



NORMAN BORLAUG FELLOWSHIP PROGRAM FINAL PRESENTATION



Maggie Munthali

MENTORS

Assoc. Prof. Francisco X Aguilar & Hong He

Presented at University of Missouri, CAFNR

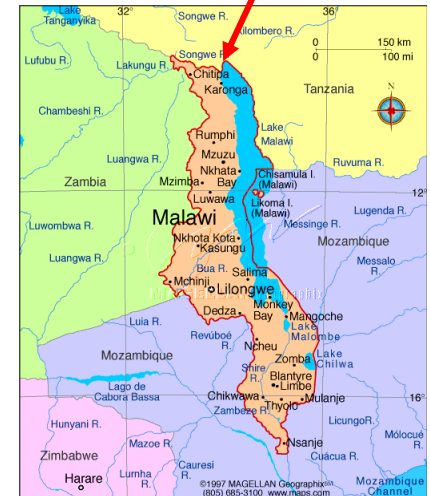


Outline

1. Malawi Profile
2. Maggie Short-Bio
3. Home Institution (Dept. of Forestry)
4. Forests in Malawi
5. Experience as a Borlaug fellow at University of Missouri
6. Acknowledgements

Malawi

Total Area	118,484 sq. km
Population	16.1 millions (2014)
Economy	Predominantly agriculture
GDP by sector	Agriculture 29.4%, industry 18.9%, services 51.7%
Languages	English (official)
	Chichewa (official)
Main Exports	Tobacco, Sugar, Tea and Coffee
Main Imports	Oil, Consumable goods and Fertilizers



Malawi in Pictures



Capital Hill



The big five



Malipenga Dance



Staple food-Nsima



New parliament



Nyau



Traditional wear

Professional Background

2010 – date	Assistant Regional Forestry Officer, Department of Forestry, Malawi
2014 to date	Role Model (Volunteer)
Jun – Sept 2014	Visiting Research Fellow (CIAT, Kenya)
2008 -2010	Secondary School Teacher, Ministry of Education, Science & Technology
2014	Graduated as LEAD Fellow
2015	Graduated as AWARD Fellow

Academic Background

2015

Graduate Certificate Student , Forest Carbon Science, Management & Policy (Michigan State University)

2015

2016 Prospective PhD Student (University of Pretoria, South Africa) funded by OWSD

2013

MSc in Soil Science (University of Nairobi, Kenya)

2008

BSc in Forestry (Mzuzu University, Malawi)

2006

Certificate in Marketing of Forest Products (Kymenlaakso University of Applied Sciences, Finland)

Maggie in Pictures



Graduation UoN



Kymenlakso Univ Finland



Role Modeling at Primary School



Tree planting at Makanya



Graduation Mzuzu Univ.

Department of Forestry – Malawi

Five Technical divisions of Forestry:

1. Forestry Communication and Advisory Services Division
2. Forestry Development and Management Division
3. Forestry Planning and Training Division
4. Malawi College of Forestry and Wildlife (MCFW)
5. Forest Research Institute of Malawi

6. Regional Forestry Office (RFOs)



Forests in Malawi

- (a) Provide support through the provision of shelter, energy, shade and health.
- (b) Contribute to rural incomes through sales of forest goods
- (c) Contribute to the economy of the country through timber exports and provision of jobs in Forestry.
- (d) Provide of ecosystems services such as nutrient cycling, soil formation, and catchment conservation for water bodies and offer habitat.

Classification of Forest in Malawi

- (a) By type
 - natural/indigenous
 - plantation forests.
- (b) Land type.
 - Customary forests e. g Village Forest Areas (VFAs) are those located on unallocated common access land under the jurisdiction of Traditional Authorities (TAs).
 - Public Forests – Forest reserves and government plantations owned by Government

“Malawian vegetation is dominated by miombo (Brachystegia) woodlands which are found in most of the forest reserves and customary land”.

