, H. Talib, Animal Production Research Centre, Khartoum, Sudan

Mesquite (*Prosopis juliflora*) is a multi-purpose, evergreen leguminous tree or shrub. The tree, a nitrogen fixer, tolerant to drought and high temperatures, is endowed with high water use efficiency. Prosopis, often multi-stemmed with spreading pendulous branches touching the ground, reduces wind speed and stabilizes sand dunes. The plant, endowed with a high degree of self-

incompatibility, is a copious seed producer and well adapted to semi-arid environments. The seeds, characterized by coat-imposed dormancy, establish a huge seed bank and germinate in flushes. The main vehicles of seed dissemination, beside man, are animals and water. Subsequent to germination, seedlings display rapid growth and develop an extensive root system, comprising a taproot, which often connects to the water table, and laterals which extend beyond the crown and forage for rain and surface water. Rapid growth and the extensive root system coupled with unpalatability of seedlings leaves contribute substantially to survival, especially under heavy grazing. In its native range, mesquite combats desertification, promotes biodiversity, supplies wood and non-wood products, poles for fencing, shelter for animals, forage for bees, feed for animals and food for humans. The plant has ameliorating effects on soil and the leaves provide good quality compost. Based on the above characteristics mesquite was introduced into several countries in Africa and Asia to curb desertification and spare indigenous tress. However, unawareness of the invasive nature of the plant, under-utilization, lack of natural enemies and mismanagement turned the plant into a serious weed. This paper presents work on alternative uses and management of Prosopis in the Sudan.

Mesquite pods contain all essential amino acids present in acceptable qualities of standard protein as set out in the FAO/WHO requirements for food and feed. Mesquite pods have been a component of the diet of Native Americans (Amerindians) since time immemorial and even today mesquite still provides food to desert dwellers. Recent studies in Sudan have shown that mesquite flour in a blend with wheat flour makes good quality bread. Furthermore, jam and concentrates could be made from mesquite pods.

In Sudan, agriculture and animal wealth are the main contributors to the national economy and farming and pastoralism are the major occupations. Desert encroachment, land degradation and over-exploitation of natural resources are major problems in Sudan. Desertification, in Sudan, is not a new phenomenon. However, recently it has been exacerbated by drought, population pressure, and associated over grazing and over-exploitation of natural vegetation, and by various malpractices in agriculture.

Mesquite was introduced into Sudan in 1917 from Egypt and South Africa and planted in Khartoum. In 1937 the plant was introduced into the White Nile and subsequently into Sennar, Elfoung, Elgahba and Portsudan. Further introductions were made into Tokar (1945), Kassala (1947), Elgahba (1958) and over 1962-1966 it was planted as a green plant in the suburbs of Khartoum and introduced into new Halfa. In the 1970s, facing severe drought and enticed by previous success, the authorities allowed the introduction of mesquite and it was introduced into the River Nile and northern States as shelterbelts for irrigated agricultural schemes and basins. Currently, mesquite is present in more than half of the Sudanese States and has invaded highways, railway lines, watercourses, flooded plains and irrigation canals. However, the plant is more of a problem in Eastern Sudan, where the Tokar and Gash deltas are heavily infested, mesquite thickets are predominant and the plant has become a threat to agriculture, pastoralism and settlements, due to a sharp decline in water tables and increased salinity of borehole water.

Research and field observation, in Sudan, have revealed that fresh mesquite leaves are unpalatable and may be harmful to animals even if browsed on trees. Mesquite pods, with their high protein contents, are suitable as part of rations in ruminant feeds. In poultry, mesquite flour mixed with enzyme preparations easily substitutes a considerable proportion of sesame or cotton meals in broilers' and layers' rations. Mesquite also provides charcoal. However, in Sudan, traditional charcoal making provides poor quality products and needs to be improved for better marketability. Grinding and briquetting, as experienced in the US, gives high-density charcoal, saves storage space

and reduces transportation costs, as well as providing greater heat and long burning hours. Intensive utilisation of mesquite wood and non-wood products should be considered as part of a management programme. Converting a weed into a valuable resource, these alternative uses present opportunities that bring socio-economic benefits for the communities living in the marginal areas of the country where *Prosopis* is pre-dominant.

Utilization of mesquite provides an income source for inhabitants, reduces propagule pressure (the dispersal of pods and seeds) and cuts down the spread of the plant. However, utilization should be considered ancillary and not a goal in itself, as, most probably, it will not outweigh the immense, negative, economic, social and ecological effects that occur when ecosystems are dominated by inaccessible thickets. Furthermore, mesquite is now common in many parts of the country where large populations face malnutrition due to drought, a situation exacerbated by mass movements of refugees in response to food shortages and military conflicts. In these situations, *Prosopis* has potential at least as a famine food and/or as feed for animals, if not as a regular source of nutrition.

2.7 Sudan: What Do Local Actors Say on Managing Prosopis?

Mohamed Ali, Pastoralist Environment Association in Kassala State (PEAKS), Sudan

The challenges and the opportunities that come along with the presence of Prosopis in an area involve all the levels of the government structures and also all local, national and international actors. In effectively and efficiently managing and using Prosopis and also ensuring the long-term sustainability of environmental governance the role of local actors – both the local governments and community-based organisations (CBOs) becomes crucial.

PEAKS worked closely with PENHA and the Animal Production Research Centre (APRC) of the Ministry of Animal Resources, Khartoum Sudan in identifying the potential challenges and opportunities of Prosopis in Kassala, Eastern Sudan.

