



10<sup>-3</sup> የኢትዮጵያ የግብርና ምርምር  
ኢንስቲትዩት

Ethiopian Institute of Agricultural Research

---

# Forestry Research Directorate

## Research Directory

2009-2010

---

---

# Government Funded Research Projects

**Case Team:** Plantation and Agroforestry

**Case Team Coordinator:** Abayneh Derero

**Title:** Rehabilitation and Restoration of Degraded Lands in Selected Agroecological Zones of Ethiopia

## Objectives

### General objective

To generate technologies and information that enhances the rehabilitation of degraded lands and thereby improving the economic, ecological, and social benefits at various levels

### Specific objectives

- To select the best performing tree/shrub species and species mix on degraded lands;
- To investigate the role of area closure and fostering trees in rehabilitation of degraded lands; and
- To assess the impact of single and dual inoculation of bio-fertilizers on early growth performance of seedlings on degraded land.

## Expected Outputs

- The best performed trees and shrubs will be selected for the rehabilitation of degraded lands;
- Information/technologies on the role of area closure and fostering trees for the rehabilitation of degraded land will be generated; and
- The impact of inoculation of bio-fertilizers on early growth performance of species on degraded land will be known.

## Components

Component 1: Selection of trees and shrubs for rehabilitation of degraded lands;

Component 2: The role of area closure and fostering trees in rehabilitation of degraded lands; and

Component 3: The role of area closure and fostering trees in rehabilitation of degraded lands

**Locations:** Highland (Debre Berhan) mid highland (Guder) and lowland (Dodotasere)

**Persons Responsible** Negash Mamo, Abayneh Derero, Mehari Alebachew, Wondosen G/Tsadik, Malefia Tadlele, Tirehas, Belay Gebre, Kassahun Bekele, Miftah Fekadu and Shasho Megersa.

**Project Coordinator** Wondosen G/Tsadik

**Duration:** 2008-2013

---

**Title: Agroforestry for rural livelihood improvement and natural resources Management**

## **Objectives**

### **General objective**

Improve the livelihood of smallholder farmers while enhancing the management of natural resources through agroforestry interventions and practices in a sustainable manner.

### **Specific objectives**

- To screen tree/shrub and fruit tree species for various products and services in different agro ecologies of the country;
- To evaluate and promote different agroforestry technologies for wood, feed, food, income generation and soil management; and
- To identify, characterize and quantify the economic value of traditional agroforestry practices in the various agro ecologies, assess and compare the social, economic, and ecological value of the major competing land uses within the Agro-forestry land use systems

## **Expected output**

- Early adaptation and performances of feed, fruit, wood and soil improving species known;
-

- Agroforestry technologies that can be used for soil improvement, feed for animals, wood, food and income source identified and promoted; and
- Potential traditional agroforestry practices identified and characterized, and their economic value quantified. And social, economic, and ecological value of the major competing land uses Within each Agro-forestry land use systems identified

## Components

Component 1: Screening of multipurpose tree / shrub and fruit species;

Component 2: Agro forestry technologies/ trees evaluation and promotion; and

Component 3: Traditional agro forestry practices and comparative economic analysis of traditional agro forestry Practices with other land use systems

**Locations:** Mid highlands (Gurage, Guder), highland (Chilmo) and lowland (Arsi Negelle)

**Persons Responsible:** Yitebitu Moges, Abayneh Derero, Tirehas, Malefia Tadelle, Mehari Alebachew, Getaneh Nigatu, Wendosen G/Tsadik, Kassahun Bekele, Dechassa Jiru and Demsew Sertse.

**Project Coordinator:** Yitebitu Moges

**Duration:** 2008-2013

---

**Title:** Selection of superior provenances and enhancement of tree planting in Ethiopia

## Objectives

### General objective

To promote industrial plantation development through tree improvement programs

### Specific objectives

- To determine the effect of provenance on the performance of *Juniperus procera*;

- To study the adaptability of the four pine species and select the best adapted provenance;
- To evaluate the stump sprouting abilities of *Eucalyptus globulus*;
- To investigate socioeconomic attributes of tree planting practices; and
- To assess the existing status of the seed stands of Forestry Research Center and suggest a possible recommendations for further promotion

## **Expected Outputs**

- The best provenances of *Juniperus procera* will be determined for considered agroecological zones;
- The best provenances of two pines species will be selected;
- The best season of sprouting will be identified;
- Socioeconomic attributes of tree planting practices will be investigated investigate; and
- Reports with possible recommendations on FRC seed stands will be produced

## **Components**

Component 1: Provenance effects on the performance of *Juniperus procera*;

Component 2: Evaluation of provenances of four pine species;

Component 3: Evaluation of effect of cutting season on coppicing ability of *Eucalyptus globulus*;