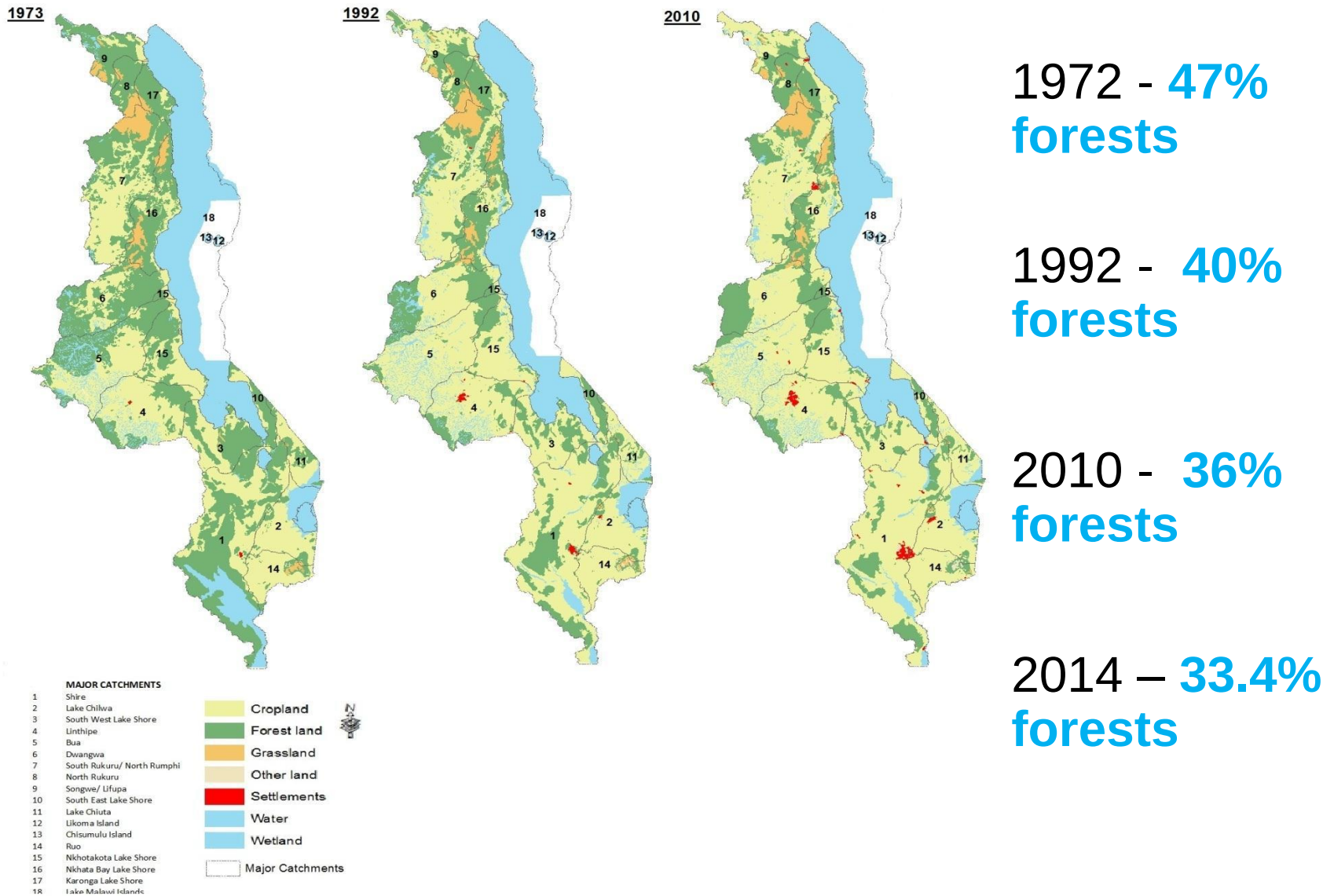
Status and Trends of Forests in Malawi

Changes in Forest Cover from 1990 - 2015

Variable	1990	2000	2010	2015
Forest Area (ha)	3,896,000	3,567,000	3,237,000	3,147,000
Change in total forest area (ha)	-	329,000	165,000	90,000
Percent of Land with forest (%)	41.3	37.8	34.3	33.4
Natural Forest Area (ha)	3,764,000	3,370,000	2,872,000	2,728,000
Area of other land (ha)	5,532,000	5,861,000	6,191,000	6,281,000
Inland water bodies (ha)	2,420,000	2,420,000	2,420,000	2,420,000
Afforestation (ha)	-	15,300	18,000	-
Primary Forest (ha)	1,727,000	1,330,000	934,000	845,000
Planted Forest (ha)	132,000	197,000	365,000	419,000
Planted Forest Area change (ha)		65,000	80,000	54,000

Source: FAOSTAT 2015

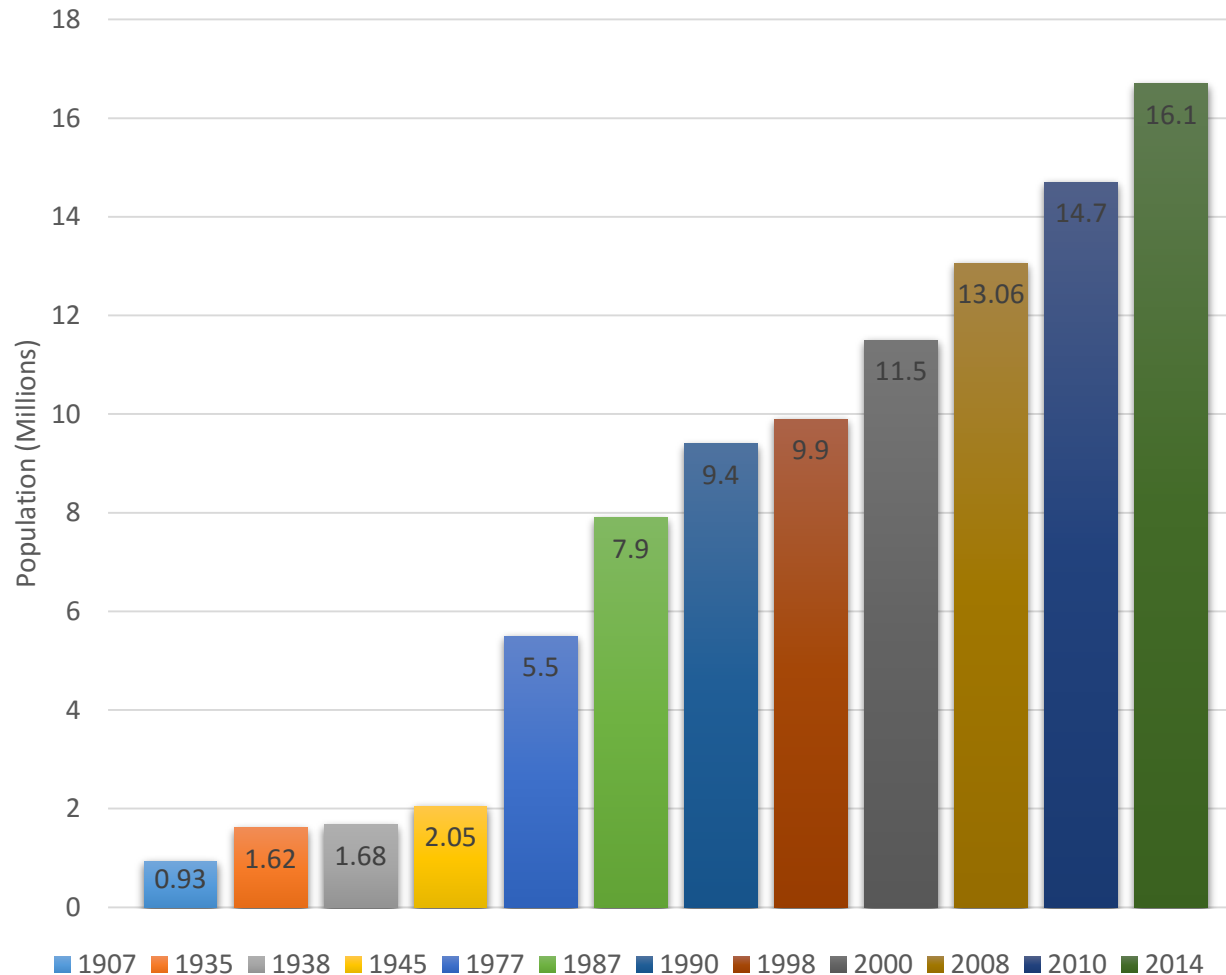
Malawi Land Cover and Land Use Changes between 1972 and 2010