This collaboration involved:

- exploring the status of Prosopis in the riverine areas,
- engaging communities, policy makers, public servants, media and other stakeholders in mainstreaming Prosopis in the regional and national natural resource management strategies of Kassala State and Sudan,
- conducting pilot projects on the basis of the experiments conducted by PENHA and APRC to develop feed mixes that utilize Prosopis
- and also integrating the work on Prosopis with other development interventions, including women's economic empowerment, ensuring that women are involved in efforts to promote better management and utilization.

Prosopis as Animal feed demonstration, Kassala, Sudan

Importantly, there are major differences, and an ongoing conflict of interests, between farmers and pastoralists on what kind of Prosopis management to take up. The perceptions of farmers and pastoralists differ, as their livelihoods and the ways in which they exploit natural resources, differ. Farmers see Prosopis as a resource, while pastoralists see it as a weed and a menace. For pastoralists, Prosopis reduces the availability of pasture and water, the basis of their livelihoods.

2.8 Prosopis in Somaliland: Dealing with the 'Unknown' – Reviewing Experience and Prospects for Management

Abdirizak Libah (Candlelight) and John Livingstone (PENHA)

After its introduction by development agencies during the 1970s, Prosopis Juliflora has aggressively invaded farmland and rangeland in Somaliland. Suppressing indigenous plants, taking over farmland and rangeland, Prosopis has had a severely negative impact on the livelihoods of farmers and pastoralists.

The plant is known locally as "Garaanwa", the "Unknown one". The name was coined by Somali refugees who returned to Somaliland in the early 1990s, from refugee camps in Ethiopia, to find that this strange plant has spread rapidly and widely across their home areas, covering large areas of farm land and establishing itself within towns and trading centres. Without a base of indigenous knowledge of positive uses of the plant, negative perceptions of the plant took hold and underutilization facilitated the spread of Prosopis on range and farm land. Local people strongly favour its eradication. However, understanding is growing – Prosopis is no longer an "unknown" invader. Raw Prosopis pods are now a standard dry-season feed for pastoralists. Candlelight, a local NGO, took the initiative to study Prosopis and attempt to address the challenges it poses. Shukri Bandera, the woman who led those early initiatives, is now the Minister of Environment and Rural Development, and argues strongly for control through utilization. A new consensus has emerged that centres on promoting the positive use of Prosopis, in animal feed and in charcoal production, as well as in construction and carpentry.

Interestingly, we found in our fieldwork that it is women who are commercializing the use of raw Prosopis pods, collecting and selling them to pastoralists during severe droughts, when preferred forage and browse is not available. While this use of raw pods is expanding the spread of Prosopis, it is also bolstering resilience in the face of recurrent drought, and could be an important element in adaptation to climate change. And, given women's active use of Prosopis, the participation of organised women's groups in new interventions should not be overlooked.

There has been no proper mapping of the extent and nature of the spread of Prosopis in Somaliland. This would appear to be a useful first step. A participatory mapping approach, along the lines of approaches developed by the International Union for Conservation of Nature (IUCN), could be employed, alongside the application of aerial survey technologies by the relevant UN agencies, working with government. Very little has been done on Prosopis in Somaliland, in terms of research, analysis, or project implementation. A good overview of the impacts and issues (Awale & Sugule, 2006) produced for Candlelight was not followed by further analysis or any major programme of action. Candlelight, beginning in 2002, has promoted the utilization of Prosopis as fuel wood and in charcoal production, providing training for community groups. With support from IFAD, PENHA (the Pastoral & Environmental Network in the Horn of Africa) has implemented a 2-year programme based on training for local cooperatives and the provision of equipment. FAO-Somalia, drawing on Kenyan expertise and experience, is implementing a pilot project, providing training and hammer-mills for three local cooperatives, so that they can commercialize animal feed mixes that make use of Prosopis. When consumed in large quantities, Prosopis can have negative, and even toxic, effects on animals. It has been used as part of a carefully composed feed mix, and should be seen primarily as a feed supplement. Training for producers and consumers in the proper use of Prosopis is, therefore, a necessary element in any new programme. Equally, productivity enhancing effects of Prosopis, increased milk and meat production, have been observed by pastoralists whose animals browse Prosopis pods, and in tests conducted in Kenya and Ethiopia (in

similar pastoral conditions). Market assessments will also be needed to determine the level of demand for Prosopis feeds. Pastoralism dominates Somaliland's economy. The livestock trade is characterized by a high degree of regional integration, and a large portion of Somaliland's livestock exports to the Gulf originate in Ethiopia and in South-Central Somalia. Livestock markets and holding grounds could provide demand for new, Prosopis-using, animal feeds. As it is elsewhere in the region, pastoralism in Somaliland is evolving and adapting to new circumstances. Peri-urban milk producers supply camel milk to growing urban centres, and they could be a major source of demand for new feeds. These pastoral-area entrepreneurs might also take up the production of Prosopis-using animal feeds themselves, particularly if tests or pilot projects show an increase in milk output.

These efforts have to be part of wider efforts to promote enterprise and establish adaptive and participatory agricultural learning systems that involve the private sector, local cooperatives and community groups, as well as research institutions across the region. They will be important in driving the increases in agricultural productivity that are necessary to maintain and increase living standards.

2.9 Some Lessons of Project Experience in Somaliland

Amsale Shibeshi, Regional Programmes Coordinator, PENHA

Amsale Shibeshi described project activities in Somaliland, including some of the principal challenges and opportunities. She presented a short film, made by PENHA-Somaliland, with subtitled interviews of local people describing both the challenges posed by Prosopis, and the way their attitudes towards it have changed as a result of the awareness work undertaken during the project.