Component 4: Assessment of Tree plantations in Ethiopia; and

Component 5: Evaluation and enhancement of seed stands

**Locations:** Koso Ber, Sululta, Hegeremariam, Welkite, Bebeka, Aman, and Bonga

**Persons Responsible:** Miftah Fekadu, Negash Mamo, Diriba Nigusie, and Wubalem Tadesse

**Project coordinator:** Miftah Fekadu

**Duration:** ?????

## **Title: Domestication of indigenous fruit and fodders trees in pastoral and agropastoral areas of Ethiopia**

### **Objectives**

#### **General objective**

To generate technologies and information that enhances tree planting thereby improving the food and feed problems in pastoral/ agropastoral areas of Ethiopia

#### **Specific objectives**

- To investigate the experiences and preferences of fruit tree species, establishment and management techniques,
- To investigate the impact of seasonal climatic variability on penology of the selected fruit tree species,
- To characterize the seeds, determining the effect of temperature and moisture on viability of stored seeds of selected tree species,
- To determine the nursery life of seedlings, pre-sowing treatment of seeds of selected tree species, and
- To evaluate on farm and off farm the performance of fruit trees of selected tree/shrub species

#### **Expected Outputs**

- The major indigenous fruit tree species and their establishment and management techniques and their problems will be identified;
- The season and climatic requirement for the flowering, fruiting and seeding of selected fruit trees will be determined;
- The optimum temperature and moisture requirement for the storage of seeds selected fruit trees will be determined;
- The nutrient composition of the food parts of selected fruit tree species will be determined;
- The pre-sowing treatment of seeds and nursery life of seedlings of selected fruit tree species will be determined, and;
- The early performance and planting requirements, on farm and off farm of selected fruit trees will be determined.

## **Components**

Component 1: Socioeconomics: Investigating the experiences and preferences of fruit tree species, establishment and management techniques,

Component 2: Investigating the impact of seasonal climatic variability on phenology of the selected fruit tree species,

Component 3: Characterization of the seeds, determining the effect of temperature and moisture on viability of stored seeds of selected tree species

Component 4: Determination of the nursery life of seedlings, pre-sowing treatment of seeds of selected tree species

Component 5: On farm and off farm evaluation of the performance of fruit trees of selected tree/shrub species

**Locations:** Somali: Werede zone, Bohk woreda; Gambela; Gudere; and Afar: Werer Agricultural Research Center

**Persons Responsible:** Abayneh Derero, Miftah Fekadu, Binyam Abebe, and Mohammed Abdela (SoRPARI).

**Project Coordinator:** Yitebitu Moges

**Duration:** 2003-2008

---

**Title:** Conservation Agriculture with Trees (CAWT) for Improved Livelihoods and Climate Change Mitigation in Dryland Ethiopia

## **Objectives**

### **General objective**

To assess adoption potential and evaluate the biophysical effectiveness of CAWT

### **Specific objectives**

- To identify the opportunities and constraints for introducing CAWT;
  - To assess farmers' perception towards CAWT before and after experiments;
-

- To determine economic performance of CAWT as compared to conventional agriculture;
- To determine the level of tree crop interactions in CAWT;
- To evaluate the effects of CAWT on soil water conservation and fertility improvement;
- To determine biological productivity of CAWT as compared to conventional agriculture and thus its implications for food security; and
- To evaluate carbon sequestration potential of CAWT and its overall significance for environmental sustainability

## **Expected Outputs**

- Impact of CAWT on crop productivity and carbon sequestration determined;
- Economic performance of CAWT evaluated;
- Overall workability of CAWT determined in Ethiopian conditions; and
- At least 2 scientific publications

## **Components**

- Socioeconomics of CAWT; and
- Bio-physical effectiveness of CAWT

**Locations:** Two sites for the CAWT experiment will be selected through the support of data from the social survey. The sites will be selected so that they will have different agro-ecological zones, although both of them will be located in the dryland area.

**Persons Responsible:** Yitebitu Moges, Zebene Asfaw, Abayneh Derero, Zewdu Eshetu, Kidane Georgis, Mengistie Kindu, and Kaleb Kelemu.

**Project coordinator:** Yitebitu Moges

**Duration:** 2003-2008

---

**Case Team:** Non Timber Forest Products

**Case team coordinator:** Adefris Worku

**Title:** Bamboo management and utilization in selected districts of Ethiopia

## Objectives

### General objectives

To develop improved technologies of bamboo for sustainable production and utilization thereby contribute to environmental protection and food security of the country.

### Specific objectives

- Determine the best propagation techniques for bamboo employing offset and layering techniques;
- To develop an efficient micro propagation and in vitro regeneration protocol for bamboo;
- Investigate regeneration, culm characteristics and yield of bamboo under different harvesting intensities;
- To determine best weeding frequencies on the early performance of *O. abyssinica* seedlings;
- Investigate the suitability of Ethiopian highland bamboo for bamboo mat board production, determine the best drying method and determine nutrient content of bamboo shoots;
- Evaluate the performance introduced bamboo species;
- Identify the genetic variation among different provenances of Ethiopian highland bamboo;
- Assess important pests and diseases; and
- To determine the best storage medium and storage time for *O. abyssinica* seeds.