Source: LTS International Report, 2013

Major Drivers of Forest Loss in Malawi

1. High Population growth (1907 – 2014)



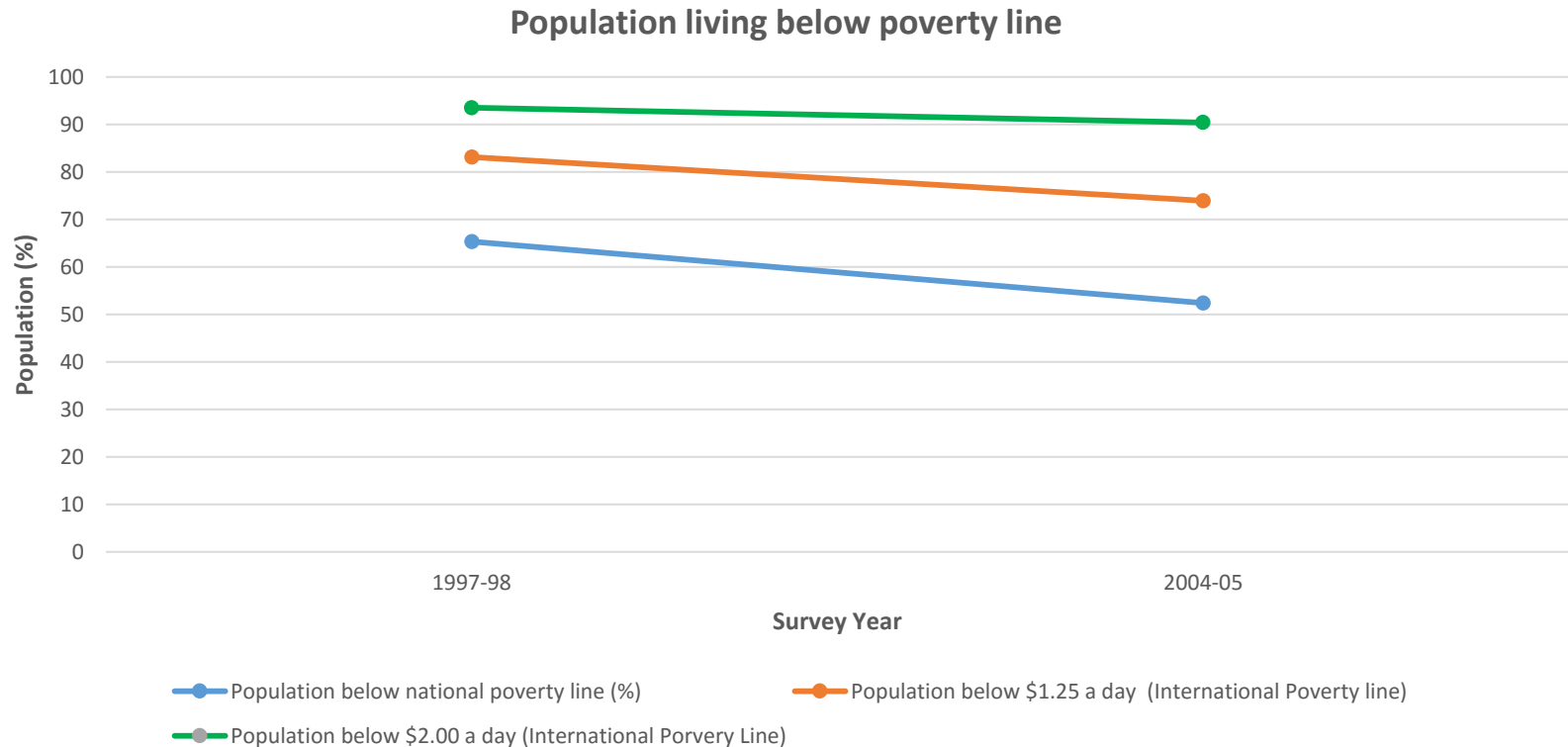
Population growth rate is 2.8%

Forested areas are increasingly cleared for agricultural production and settlement

Pressure on natural resources such as cultivation land and fuel wood.