PENHA-Somaliland has been implementing a two-year, IFAD-funded project, aimed at promoting the positive use of Prosopis. The main elements of the project are:

- Workshops for local groups, to raise awareness and understanding of Prosopis.
- The provision of training, equipment and choppers (based on a design used in Sudan) for making animal feed mixes that use Prosopis pods.

FAO-Somalia initiated a similar project. The aim is to help agro-pastoralists to process *Prosopis* pods as an alternative feed source and to utilize pod meal in marketable products, creating income and employment opportunities. FAO's project formed three cooperatives, and provided training, processing machinery (hammermills) and other inputs. PENHA-Somaliland is working with farmer groups in three areas, Awbarkhadle, Dheenta, and Dinqal. We have helped them to form an umbrella cooperative ("Tawfiiq"). Initially they were very hostile to the idea of Prosopis as a useful resource. (Local livelihoods have been severely affected, and indeed, local people were, at first, demanding compensation from us, as it was a British NGO that first brought Prosopis to the area!) They have impressed us with their seriousness - they participated energetically in all our training workshops and they have taken the lead in developing their own initiatives, making and marketing charcoal, crafts, furniture and utensils from Prosopis wood. However, the products are of generally poor quality. Local cooperatives need support, and business development services, so that they can improve the quality of their products and find markets for them. Value chain studies are needed to assess supply chains and market conditions, as well as benchmarking and identifying technical needs for a range of Prosopis-utilizing products.

Prosopis trees also support apiculture, and we have been supporting local farmer groups and women's groups with the provision of beekeeping training and equipment. Accessing Gulf markets with processed honey is a real possibility.

Key lessons of our experience:

- Efforts to raise awareness and understanding of Prosopis can change attitudes and turn people around to seeing Prosopis as a useful resource.
- It is vital to work through local people's own organizations. They can be a focus for multiple, related activities, and can participate in a process of testing and refining new methods and techniques, adapting these to local conditions.
- Women, and organized women's groups, must be involved in efforts to commercialize Prosopis utilization – they are already marketing Prosopis pods, they are economically active at the local level, and they are important resource users and managers of smallholder farms and herds of shoats.
- Women's participation in local and national governance is limited. Women's economic empowerment could strengthen their voices in public affairs. One women's group supported by PENHA used their increased incomes to pay for the policing of charcoal burning in their area – evidence that women can, with the right support, play a role in environmental governance at the local level.
- Steps must be taken to make the necessary equipment (hammermills and tools) widely available, and affordable or accessible to local cooperatives and entrepreneurs.
- Steps to promote the manufacture of hammermills within the region should be considered.
- It is challenging for local cooperatives to commercialize animal feeds – private companies with sufficient capital and technical expertise will need to take this on.
- It should be possible for private feed companies within the IGAD region to invest and establish joint ventures with companies in other member countries.
- The use of Prosopis wood in charcoal and energy production is a particular priority, as the over-exploitation of acacia is undermining pastoral livelihoods. Here, the technical challenge is to make it easier to produce Prosopis charcoal of the right quality and price, to sufficient scale.

Somaliland's Minister of Environment and Rural Development, Shukri Haji Bandere, assured us, in our policy workshop, that she would welcome investments from Ethiopian and Djiboutian feed and other companies. She has been actively involved in efforts to address Prosopis invasion since 2000, and has urged NGOs and international development agencies to focus on bringing in the required machinery, tools and equipment, as well as technical expertise.

2.10 Some Reflections on the First Day of the Conference

Dr. Solomon Desta, Managing Director of MARIL (Managing Risk for Improved Livelihoods), formerly of Utah State University's Pastoral Risk Management (PARIMA) programme

Representation

The selection of participants achieved a good regional representation – with Eritrea, Ethiopia, Kenya, Sudan and Somaliland represented, although Djibouti and some other countries in the Greater Horn, similarly affected by Prosopis spread, were not represented.

Presentations and Discussions

The presentations were very good, informative and well organized. Discussion and participation was excellent, with important points raised and considered. All the presentations by the subsequent speakers, in addition to sharing their respective experience in managing or controlling spread of Prosopis, in some ways complemented or re-emphasized issues raised by the state minister in his opening speech.

What came out strongly:

- Prospis is potentially a very useful resource, if managed and controlled properly. If not, it is a problem tree that generates serious negative impacts.
- Prosopis could be utilized as a source of food and feed and incomes at different levels/scales (individual, village/community, commercial); the challenge is how to maximize the benefits of Prosopis, while at the same time minimizing its negative impacts. (An “optimization” issue.)
- Technologies and management options for both utilization and control exist; the smart thing to do is to make maximum use of experience from elsewhere. There is no need to reinvent the wheel - testing the existing knowledge, multiplying it to scale when it is shown to work, at the same time as taking care to adapt different technologies to fit different contexts.
- Management of Prosopis should involve prevention and containment - stopping the advancement of Prosopis and implementing eradication based on the stage of invasion and the possible alternative use of the occupied land, taking opportunity costs into account, as well as other environmental factors.
- The need for coordination among actors and the sharing of experiences was emphasized – involving, among others, academic institutions, research organizations, government, NGOs, the private sector and donors.
- The scale of the effort needs to match both the scale of the opportunities and the scale of the problem.
- Prosopis has become a regional issue, hence a regional approach is needed: PENHA is well positioned to facilitate a regional effort related to Prosopis management.
- It was underlined that the role of government in Prosopis management is critical in terms of resource allocation, the formulation and enforcement of rules and regulations on utilization and control, and on the movement livestock, and other factors.
- Equally critical is the role of the private sector and its active engagement to turn Prosopis utilization into businesses that generate profits for investors, as well as societal benefits.
- At the initial stages, some level of subsidy (or tax incentives) might be necessary to encourage the private sector to invest, to put money into the commercialization of Prosopis.
- Long-term commitment is required, from government as well as from the private sector.
- National land-use and development planning should take Prosopis into account.
- The ownership of land (individual or communal) and security of land tenure are important issues here – with secure tenure providing incentives for management and for exploitation.