### Expected Outputs

- The best propagation techniques of bamboos will be identified;
- Efficient micro propagation and in vitro regeneration protocol will be developed.
- Regeneration, stand characteristics and yield of bamboo under different harvesting intensities will be investigated;
- The suitability of Ethiopian bamboo for bamboo mat board production will be known

- Effective drying method of bamboo determined,
- Nutritive value and preservation techniques of bamboo shoots will be identified
- The performance of exotic bamboo species will be known and the best performing ones will be selected for different agro-ecologies;
- The phenotypic variation of different provenances and genetic variability of Ethiopian highland bamboo will be known and the best performing and with desirable characteristics will be selected; and
- Important pests and diseases of bamboo will be known;

## **Components**

- Component 1. Developing propagation techniques for highland and lowland bamboo in Ethiopia
- Component 2. Management of highland and lowland bamboo stands
- Component 3: Evaluating bamboo for different end use
- Component 4: Assessment of bamboo pests and disease
- Component 5: Performance evaluation of introduced bamboo species
- Component 6: Effect of different storage conditions on germination and field emergence of *O. abyssinica* seeds.
- Component 7: Evaluation of genetic variation of highland and lowland bamboo

**Locations:** Tikure Inchine, Assossa, Pawe, Holetta, Addis Ababa University, Bore, Gambo, FRC, and Injibara

**Persons Responsible:** Mehari Alebachew, Adefris Worku, Misitre Abebe, Demsew Sertse, Ayelech Araya, Sintayehu, Malefia Tadele, Dr.Abayneh Derero, Dr.Seyoum Kelemwork, Temesgen Yohannes, Zebene, Ayelech Araya, Kassahun Bekele and Abraham Yirgu.

**Project Coordinator:** Mehari Alebachew

**Duration:** 2008-2013

## **Title: Developing technologies for improving sustainable management of Natural gum and resin production from dry lands of Ethiopia**

### **Objectives**

#### **General objective**

To develop comprehensive packages of technologies and scientific knowledge that promote the sustainable management and utilization of natural gum and resin resources for enhanced contribution to livelihoods, poverty reduction, and national economy while maintaining ecological integrity

#### **Specific objectives**

- To map the over all resources base of the selected high value gum and resin bearing species using Remote Sensing and GIS technology;
- To assess the current population status (diversity, abundance, regeneration status, population structure) of study species;
- To assess socio-economic importance and to identify associated challenges and constraints that hinder the sustainable production of natural gum and resins;
- To develop technology for effective propagation and field establishment techniques and to assess the flowering and fruiting phenology;
- To improve the stands through selection of best provenances with higher growth performance and gum and resin yield;
- To develop and adopt suitable tapping, processing and handling techniques that could yield optimum gum and resin yield and quality and to investigate the effect of tapping on the physiology of the tree;
- To investigate physico-chemical characteristics of gum and resins from study species and to promote value added processing of these commodities;
- To investigate the type of insect pests and diseases attacking the study species;
- To determine Physical and mechanical wood property of the study species; and
- To scale up the obtained technologies to be used widely.

#### **Expected Outputs**

- Resources base, current population status and potential natural gum and resin production sites in the country known;

- The role of natural gum and resin sub sector on local, regional and national economy known;
- Potential challenges and opportunities behind integrating the gum and resin sub-sector to other livelihood activities known;
- Tree improvement, propagation and seed biology/phenology and nursery and field establishment techniques developed;
- Appropriate tapping, processing and product handling techniques developed and adopted;
- Physico-chemical characteristics (essential oil quality) that add value to the product known;
- Actual and potential yield per tree of the study species in relation to the physical environment known;
- Wood property of gum and resin bearing species known;
- Effective insect pest control methods against different insects on different species of gum and resin will be known; and
- Effective disease management options will be known.

**Project coordinator:** Zewdu Yilma

## **Components**

- Component 1: Assessment of the resources base of the study species using Remote Sensing and GIS technology
- Component 2: Survey of the population status (diversity, abundance, and Regeneration) of the target species
- Component 3: Propagation, seed ecology and reproductive phenology
- Component 4: Field establishment, growth performance, yield evaluation
- Component 5: Developing and adopting of appropriate tapping technology
- Component 6: Investigation of physico-chemical characteristics of gum and Resin from study species
- Component 7: Determining Physical and mechanical wood property of the Study species
- Component 8: Scaling up of the obtained technologies for their use at wider Scale

**Locations:** Benishangul (Metekel and Pawe), Amhara (Metema), Tigray (Borana, Guji Zones, Middle rift valley areas), Liben/Afdher from Somali and Metekel/Assosa from Benishangul regional state.