Major Drivers of Forest Loss in Malawi

2. Poverty and food insecurity



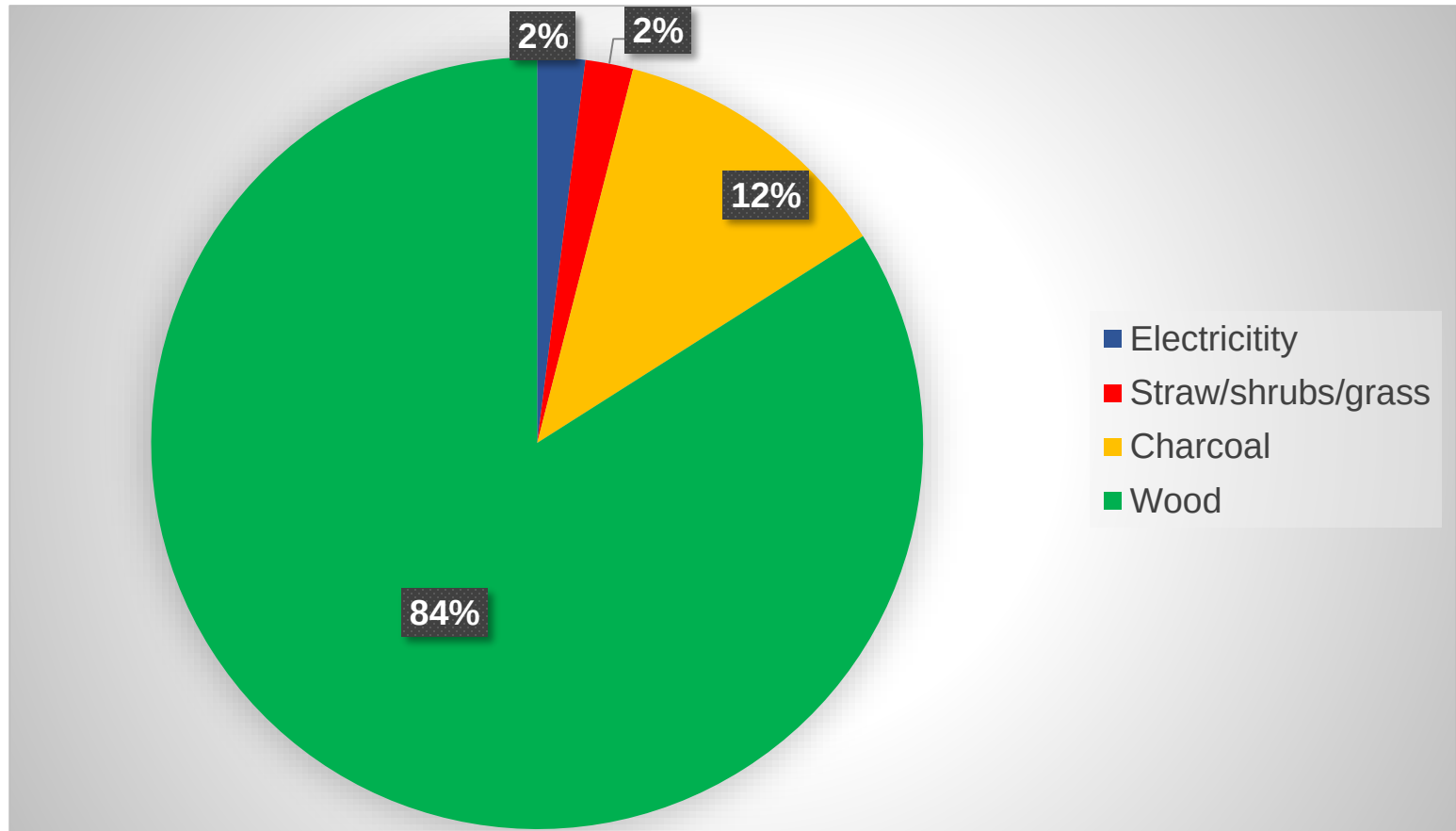
Source: World Development Report, 2010

High incidence of poverty and food insecurity, lead

- to increasing demand for land and forest resources
- adoption of unsustainable coping strategies

Major Drivers of Forest Loss in Malawi

3. High dependence on fuelwood



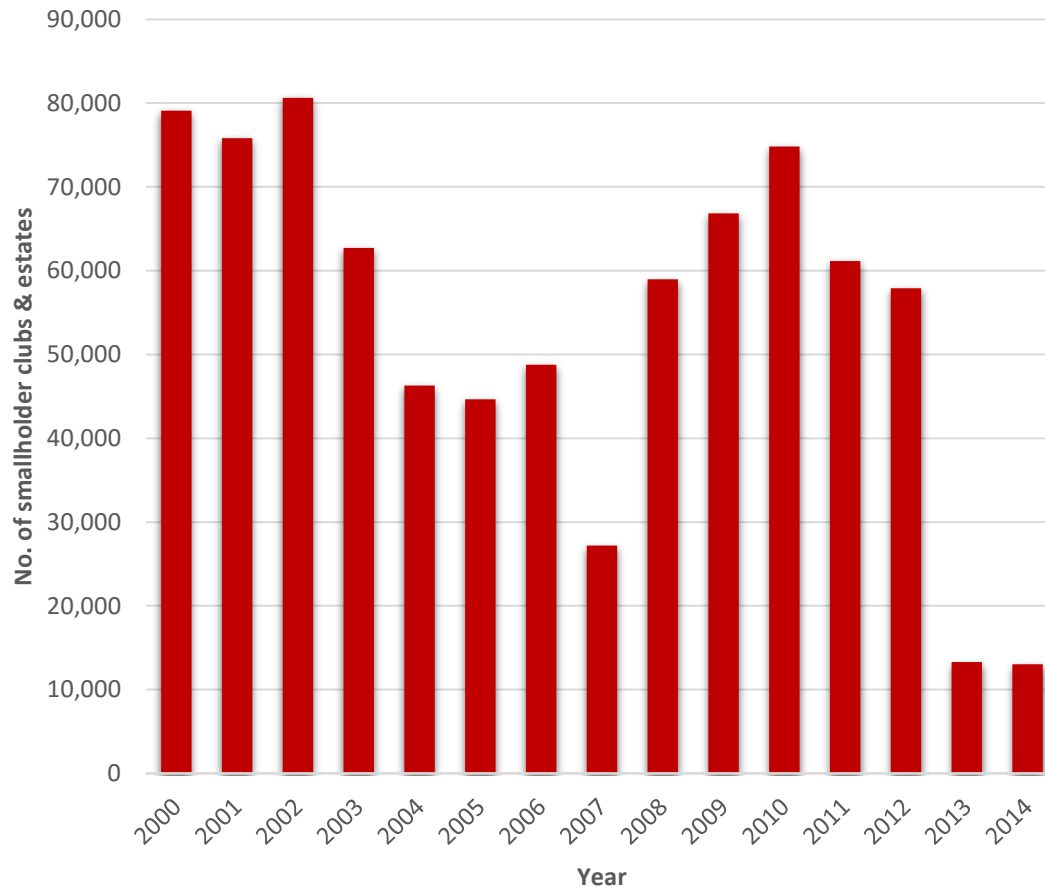
Source: Malawi Government, 2013

Almost 96% of the population depends on forests as a source of energy and heating