- Local support and incentives to act - who is benefiting? - are some important factors in ensuring sustainability. Getting buy-in from local communities and local authorities is also essential.
- There is a breadth of knowledge to share on Prosopis. The digital resource on the PENHA website is an ideal initiative and it is worth investing more into it, making the website a platform for global knowledge sharing on Prosopis.

To conclude, I strongly recommend the holding of another regional, follow-up workshop that involves a wider set of stakeholders, and is focused on next steps.

2.11 Prosopis in Eritrea: Some reflections

Dr. Zeremariam Fre, University College London (UCL)

Eritrea comprises three geographical regions: the Lowlands, Central Highlands and the Coastal region. During the Italian colonial period (of about 75 years), the Western Highlands were the major agricultural area. Prosopis entered Western Eritrea in the 1950s and 1960s, at about the same time as it entered Eastern Sudan. The impact was not felt at the time, as the country was focused on other issues.

The riverine areas, with rich alluvial soils, have supported a wide range of plant varieties which were available and of importance to pastoralists based in the lowlands. However, with the new, independent Eritrean government in 1991, the priority became food production - and this caused problems for the pastoralists because of the change in land use. Apart from government programmes, a number of people from the returning diaspora were given land in these riverine areas to farm. It is questionable whether this was a good food security strategy.

When the speaker visited one riverine area in 1992, it was rich with traditional vegetation. When he visited the same area 15 years later, the half-kilometer belt of cultivated land in the valley had expanded to become a two-kilometer belt of intensively cultivated land. This expansion was very damaging to the environment and it led to erosion, allowing Prosopis to come in and subsequently exclude everything else. So by now, the riverine savannah area below 1,000 metres is infested with Prosopis.

Prosopis is predominantly found in the western part of Eritrea which borders the Eastern part of Sudan. It is believed that Prosopis was introduced to this part of the country through a combination of natural and manmade factors, including spreading via rivers and animal dung. As expansion of Prosopis is not deterred by artificial boundaries, it easily penetrated into the fertile soils of the riverine areas, on which the pastoralists, agro-pastoralists and farmers depend for their livelihoods. The communities see this specie as an antagonistic actor in their lands, as they have witnessed the destruction of the native vegetation and Prosopis' very expansive nature. In the eastern part of Eritrea, Prosopis is also present. As in the other countries of the Horn, in Eritrea, it is expanding fast and, although government aims to control and ultimately eradicate it, it will not be possible to curb or reverse the dominance of Prosopis in the ecology of both western and eastern parts of the country.

Eritrea has no national policy on Prosopis - and there has been little research done on it. Apart from some interaction at the border with Eastern Sudan, there is little or no cross border interaction or co-operation on the issue of the control, management or possible use of Prosopis. Nevertheless, Eritrea cannot be excluded from the regional Prosopis equation, as it is facing both the challenges and opportunities being posed by Prosopis in the Greater Horn Region.

2.12 Exploring Global Best Policies and Practices in Prosopis Juliflora Management and Use – including Recent Experiences from Kenya and Djibouti

Simon Kosgei Choge, Kenya Forestry Research Institute (KEFRI)

There is growing concern about the impacts of Prosopis Juliflora invasion in arid and semi-arid lands (ASALs) within the Greater Horn of Africa countries, on the agricultural productivity of land, on livestock production (particularly through the loss of pasture and effects of sugary pods on teeth), on biodiversity and on scarce water resources. These effects have become an important topic of discussion and policy debate in many parts of Africa, south Asia, Australia and the Americas where the species was introduced and has naturalized. Estimates of the extent of Prosopis invasions in only three African countries (Kenya, Ethiopia and South Africa) total almost 5 million hectares, equivalent to the total area invaded in the Indian sub-continent. Its capacity to thrive in a range of climates, soils and landscapes means that extremely large areas of these countries are threatened. Prosopis continues to spread to new areas, causing misery and serious ecological damage, due to its colonization of productive land and wetlands, out-competing grass and forage species and dramatically reducing biodiversity. The local communities in the affected areas have little or no knowledge on its management and control, or of the utilization options that are necessary to curb its effects and spread.

Beginning in 1999, the Government of Kenya initiated efforts aimed at defining the status of the species in the country and, more importantly, at bridging the knowledge gaps that exist among the local communities on its management, control and utilization. Other countries in the region have also initiated similar activities in recent years. Active exchanges of experiences and approaches being used in the Americas (Peru and Argentina), India and South Africa have informed the adoption of the 'control of Prosopis through utilization' model by the Government of Kenya. This diffusion of knowledge is gradually helping to change the negative perceptions that the communities have had, and Prosopis is now increasingly being viewed, and rightly so, as an important resource, if well managed. However, it is important to underline the fact that, if left unmanaged, Prosopis will remain a nuisance just like any other weed.

This contribution to the literature outlines the history of the introduction of Prosopis and its related species to Africa and highlights the approaches being used to address the invasion problem in Argentina, India, Australia, South Africa and Kenya. Current policy environments in each of the selected countries with regard to management and control of Prosopis species are discussed. These different approaches have clearly demonstrated that Prosopis has significant value as a resource, one that is increasingly serving efforts to meet the environmental and development challenges of our time, Successful policy and practice in different countries have shown that the use of Prosopis has the potential to contribute significantly to sustainable development, if the appropriate knowledge is shared and translated into practice at the grass roots within the affected areas. But, national governments must do more to facilitate and support Prosopis management, control and utilization programmes on a long-term basis, in order to ensure their sustainability and impact on a significant scale both on the environment and on livelihoods. New policies and programmes must build on a careful examination of regional and international experience.