**Persons Responsible:** Adefris Worku, Zewdu Yilma, Temesgen Yohannes Sintayehu, Umer and Getaneh Nigatu

**Project Coordinator:** Mahdere Mulugeta

**Duration:** 2008- 2013

---

**Title:** Innovations to develop production and processing technologies of bio-energy in Ethiopia

## **Objectives**

### **General objective**

To develop innovative production and processing technology of bio-energy to improve the lively hood of the populations

### **Specific objectives**

- To collect, introduce and generate variability of castor, physic nut, pongamia, sweet sorghum, and palm germplasm for variety development;
- To release high yielding disease tolerant one each of semi dwarf castor variety, perennial castor variety and sweet sorghum for bio energy production by the year 2011;
- To develop appropriate cultural practice methods for castor, physic nut, sweet sorghum, and pongamia by the year 2011;
- To adapt physical and chemical composition analytical methods, transesterification processes, fermentation of sugar and; and blending level of methyl esters and ethanol for bio energy production; and
- To test adaptability and calorific value of fast growing tree species.

## **Expected Outputs**

- Information on basic genetics and physiology as well as chemical and physical traits seeds of castor, pongamia, physic nut; palm and gomenzer oils will be generated. The technology for production and utilization of sweet sorghum will be established. Scientific data on seed physiology, microbiology, marker traits, genetics of marker traits of castor, isolation distances of castor, valuable germplasm such as high oil, unique fatty acid

composition, growth stages, and resistance sources for major diseases will be available;

- The analytical techniques of oil content, oil quality, physical and chemical traits of vegetable oils, bio-ethanol, and biodiesel would be developed; and
- Methods of transesterification of vegetable oils into biodiesel and distillation of sugar into bio-ethanol will be developed

## **Components**

Component 1: Biodiesel;

Component 2: Bio-ethanol; and

Component 3: Biomass production for fuel wood

**Locations:** Pawe, Aman, Godere, Wondo Genet, Arbaminch, Bako, Babile, Mekele, Areka, Fenoteselam, Kobo, Holetta, Adet, Shoa Robit, Arsi, Kulumsa, Sirinka, Melkassa, Assossa and Ambo

**Persons Responsible:** Getnet Alemaw, and Getaneh Nigatu

**Project Coordinator:** Getaneh Nigatu

**Duration:** 2008-2013

---

**Title: Economic contribution of NTFP to rural livelihood and national economy of Ethiopia**

## **Objectives**

- To describe and assess the operation and strategies of the existing market, the stakeholders involved in the market chain and their respective roles and benefits;
- To assess the impact of product quality, quantity, seasonality on marketability of products;
- To identify existing and potential local and international markets and traders and conditions to access these market;
- Quantify the potential contribution of gum, resins and bamboo products to household livelihood and national economy; and

- Document on the existing formal and informal institutional arrangements facilitating and/or hindering production and marketing of gum, resins and bamboo products

## **Expected Outputs**

- Gum and resin and bamboo products marketing strategies and operations will be revealed;
- Stakeholders involved in gum and resins and bamboo production-consumption continuum will be identified;
- Roles and relative benefits of each stakeholders in the production-consumption continuum will be known;
- The impact of product quality, potential supply and seasonality of production on marketability of gum and resins and bamboo products will be made clear;
- Potential national and international markets, traders and market channels and the prerequisite to utilize those market options will be identified;
- The economic contribution of gum and resins and bamboo to household livelihood and national economy will be quantified; and
- Formal and informal institutional arrangements and factors facilitating and/or hindering production and marketing of gum and resins and bamboo will be documented

## **Components**

Component 1: Bamboo product socioeconomics study; and

Component 2: Gum and resin socioeconomic study

**Locations:** Benshangul Gumuze (Asossa and Pawe), Amhara region (Bahir Dar and Enjibara), Oromiya (Tikur Inchini), SNNPR (Hagere Selam, Chancha and Masha), and Addis Ababa.

**Persons Responsible:** Kaleb Kelemu, Temesgen Yohannes, Adefris Worku, Mehari Alebachew and Tirehas Mebrhatu

**Project Coordinator:** Kaleb Kelemu

**Duration:** 2008-2011

**Case Team:** Natural Forest

**Case Team Coordinator:** Worku Zewdie

**Title:** Selected high forest and woodland for sustainable forest management, in Ethiopia

## **Objectives**

### **Major objectives**

- Describe and determine the vegetation structure and population dynamics in high forests and wood lands in relation to degree of anthropogenic disturbances;
- Assess spatial and temporal variation in the coverage of natural high forest and wood lands and mapping extent of area of coverage;
- Determine the phenology of different indigenous tree species and develop methodologies/protocol for seed testing and propagation methods applied to managing natural forests;
- Assess socio-economic values of forests and document indigenous knowledge and attitudes on forests and forest products;
- Determine the value of various forests and forest lands, applicable for determining the non use values of the forest contribution;
- Characterise forest soil conditions and determine its relation to forest population dynamics and degree of forest disturbances;
- Develop long-term forest growth model for natural high forests and wood lands, reconstruct long-term climate variability;
- Determine temporal and spatial variation in C sequestration in forests and their soils, and develop carbon sequestration estimation model applicable to carbon-based forest management planning;
- Assess and identify pests and diseases of forests and design their control mechanism; and
- Develop management plan for sustainable utilization of forest resources and environmental protection.