Major Drivers of Forest Loss in Malawi

4. Tobacco Curing

Number of registered tobacco Smallholder clubs and estates



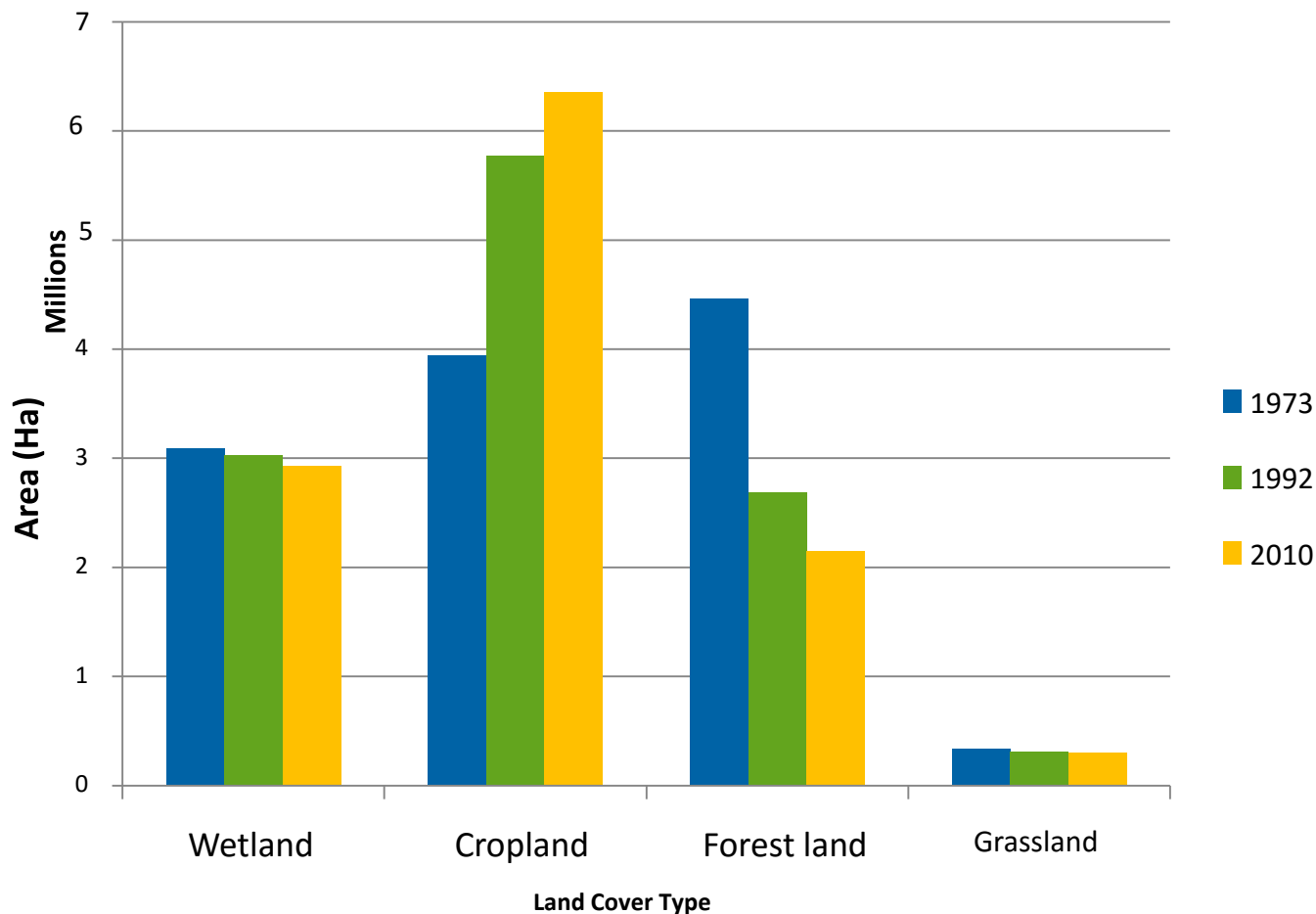
Sources: Tobacco Control Commission (www.tccmw.com)

- Tobacco contributes 35 % to the Gross Domestic Product (GDP) and 90% of the export earnings.
- However, tobacco growing has contributed to deforestation
 - ✓ for barn construction,
 - ✓ poles and twigs for hanging and drying the tobacco;
 - ✓ firewood for tobacco curing.



Major Drivers of Forest Loss in Malawi

5. Agriculture expansion



- 1973 to 2010, land under agriculture has increased by 2,412,615.87 ha
- Another report indicated that Agricultural expansion between 1991-2008...intensive agriculture had increased by 20%.