Emerging research and innovations are extending the development frontiers, with successful technologies for the management and control of Prosopis invasions. At the same time, we face serious challenges, such as continued environmental degradation and a shortage of wood resources that result from rising human populations and climate change. In this context, there is an urgent need to move away from seeing Prosopis as a weed and towards a vision of Prosopis as a valuable

resource, in energy generation, in foods and animal feed and in a variety of alternative uses. International efforts to address climate change should also consider the positive aspects of Prosopis trees. Prosopis trees can improve soil fertility, stabilize sand dunes and provide shade in hot environments. Moreover, their fast growth, adaptation to dry areas and their evergreen nature make them excellent carbon sinks.

3.0 Thematic Group Discussion and Outcomes - Summary

Participants were divided into thematic groups, in order to further explore issues of policy and practice, and outline suggestions for the future, on the basis of the paper presentations and plenary discussions.

Representatives of each thematic group presented the outcomes of their group discussions to plenary sessions, in which these were further refined.

Theme One: *NGO and Government Experience within the region of Good Practices in Prosopis Utilisation in Pastoral, Agro-Pastoral, and Farming communities*

In this thematic group, participants assessed the specific roles and experiences of governments and NGOs in promoting new approaches to Prosopis management across the region.

Participants noted that, for the most part, it is NGOs that have take the lead in initiating and experimenting with various innovative Prosopis management models and approaches.

However, they emphasized, given the scale of Prosopis invasion, governments have a critical role to play in addressing it and the associated problems, just as they do in broader efforts to improve communities' livelihoods.

It was underlined that the role of government in Prosopis management is critical in terms of resource allocation as well as the formulation and enforcement of rules, regulations and policy on utilization and control within their respective national boundaries.

Governments also have important roles to play in promoting regional experience sharing and collaboration, aiming to "synergize" national efforts and to work regionally.

Theme Two: *The role of the Private Sector in Prosopis Utilization and Control*

Participants agreed that, the private sector has an important role to play in the sustainable management of Prosopis.

The private sector encompassed small-scale enterprises, often supported by NGOs at the local level, as well as medium-sized enterprises and larger companies with much greater access to finance, capital equipment, technologies and expertise.

Large-scale commercialization of sophisticated products, animal feeds, Prosopis charcoal and other Prosopis-utilizing products involves significant investments, in terms of equipment and skills. However the development of profitable enterprises would create employment opportunities for community members. Private companies can also play an important role in filling the technological gap, particularly where joint ventures enable technology transfer.

At the community level, the establishment of small-scale enterprises can help local individuals, groups and cooperatives to generate incomes. These actors could also act as suppliers, of wood or pods, to larger companies.

Some participants emphasized the fact that profitable enterprises have the important feature of being self-sustaining. Profitability also implies the expansion of activities to a large scale.

Measures to stimulate private sector investment would be required, such as tax exemptions for imported equipment. Some participants felt that private companies would, at least initially, require subsidies. Value chain studies for a range of products were recommended, involving the identification of bottlenecks and market failures, benchmarking, and attention to issues of supply chains, marketing and access to regional and international markets. The studies would feed into value chain interventions that promote the commercialization of Prosopis-utilizing products. It was agreed that efforts to promote commercialization would have to fit into larger private sector development policies, at the national and regional levels.

Theme Three: *Regional and Global Alliances in Research, Communication and Resource Mobilisation to enhance National Strategic Actions towards the Management of Prosopis*

This group worked to identify the potential roles of regional and global actors in addressing the issue of Prosopis management as part of their poverty reduction efforts.

Development partners can provide effective support if they take bold decisions to back local, national and regional initiatives through resource mobilization, technical support, knowledge and practice management.

It is also vital to create strategic alliances, pooling efforts and developing coherent, as well as joint actions. The harmonization of policies and interventions might follow from the promotion of learning and experience sharing. The latter are, however, essential first steps. Participants also highlighted the need to build the research capacity of the region's young academic institutions, particularly those in affected areas that are well placed to carry out analyses in a continuous way.

Participants concluded that regional and global actors who have a stake in promoting sustainable natural resource management, safeguarding the environment, and reducing poverty should come together to help turn Prosopis from foe to friend.

4.0 Key Recommendations and Joint Statement by Participants

At the end of day two, participants agreed to issue a joint statement that sets out some shared principles and recommendations for further actions to be taken by the concerned parties and different stakeholders. The joint statement, entitled '*The Effective Management and Utilization of Prosopis Juliflora in the Greater Horn of Africa*', was agreed after careful discussion of every element and intended to show the participants' commitment to address the problems posed by Prosopis, and take advantage of any opportunities for positive uses of Prosopis, The joint statement also provides a basis for further, separate or joint, initiatives. (See Annex B for the full two-page statement).

The statement recognized the multiple uses of Prosopis, in particular:

- The production of **high-quality hardwood, posts, poles and furniture** from Prosopis wood and logs.
- **Prosopis charcoal** as an alternative to the use of over-exploited Acacia trees.
- The potential of Prosopis use in **bio-fuel plants for electricity generation.**
- The use of processed Prosopis pods to produce **animal feeds** that enhance animal productivity, promote food security and bolster resilience to drought.
- The use of Prosopis to produce nutritive **foods for human consumption**.