### **Specific objectives**

#### **Vegetation structure and population dynamics**

- Describe vegetation structure and patterns of population dynamics in natural high forest and wood lands in a temporal and special variation in relation to degree of forest disturbance;

- Asses the potential and diversity of soil seed bank in the same forest for enhancing natural regeneration; and
- Determine natural regeneration status of major/dominant and endangered tree species.

### **Land cover change**

- Describe spatial and temporal changes in forest cover;
- Determine the driving forces of changes in forest cover; and
- Map the extent of forest cover

### **Phenology, Seed Testing and Propagation**

- Describe the reproductive phenology of various tree species in high forests and wood lands;
- Determine the relationship between phenology and climate variability; and
- Develop and compile appropriate methods and techniques for seed testing and propagation for the tree species

### **Socio-economic values of forests**

- Document indigenous knowledge about forest and wood land utilization and management; and
- Describe and determine the economical values and contribution of forests and forest products to the local community.

### **Valuation of various forests and forestlands**

- Value the indirect values of the forest and wood land using different techniques;
- Describe forest land values in terms of forest growth and its associated products; and
- Develop forest land value index for determining forest land cost and taxation

### **Characterization of forest soil conditions**

- Quantify the storage of total soil C and N in disturbed and undisturbed forest ecosystems along elevation gradient in the high Forest and woodlands;
- Determine the variability and status of available base and acid cations as well as available P and N of different soil types under disturbed and undisturbed forests along elevation gradient;
- Establish the relation ship between C and N storage, forest growth, density and diversity;
- Determine the relationship between the total and available plant nutrient elements; and

- Identify and characterize major soil types along the elevation gradient in forested landscape.

### **Forest growth and rainfall variability**

- Develop dated tree-ring chronologies of various tree species for developing tree-ring chronologies for Ethiopia by accurate identification of annual ring boundaries;
- Calibrate and verify the relationship between rainfall and tree ring width growth and with it refine understanding of how rainfall variability is related to the growth of different tree; and
- Determine the growth of dominant and economically important tree species in high forests and woodlands, and generate data sets for establishing forest growth models applicable to forest management and planning.

### **Carbon stock in forests and soils**

- Estimate sequestered carbon stock in soils and above ground vegetation in natural high forests, woodlands, plantation forests and agro forestry systems; and
- Estimate the cost of stocked carbon sequestered in these land use systems

### **Pests and diseases of forests**

- To assess the abundance and diversity of pathogens on the tree species;
- To identify the kind of pathogen(s) that causes disease/ damage; and
- To evaluate the magnitude of damage they cause

### **Developing management plan for sustainable forest resource utilization and environmental protection:**

Develop different options for the sustainable management of forests that integrates carbon sequestration, timber production, biodiversity, and climate change adaptation and mitigation.

### **Expected Outputs**

- Management, conservation, and utilization plan to sustain the Natural high forest and woodland;
- Socio-economic importance of the forests to the local society and national economy;
- Maps of the forest;
- Phonological colander of different tree species;
- Data sets on carbon sequestration potentials of Ethiopian forests that assist developing carbon based forest management and planning;

- Documents of indigenous knowledge on high value tree species and medicinal plants;
- Documents to improve the livelihood improvement of the local community; and
- Manuals and scientific information's on seed biology and handling

## **Components**

- Component 1: Vegetation structure and population dynamics;
- Component 2: Land covers change;
- Component 3: Phenology, seed testing and propagation;
- Component 4: Socio-economics values of forests;
- Component 5: Valuation of various forests and forestlands;
- Component 6: Characterization of forest soil conditions;
- Component 7: Forest growth and rainfall variability;
- Component 8: Carbon stock in forests and soils;
- Component 9: Pests and diseases of forests; and
- Component 10: Developing management plan for sustainable forest Resource utilization and environmental protection

**Locations:** Bonga high forest, Borena woodland, Munessa, Belete Chaka, and Menagesh State Forest Enterprises, other fuel wood project areas around Addis Ababa, Debre Berehan, Nazret, Bahirdar, Gonder, and Dessie will be considered.

**Persons Responsible:** Deribe Gurumu,, Worku Zewdie, Zewdu Eshetu, Mahdere Mulugeta, Mengistie Kindu, and Abrham Yirgu.