Source: LTS International Report, 2013

Major Drivers of Forest Loss in Malawi

6. Urbanization

Year	Percent (%) of population	
	Rural	Urban
1960	95.6	4.4
1990	88.4	11.6
2000	85.4	14.6
2010	84.5	15.5
2014	83.9	16.1

Source: World Bank Data 2015

(<http://data.worldbank.org/country/malawi>)

7. Brick burning



Major Drivers of Forest Loss in Malawi

7. Inadequate budgetary support from Government

Trends in budget allocation by selected sectors 2004/05 to 2010/2011

Ministry	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Water	1.0	0.8	0.8	0.9	1.7	2.0	3.1
Education	11.8	10.2	11.3	10.1	8.4	9.2	16.1
Agriculture	7.8	12.7	13.3	12.1	14.0	13.1	8.1
Health	10.2	7.3	7.8	10.5	10.1	8.9	15.5
Other	69.2	69.1	66.8	66.3	65.8	66.8	57.2

*Source of data: *MEJN national budget analysis 2010*

- Malawi has 18 ministries and 57% had to be allocated to the rest of the ministries (14 ministries)
- The forestry sector in Malawi remains the least prioritized sector
- The forestry sector in Malawi is among the least funded sectors

Experience as a Norman Borlaug Fellow

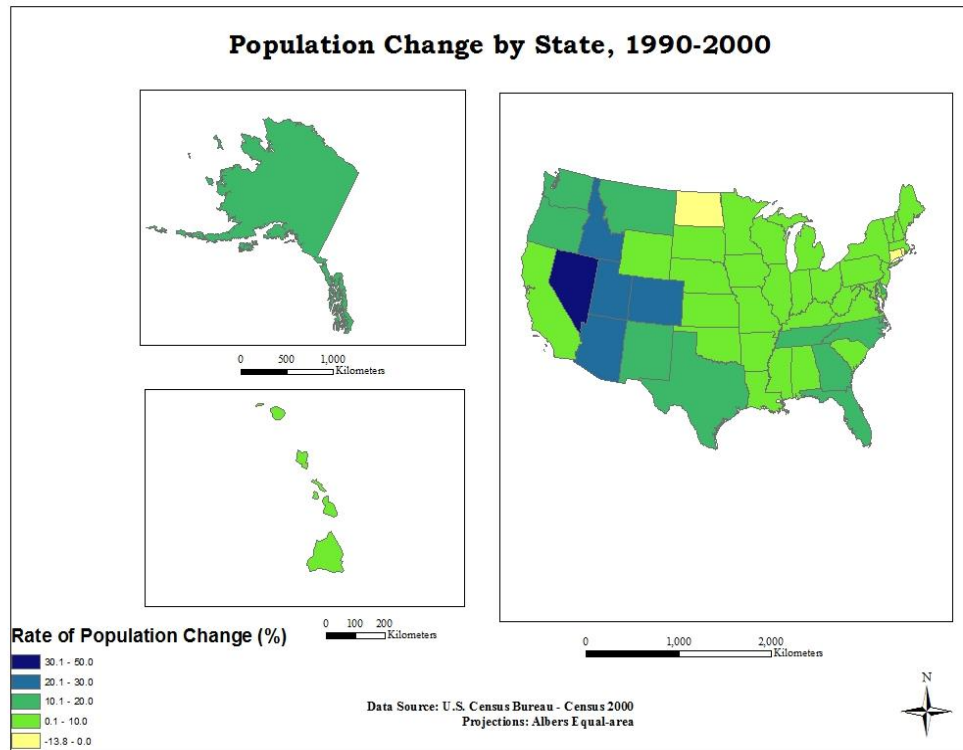


- Tour of the campus
- Introduced to:
 - ✓ MU CAFNR members
 - ✓ International Programmes Coordinator, Ms Christy Copeland
 - ✓ Dr. Nianfu Song & Dr. Shifley (US Forest Service)
- Meeting with two mentors
- Introduced to Members of staff - Dept of Forestry & USFS
- GIS PhD students

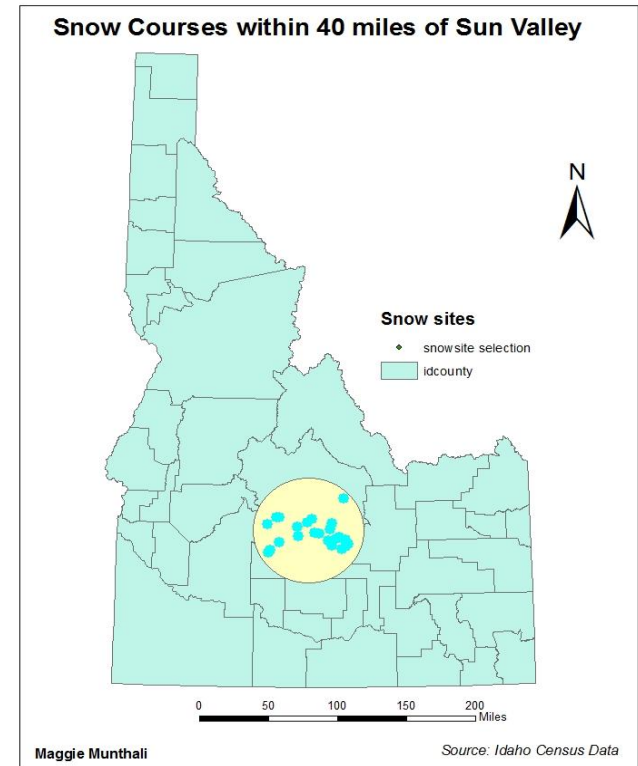
GIS projects

- Vector inputting and editing
- Map projections and coordinate systems,
- Cartography,
- Data exploration,
- Vector data analysis
- Raster data analysis
- Terrain mapping and analysis
- End of fellowship evaluation project (Midterm)