The following are some overarching principles and key recommendations:

- *Understanding the magnitude of Prosopis impacts*: The scale of Prosopis invasion, and its complex interconnections with livelihoods and the environment, must br properly understood. Prosopis management must then be integrated into governments' broader development policies, so that the proper utilization of the resource can take place on a commensurate scale.
- *Alternative utilization of Prosopis as a hidden green asset in tackling poverty*: The sharing, nationally, regionally and internationally, of existing knowledge and innovative practices should be directed towards the development and uptake of new technologies, exploiting Prosopis in ways that support and generate sustainable growth. Promoting the adoption of new technologies and techniques, working with smallholders and pastoralists to develop viable alternatives, can boost local entrepreneurship, job creation and income generation.
- *Establishment of a regional centre of excellence on Prosopis control and utilization*: The sharing of knowledge, practices and management modalities on Prosopis should be aimed at the creation of a centre, or centres, of excellence, with the specific purpose of establishing effective learning and knowledge sharing processes, and bringing together in one place the outputs of diverse actors.
- *Alliances and Regional Dimensions in Prosopis management and governance modalities*: Prosopis should not be seen simply as a local or national concern, rather it should be treated as a regional issue, as its spread is not confined within national boundaries. Accordingly, all actors should create alliances aimed at in bringing about genuine progress and large-scale impacts. Agreed outlines for Prosopis governance should be developed, with mechanisms for their continuous review in line with the evolution of Prosopis impacts.

Participants supported control through utilization, with actions to reverse the spread of Prosopis, while exploiting it as a useful asset. The important roles of different stakeholders were recognized – development agencies, (local and international), research institutions and the private sector (including local entrepreneurs), as well as smallholders and pastoralists. Governments and IGAD, the regional body, were seen as having key roles as both regulators and facilitators.

Specifically, participants called for:

- More deliberate co-ordination of the efforts of the different actors
- A regional inventory of research, pilot interventions, learning and resourcing opportunities.
- An expanded and coordinated programme of research
- Regional learning mechanisms aimed at disseminating best practices, at regional, national and local levels.
- The provision of economic incentives, or governmental support, to the private sector, civil society organizations and relevant actors, promoting the uptake of new approaches.
- The creation of an enabling environment for the private sector and local enterprises, with a focus on financing and technology transfer, promoting profitable, and therefore self-sustaining and large-scale utilization of Prosopis.

The key UN bodies – ILRI (with its ongoing fodder programme), FAO (with its work on Prosopis-utilizing feeds) and IFAD (with its support for the current program and its focus on smallholders) – were seen as having very important roles to play, particularly in the development and dissemination of new technologies and best practices, but also in supporting local initiatives.

5.0 Closing remarks

Dagmawi Haileselassie, Partnership Officer, IFAD Ethiopia

Dagmawi gave some general background on IFAD, the part of the UN system with specific responsibility for agricultural development, and its current programs. IFAD's main target is smallholder farmers - the 'forgotten people', the rural farmers, and the pastoralists. Dagmawi described the Pastoral Community Development Program (PCDP), a major initiative serving pastoral communities in Ethiopia, implemented by the Government of Ethiopia, with IFAD and World Bank support. (Participants at some length had discussed the PCDP, an ambitious and innovative programme, the previous day.)

Some highlights of Dagmawi's very well received address:

"Prosopis is a major issue facing pastoralists. But the answer is not going to come from overseas. As a potential resource, it is important to focus on the positive use of Prosopis. We have the knowledge in the region and the open exchange of knowledge and practices is the key. IFAD is keen on shared experience. There must be integration of different stakeholders and their practices. Everyone must work together. IFAD wants to make the necessary investment - to set the process going.

"In the formulation of private-public partnerships (PPP), there is a need to keep an eye on the interests of the producers, the farmers, which need to be safeguarded, as they are often not adequately considered. Often, these people are neglected and deals made, or new arrangements, lack symmetry and favour more powerful commercial interests. When private investment comes in, then IFAD is keen for the interests of the producer, of the pastoralists, to be considered. All parties need to sit around the table.

"My thanks to those who organised this conference. For IFAD, Prosopis is an important issue. IFAD is looking at new investments for the next five years and would want to use the platform that this conference has provided in developing future initiatives."

6.0 Concluding Observations

In the IGAD countries, Prosopis Juliflora has invaded a huge area of arable and grazing land. Its fast paced expansion is alarming and demands urgent action, before it goes beyond the capacity of communities and of governments to either control or manage it. Given the magnitude of the challenge it poses, and the largely unrecognized opportunities it brings, Prosopis will continue to remain both a national and regional concern that requires the integration of multiple strategies through forward-looking, regional cooperation and thinking. Moreover, Prosopis cannot be left out of the equation when it comes to addressing poverty reduction and sustainable natural resource management.

The essence of this regional conference was to explore and tailor policies and best practices in the context of the IGAD countries. Its results are expected to contribute to expanding awareness and understanding of Prosopis, and to the effective and efficient management of the species as well as creating synergies among the interventions being undertaken by various stakeholders.

The conference aimed to promote the idea that a positive attitude should be cultivated towards Prosopis, one that sees it as an underutilized resource that can bring genuinely positive impact to the pastoral, agro-pastoral and semi-urban communities of the IGAD countries, and help them in realizing development objectives. This conference also brought to the fore innovative ideas and practices on managing Prosopis, helping Horn of African policy makers, academicians and practitioners to rethink approaches and design future country level and regional policies and programmes that make the specie a positive factor in reducing poverty among the communities and promoting environmental rehabilitation. The issues of Prosopis governance modalities, cohesion and coordination were also focused on as key factors in future engagements on the issue. Moreover, the peer reviewed book that is to be produced as a result of this conference will contribute towards filling in the existing policy and practice gaps in the IGAD countries and beyond.