**Project Coordinator:** Kaleb Kelemu

**Duration:** 2008-2011

## **Title: Sustainable Management of Woodlands in selected drylands of Ethiopia**

### **Objectives**

#### **General objective**

To develop integrated sustainable utilization of the dryland forests to address food security and improvement of the livelihood of the local community

#### **Specific objectives**

- To describe the vegetation structure and population dynamics of the woodland vegetation in relation to the degrees of anthropogenic disturbances and natural calamities;
- To investigate the socio-economic contribution of woodland forest resources for the improvement of the livelihood of the community;
- To assess the impact of fire on vegetation structure and composition;
- To develop appropriate control techniques for managing aggressive species; and
- To generate technologies for degraded woodland rehabilitation.

#### **Expected outputs**

- Vegetation composition of the selected woodland known;
- The causes and consequence of woodland forest fire recognized;
- The impact of fire on woodland forest vegetation structure and composition investigated;
- Local knowledge of the community on wood land forest management will be known;
- Woodland fire management guidelines developed;
- Encroacher species control methods compared and effective method identified;
- Demonstration site established;
- Awareness on control methods created;
- Causes and consequences of wood land degradation identified;
- Soil Seed Bank status of degraded woodlands known; and
- Rehabilitation /restoration technologies for degraded woodlands identified

#### **Components**

- Wood land composition and structure;
- Socio-economics of woodlands;
- Investigation of fire impacts on woodland forest resources;
- Investigation on management options of aggressive woodland species; and
- Study on restoration options for rehabilitation of degraded woodland

**Locations:** Guji Zone, in selected woodlands, which will be determined during reconnaissance survey. The fire study will be in Metama and in one other woodland which also needs field survey before implementations. This study will be extended to other similar areas.

**Persons Responsible:** Deribe Gurmu, Mahdere Mulugeta, Abraham Yirgu, Mengistie Kindu Worku Zewdie.

---

**Case Team:** Wood Products Utilization

**Case Team Coordinator:** Sisay Feleke

**Title:** Suitability of selected tree species for industrial, construction and Energy purposes

## **Objectives**

### **General objective**

Maximizing utilization of alternative raw materials for wood industries, construction, and household energy sectors as well as substitution of imports.

### **Specific objectives**

- To generate information on physical, mechanical, seasoning, working and fuel properties of the species under investigation rational utilization;
- To investigate treatability and effectiveness of wood preservatives against bio-deteriorating agents to increase the service life of wood products; and
- To investigate the suitability of four Eucalyptus species for particleboard production

## **Expected Outputs**

### **Before project life time:**

- Information on wood physical, mechanical, seasoning and working properties of three species and fuel characteristics of 11 species will be generated; and
  - Information on appropriate harvesting age of *Cupressus lusitanica* will be generated.
-

**After completion of the project:**

- Complete information/technology will be generated on: Wood properties of three species;
- Fuel properties of 11 tree/shrub species;
- Wood protection/preservation techniques of three species; and
- suitability of four Eucalyptus species for particleboard

**Components**

- Physical and mechanical properties of wood products;
- Wood seasoning;
- Wood preservation of wood products;
- Wood working properties;
- Fuel wood properties;
- Board products-particle board; and
- Socio-economics

**Location:** Addis Abeba

**Field sites for preservation test:** Gimbi, Meiso, Adami-Tulu/Bako

**Laboratory:** FPURC, ECAFCO, Ministry of Mines and Energy

**Persons Responsible:** Sisay Feleke, Seyoum Kelemwork, Shasho Megerssa, and Getachew Desalegn

**Project Coordinator:** Seyoum Kelemwork

**Duration:** 2008-2012

---

**Title:** Suitability of *Prosopis juliflora* for Specialty Wood Products & Tool Handles and for mushroom substrate

**Objectives****General Objective**

To evaluate the suitability of *Prosopis juliflora* for specialty wood products.

---

### **Specific objectives**

- To evaluate physical, mechanical and machining properties of *P. juliflora*;
- To identify and produce at least 12 types of products;
- To demonstrate the products/organize workshops for the target groups in Werer; and
- To evaluate and recommend suitability of *Prosopis juliflora* (leaves, pods, chopped branches and stems, and mix) as substrate for Oyster (*Pleurotus sajor-caju*, *P. austreatus* and *P. florida*) and Shiitake (*Lentinula edodes*) mushrooms for mushroom cultivators.