Examples of GIS Projects

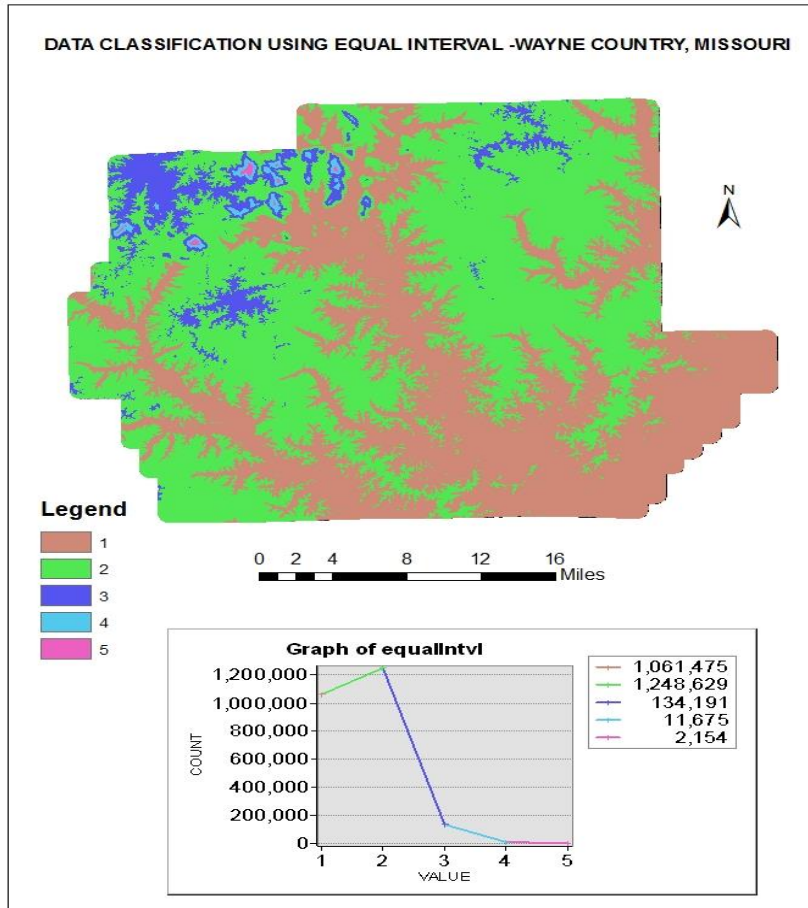


Data display and cartography

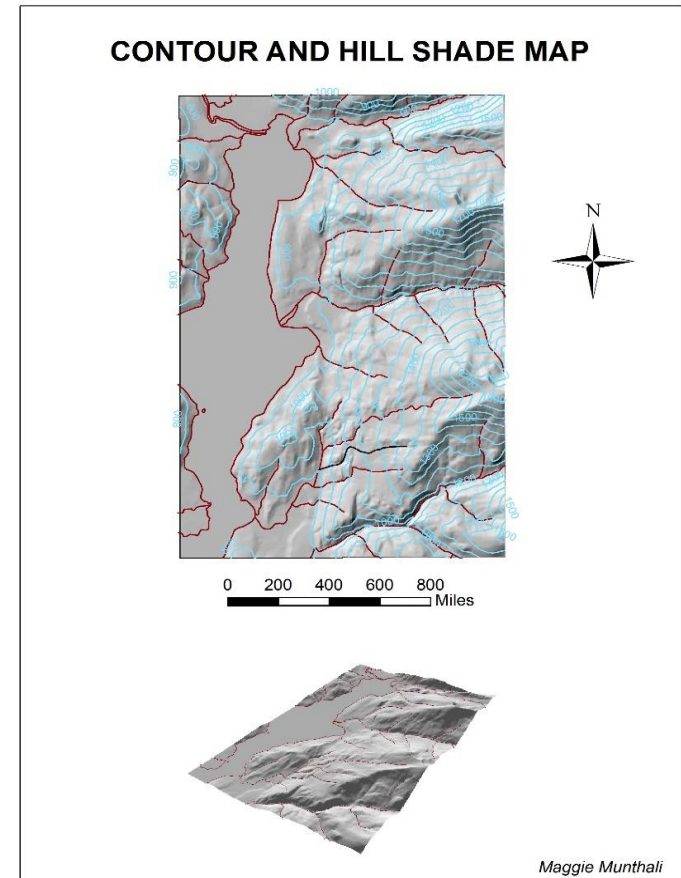


Data Exploration

Examples of GIS Projects

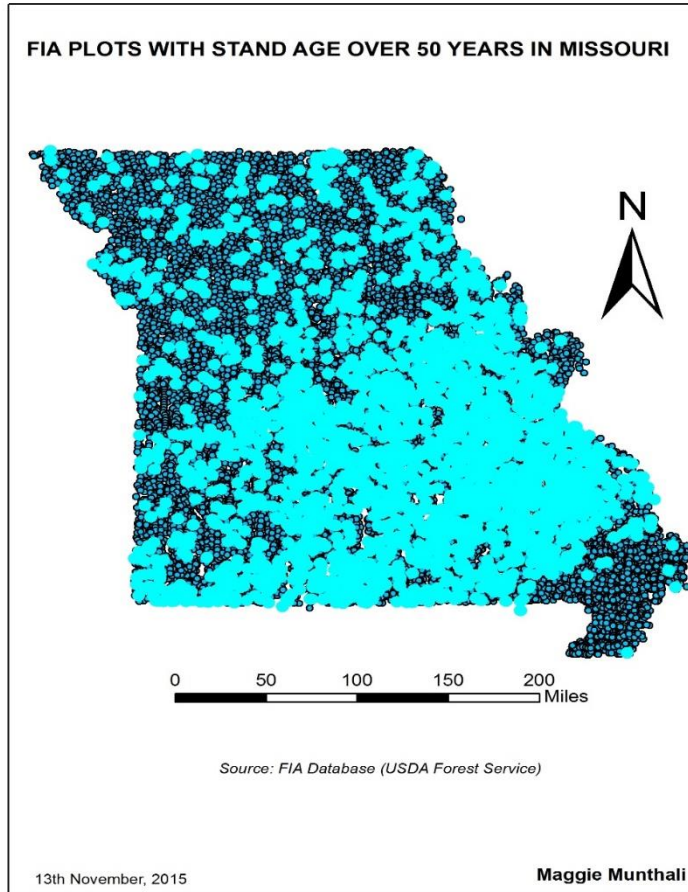


Raster data analysis



Terrain Mapping & Analysis

Examples of GIS Projects



Final Midterm Project



Prof. Hong He & Maggie

Field Visit to Mark Twain National Forest

- Restoration activities (prescribed fire Treatment)
- Scenic places (Springs, camping, hiking and fishing)