Annexes

Annex A: Regional Conference Programme: *Exploring Prosopis Management and Policy Options in the Greater Horn of Africa*
November 26th to 27th 2014 Desalegn Hotel, Addis Ababa, Ethiopia

Time	Day One: Learning from Country, Regional and Global Levels on Prosopis	Country	Presenter
8:30-9:00	Arrival and Registration		Conference Organizers
9:00-9:20	Welcome by Host	Ethiopia	Dr. Tafesse Mesfin PENHA board member
	Chair Rapporteur	Kenya UK	Simon Choge Kees Maxey
9:20- 9:40	Keynote Speech	Ethiopia	H.E. Dr. Gebreegziyabher Gebreyohanes, State Minister for Livestock Resource Development Sector, MOA
9:40- 10:00	Conference Aims, Objectives and Expected Outcomes	UK	Dr. Zeremariam Fre and Bereket Tsegay, PENHA
10:00- 10:30	Prosopis Control and Management: The Ethiopian Experience	Ethiopia	Beruk Yemane, Consultant
10:30– 11:00	Farm Africa Experience in Managing Prosopis in Afar region of Ethiopia	Ethiopia	Hirut Kassa, Farm Africa
11:00-11:20	Tea Break		
11:20-12:15	Prosopis Juliflora Management and Use in the Sudan	Sudan	Dr. Abdel Gabar Babiker, Sudan University of Science and Technology (SUST)
12:15- 12:30	Sudan: What Local Actors Say on Managing Prosopis?	Sudan	Mohamed Ali, Pastoralist Environment Association in Kassala State (PEAKS), Sudan
12:30-13:30	Lunch Break		
	Chair Rapporteur	Ethiopia UK	Beruk Yemane Bereket Tsegay
13:30-14:30	'Prosopis in Somaliland: Dealing with the 'Unknown'- Reviewing Experience and Prospects for Management	Somaliland	John Livingstone, Abdirizak Libah, Amsale Shibeshi (PENHA-Somaliland)
14:30-15:15	Prosopis: A growing resource for the Greater Horn of Africa and the case for turning a ''foe into a friend''.	UK/France	Dr. Zeremariam Fre, University College London (UCL) and Nick Pasiecznik, Agroforestry Enterprises
15:15-15:40	Tea Break		
15:40 -16:30	Global Experiences and Perspectives on Alternative Uses of Prosopis including recent experiences from Kenya and Djibouti	Kenya	Simon Choge, Kenya Forestry Research Institute (KEFRI)
16:30-17:30	Reflection and Conclusion	Ethiopia	Dr. Solomon Desta

Day Two: Reflections, Strategies and Way forward			
	Chair Rapporteur	Sudan Somaliland	John Livingstone Dr. Abdel Gabar Babiker
9:00-9:30	Recap on day one		Conference organizers
9:30-10:30	Prosopis in Ethiopia: Reflecting on Government Policy, Institutional Framework and Working Modalities, the case of the Afar region	Ethiopia	Dr. Ahmed Said Ali, Afar Pastoral and Agro-pastoral Research Institute
10:30-11:15	The Ethiopia government's strategy in control and eradication of Prosopis	Ethiopia	Dr. Kidane G/Meskel
11:15-11:30	Allocating discussion points and generating policy options to groups		Conference organizers
11:30-12:00	Tea Break		
12:00-13:30	**Theme One**: NGO and Government Experiences within the region of good practices in Prosopis utilisation among pastoral, agro-pastoral, and farming communities	Group 1	Facilitators Jemjem Udessa and Dr. Ahmed Said Ali
12:00-13:30	**Theme Two:** The role of the private sector in Prosopis utilization and control	Group 2	Facilitators Beruk Yemane and Dr. Edmealem Shitaye
12:00-13:30	**Theme Three:** Regional and Global Alliances in Research, Communication and Resource mobilisation to enhance national strategic actions towards the management of Prosopis	Group 3	Facilitators Dr. Zeremariam Fre and Abdirizak Libah
13:30-14:30	Lunch		
14:30-15:00 (with break)	Group Presentations (thematic groups)	All	Facilitators Amsale Shibeshi and Dr. Abdel Gabar Babiker
15:00-15:30	General discussion on group presentation	All	
15:30-16:00	Way forward	All	
16:30-16:45	Declaration: Alternative Policy Options	All	Working group
16:45-17:00	Closing Remark by IFAD Representative	Ethiopia	

Annex B: Joint Statement/Declaration

Addis Ababa Declaration

The Effective Management and Utilisation of ProsopisJuliflora in the Greater Horn of Africa

Addis Ababa, Ethiopia

November 27th 2014

We the participants of the IFAD funded and PENHA convened conference "*Exploring Prosopis Management and Policy Options*" have approved this statement. We represent various governmental, academic, civil society and private sector actors from the Greater Horn of Africa. PENHA commends IFAD, FAO, IGAD and our Ethiopian partners for supporting this regional conference and for encouraging this important exchange of academic and applied experiences and best practices on Prosopis management.

Prosopis is an invasive tree species that has taken over large areas of farm and range land, undermining rural livelihoods.

We take as our starting point a recognition that Prosopis represents a real and profound threat to the economy and environment in large parts of the region, particularly in the drylands. Prosopis has invaded some 5 million hectares in the Greater Horn, expanding at a rate of around 5% per year. It has significant effects on livelihoods and on the environment, reducing grazing and biodiversity, affecting livestock health and displacing communities.

Prosopis can be utilized positively, and profitably.