### **Components**

- *Prosopis juliflora* for specialty wood products and tool handles
- Wood preservation
- *Prosopis juliflora* for mushroom substrate

**Location:** Addis Abeba

**Persons Responsible:** Seyoum Kelemwork, Shasho Megersa, Siay Feleke, Getachew Desalegn

**Project Coordinator:** Seyoum Kelemwork

**Duration:** 2003-2006

---

## **Externally Funded Projects**

**Case team:** Plantation and Agroforestry

**Case team coordinator:** Abayneh Derero

**Title:** Agroforestry based practices to support diversification and intensification in the highland areas of central Ethiopia

### **Objectives**

#### **General objective**

To contribute to the management of natural resources and increase income of small-scale farmers through participatory introduction and evaluation of agroforestry practices in the highlands of central Ethiopia.

#### **Specific objectives**

- To identify and characterize multipurpose tree and shrub species of the different agroforestry practices in Cheha Wereda of the Gurage Zone;
- To investigate establishment techniques of different tree species on Vertisols areas;
- To evaluate the potentials to which shrub species contribute to the management of soil nutrient depletion in Nitosols areas;
- To evaluate the performance of multipurpose tree and shrub species around the homesteads in Degem wereda of the North Shewa Zone; and
- To create the awareness of different stakeholders on agroforestry based practices through different capacity building mechanisms.

#### **Expected Outputs**

- Potential multipurpose tree and shrub species of the different agroforestry practices in Cheha Wereda of the Gurage Zone identified and characterized.
- Tree establishment techniques that can be recommended to the farmers' on Vertisols areas identified.
- The potentials and practicability of integrating shrub species for soil management in Nitosols areas investigated.
- Multipurpose tree species suitable for homestead plantation in the high altitude areas of northern Shewa identified.
- Awareness of farmers and development agents on agroforestry based practices increased.

## **Components**

- Component 1: Identify and characterize multipurpose tree and shrub species of the Different agroforestry practices in Cheha Wereda of the Gurage Zone;
- Component 2: Investigate establishment techniques of different tree species on Vertisols areas;
- Component 3: Evaluate the potentials to which shrub species contribute to the management of soil nutrient depletion in Nitosols areas;
- Component 4: Evaluate the performance of multipurpose tree species around the homesteads in Degem Wereda of the Northern Shewa Zone; and
- Component 5: To create the awareness of different stakeholders on agroforestry-based practices through different capacity building mechanisms

**Locations:** Dendi, Guder and Ejere (Oromiya) and Cheha (SNNP)

**Persons Responsible:** Kindu Mekonnen, Mehari Alebachew, and Chilot Yirga

**Project Coordinator:** Kindu Mekonnen

**Duration:** 2009-2012

---

**Case Team:** Non-Timber Forest Products

**Case Team Coordinator:** Adfris Worku

**Title:** Establishing model value chain of moringa, an innovative approach to commercialization of moringa production

## **Objectives**

### **General objective**

Commercializing Moringa production in the country

### **Specific objectives**

- To create awareness on the use and utilization of moringa;

- To create awareness on production, processing utilization and marketing of moringa for rural and urban residents of the selected woredas;
- To establish model value chain for moringa;
- To promote various private and public sector stakeholders involvement in the production, processing and marketing of moringa;
- To promote involvement of private and public sector involvement in production, processing and marketing of moringa; and
- To collect, analyze and document feedback information for further research and development endeavor on moringa.

### **Expected Outputs**

- Awareness will be created on the use and importance of moringa among rural and urban residents of the targeted areas;
- Farmers will acquire skill and knowledge on the production and management of moringa;
- Moringa processing and marketing knowledge and skill will be acquired by targeted women groups;
- Model value chain of moringa will be established
- Involvement of private and public sectors in the production, processing and marketing of moringa will be created/ strengthened.

### **Components**

Component 1: Baseline survey; and

Component 2: Awareness and demand creation

**Locations:** Amhara (Kewet Woreda, Shewa Robit), Tigray (Alamata Woreda and Mekele), Oromiya (Adama), Afar (Werer and Semera) and Addis Ababa

**Persons Responsible:** Kaleb Kelemu, Mengiste Kindu, Senait Yetneberk, and Yeshi Chiche

**Project Coordinator:** Kaleb Kelemu

**Duration:** 2009- 2011

**Case Team:** Natural Forest

**Case Team Coordinator:** Worku Zewdie

**Title:** Climate, land use change

## **Objectives**

- Understand and determine the extent to which previous land management and environmental changes influence the development activities and the livelihood of the Ethiopia community;
- Determine the relationship between past land use and forest growth for calibrating past climate; and
- Make use of tree ring to develop management tools that indicate land productivity.

## **Expected Outputs**

- Provide long term reconstruction of climate and land use change;
- Past climate reconstructions from land use change and climate calibration from tree ring analyses could advance our understanding on causes of drought and famine in Ethiopia;
- Determining the relationship between drought and tree ring growth would help understanding the profound impacts of climate extremes on human history, and provide early warning to save human life; and
- Determining the relationships between human land use change and climate would contribute to government's policy and strategy in achieving food security and Millennium Development Goal.