However, we have found that extensive research and practice challenge the predominant orthodoxies around the response to Prosopis, and that management options exist that need to be considered, alongside eradication. We have heard compelling arguments, based on experience from within the region and externally, suggesting that Prosopis provides a considerable but insufficiently understood range of opportunities. The multiple uses of Prosopis include:

- The use of **Prosopis wood and logs** in producing high-quality hardwood, posts and poles, and in furniture production.
- Prosopis **charcoal** as an alternative to the use of over-exploited Acacia trees.
- The potential of Prosopis as a source of**'green energy' in electricity generation**.
- The use of suitably processed Prosopis pods in producing **animal feeds** that **enhance animal productivity**, **promote food securit**y, and also **bolster resilience** to drought.
- The use of pods to produce **nutritive foods** for human consumption, some of which may have positive medicinal effects.

While recognising the need to step up efforts to control Prosopis, we believe that Prosopis management should embrace its potential benefits for a variety of

stakeholders, with a new, inclusive narrative and approach that considers Prosopis as much a friend as a foe.

We recognise the varied and often innovative contributions made by national governmental institutions, the private sector, research institutions and civil society organisations around the management of Prosopis, as well as the importance of drawing on experience from other parts of Africa and beyond. We consider that regional institutions, national governments, international donors, the private sector, academic institutions, and national and international civil society, can all play a critical role in addressing the Prosopis Juliflora challenge across the Horn of Africa.

To this end we call upon all concerned parties to take action to reverse the spread of Prosopis, to reduce its negative impacts, and to turn this threat into a useful asset.

We urge the various stakeholders to act in their different capacities to:

1. Work in **more deliberate co-ordination**, recognising both threats and opportunities.

2. Commit to developing **a regional inventory of research, pilot interventions, learning and resourcing opportunities** that together represent the collective regional knowledge and finance resource base around Prosopis management.

3. Support **an expanded co-ordinated programme of research**.

4. Promote regional understanding of best practice, by establishing appropriate and co-ordinated **regional learning mechanisms**, to disseminate these practices to those who need them at the appropriate level, and in the appropriate form, at regional, national and local level.

5. **Provide incentives, and governmental support**, to the private sector, stakeholders and civil society, to undertake work that builds on applied research and scales up practical applications, benefitting communities, the wider economy and the environment.

6. **Create an enabling environment** and provide financial, technology transfer and capacity building support to the private sector and to local enterprises, promoting profitable, and therefore self-sustaining and large-scale, uses of Prosopis.

We urge regional and international organizations, including IGAD, FAO and IFAD, to take concerted action to support national governments and non-governmental organizations in further efforts:

- **to share experience**,
- **to promote the application of proven technologies and best practices**, and
- **to conduct research on new technologies that address the challenge of Prosopis**,
- while **enabling the rural poor to strengthen their livelihoods**.

We the undersigned commit in our personal and professional capacities to further the spirit of this declaration, to address the pressing threat represented by Prosopis to the Horn of Africa. In so doing, we will work in ways that both harness its positive potentials and tackle its negative effects, striking a balance between control and utilization.

We urge regional bodies, national governments and donor partners to support this declaration and promote effective management and utilisation of Prosopis in the Greater Horn of Africa.

Annex C: List of Conference Participants

No.	Name	Organisation
1	Simon K. Choge	Kenya Forestry Research Institute (KEFRI)
2	Dr. Ahmed Seid Ali	Afar Pastoral and Agro-pastoral Research Institute (APARI)
3	Bereket Tsegay	PENHA
4	Elias Guyo	EAPDA
5	Mohamed Ali Solieman	PEAKS - Sudan
6	Hirut Kassa	Farm Africa Ethiopia
7	Beruk Yemane	Ethio-Feed PLC
8	Dr. Babiker Abdel Gabar	Sudan University of Science and Technology
9	Dr. Taffese Mesfin	PENHA Trustee
10	Lemma Dinku	SOS Sahel Ethiopia
11	Jemjem Udessa	DUBAF
12	Deed Jaldessa	EECMY-DASSC
13	Ahmed Adem	PCDP
14	Zeremariam Fre	PENHA
15	Abdiaziiz Yusuf Bakaal	PENHA SOM
16	Yewbnedo Tekle	EAPDA
17	Yemane Zemenfeskidus	Horn Communications
18	Dr. Solomon Desta	MARIL
19	Dr. Lulsegged Abebe	PENHA Trustee
20	Sileshi Zewdie	CARE/PRIME
21	Mohammed Ali	EPaRDA
22	Dr. Kidane G/Meskel	EIAR
23	Tsegaw Lencha	CCRDA
24	Didier Habimana	FAO
25	Mohamed Yusuf	Federal Parliament
26	Amsale Shibeshi	PENHA SOM
27	Hailu W/Michael	EPaRDA
28	Tigneh Alemu	KH.IADC
29	Mohamed Abdi	PC
30	Dr. Edmealem Shitaye	IGAD
31	Motuma Didita	EBI
32	John Livingstone	PENHA SOM
33	Yeshimebet Gemeda	Oxfam America
34	Abdurahman Mohammed	Afar Research
35	Tesfaye Chalew	
36	Yohannes G/Michael	AAU
37	Kees Maxey	PENHA
38	Dr. Mohammed Mussa	MMA
39	Abdirizak Bashir	PENHA SOM
40	John Plastow	PENHA Trustee
41	Wendessen Gulelat	PFC/PARD
42	Melat Tiumlisan	GIZ
43	Dagmawi Haile-Selassie	IFAD

PENHA Proud to be the voice of East African pastoralists for more than 25 years

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