**Locations:** University of Kansas America ( USA) and FRC

**Funding Organization:** United States National Science Foundation  
(USNSF)

**Host Institute:** University of Kansas

**Persons Responsible:** Zewdu Eshetu and Terwilliger Valery

**Collaborator Institute:** EIAR

**Project Coordinator:** Terwilliger Valery, Department of Geography, and  
University of Kansas

**Collaborator:** Zewdu Eshetu

**Duration:** 2006-2009

---

**Title:** Estimating forest growth and forest carbon stock and reconstructing rainfall Variability as an integrated approach for forest management planning.

## **Objectives**

### **General Objective**

- To establish a long series of climate anomalies from different proxies such as stalagmites and tree rings;
- To determine rate of forest growth and estimate forest carbon stock for plantation and natural forests;
- To estimate forest carbon cost in relation to wood value and management costs and develops forest carbon stock and cost estimation protocol;
- To develop integrated forest management planning model based on forest carbon stock and forest volume growth; and
- To map spatial and temporal land use and land cover changes along elevation gradient/climatic gradient.

### **Specific objectives**

- To lay a foundation for a centre of expertise in climate research. Emphasis will be given to laminated stalagmites and tree-rings, which are excellent proxies for high-resolution climate studies that are now known to exist in Ethiopia and some studies, are being carried on them. These studies will use instrumental climate records and climate modeling for prediction. However, there is at present a need to integrate all climate research activities;
- To establish regional capacity for climate research with a goal of obtaining high-resolution, multi proxy, reconstructions of climatic (and in particular seasonal rainfall) variability over the last millennium from various parts of Ethiopia;
- To reconstruct drought, flood and rainfall variability as well as develop homogenous seasonal climate regions and historical long-term dataset in

space and time as well as to quantify rainfall variability using transfer function;

- To develop long-term forest growth model for natural high forests and wood lands;
- To develop forest C estimation protocol and methods for Ethiopia and determine temporal and spatial variation in C sequestration in forests and their soils, and develop carbon sequestration estimation model applicable to carbon-based forest management planning;
- To Estimate the cost of carbon sequestered in forests that assist concurrent development of tradable C credits providing financial incentives for considering C storage in the decisions of forest management planning; and
- To determine rate of land use and land cover changes as well as its relationship with climate gradient and their interaction effect on the physico-chemical properties of soils.

## **Expected Outputs**

- Reconstructed climate anomalies will Provide sound scientific data on climate variability with regard to flood and drought frequencies drought frequency for policy makers in the Ethiopian government, notably the Hazard Preparedness Commission and the Food Security Agency by providing early warnings on future drought and assist in saving human lives during drought and flood years. It also provides long-term data set on future availability of water to Water Resource Authority for better management of scarce water resources.
- The relationship between tree ring growth, stalagmite growth bands and instrumental climate records assist to characterize Ethiopian rainfall and ENSO variability on the decadal to century timescales; and hence to determine the causes of Ethiopian climate anomalies, namely drought and flood and its impact on agricultural productivity. It also assists to determine the magnitude of spatial and temporal variation in climate in Ethiopia. This assist in scheduling the time of planting trees and performing cilivicultural operations to mage growth of trees.
- Forest volume growth, forest carbon stocking and forest carbon cost determination as a function of forest age will be developed, and this ultimately will assist determining financial, economical and biological rotation age of forest stands in terms of carbon stocking, wood volume growth and economic return.
- Data sets on carbon sequestration potentials, wood volume growth and carbon costs will assist modifying the existing forest management planning from volume based management to integrated carbon stock and wood volume based forest management planning in that Ethiopia will play active

role in getting financial incentives from CDM and REDD funding, which will in turn supports government strategy to achieve MDG in food security and climate change adaptation for which Ethiopia has rectified several international conventions.

- Spatial and temporal mapping of land use and land cover changes (reconstructed land use changes will provide information the rate land cover change in the drought prone areas. These will assist producing a land use and a climate induced risk map, which are so important for developing integrated land and water resource management in the drought prone areas of Ethiopia, which will be part of the MDG in climate change adaptation, food security, and environmental protection.

## **Components**

Component 1: Climate proxy analyses for reconstructing long-term climate anomalies

Component 2: Determining rate of forest growth for plantation and natural forest

Component 3: Estimating forest carbon stock and determining cost forest C cost

Component 4: Determining land use and land cover changes along elevation gradient and the integrated effect of climate gradient and vegetation shift chronology on the soil nutrient dynamics

**Locations:** Menagesha- forests and surroundings, Munesa forests and adjacent lowlands, Anabi high forests and adjacent woodlands up to Mille

**Persons Responsible:** Zewdu Eshetu, Mohammed Umer, Asfaw Wossen Asrat, Mengiste Kindu and Negash Mamo

**Project coordinator:** Zewdu Eshetu

**Duration:** 2009-2012