Symposium on World Food Prize , Iowa



Maggie with Christie Vilsack from USAID



Maggie with Phil Kirsting, FAS Admin

Side events

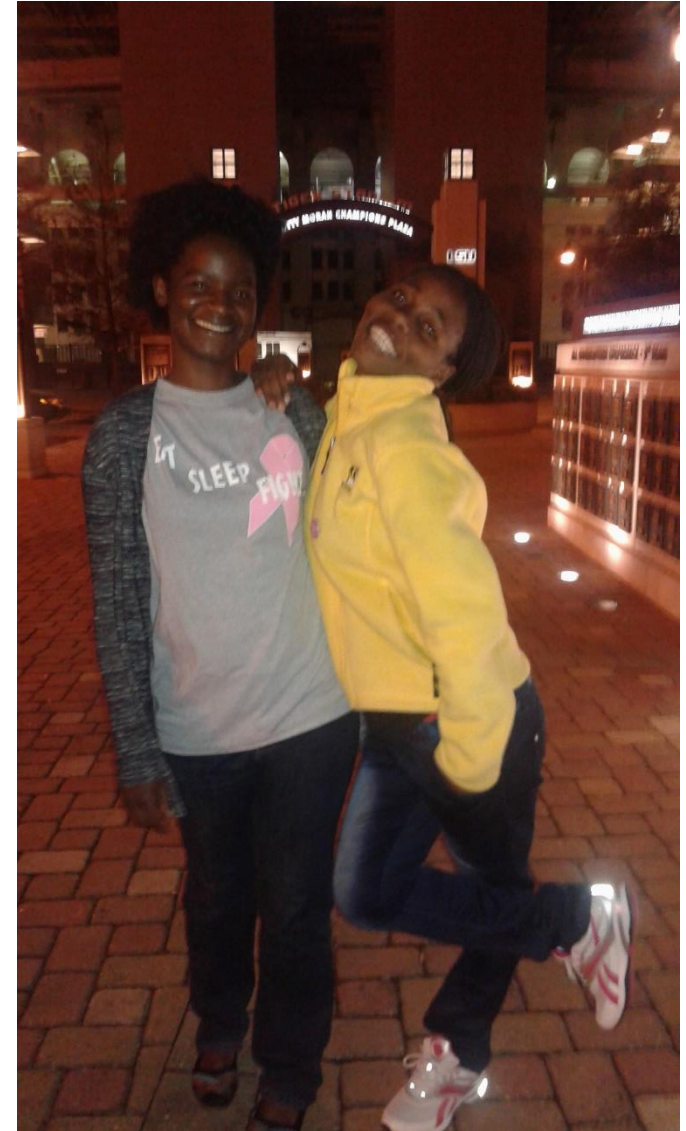
- Role of youth in agriculture
- How to inspire girls to pursue education and careers in STEM (Science, Technology, Engineering and Mathematics)
- **Networking**

World Food Prize symposium in pictures



Society for American Foresters Convention

- Side events on geospatial technologies
- US Forest Service National Silviculture Workshop
- Networking



Research Summary

Aim: Assess the land use and land cover changes in Mua-Livulezi Forest Reserve between 1990 and 2014

Why Changes in LULCC?

- Sustainable forest management
- Because forests provide the bulk of the world's forest products and services.
- Forests act as sinks and sources of carbon, so monitoring forest additions and deletions through land-use change helps scientists and decision-makers to gauge the forests' ability to reduce net greenhouse gas (GHG) emissions.
- Changes in forest cover affects the ability of forest to provide goods and services e.g employment, wood products, non-wood forest products and services.

Why Remote sensing and GIS tools in forest management?

- Provide detailed, accurate, consistent, cost effective, repetitive, synoptic and timely data for the characterization of land use, land cover, environmental monitoring.
- Easy to identify the areas where illegal activities are taking place in protected areas
- Used for biodiversity management. Aerial and satellite photographs can be used
 - to determine the presence and distribution of vegetation within a protected area.
 - to determine the presence and distribution of **invasive species** within an ecosystem

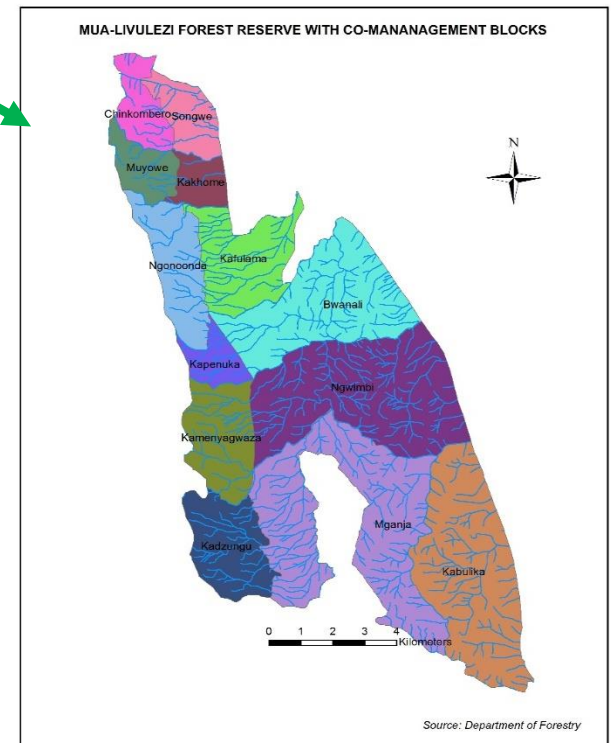
Study Area

Name = Mua-Livulezi Forest Reserve, Dedza District

Area = 12,147 ha

Why Mua-Livulezi FR

- source of a number of perennial rivers
- source of wood energy in form of charcoal and firewood to a majority of households in Dedza district as well as neighboring districts
- the reserve is being encroached through establishment of illegal farms and settlements, illegal pit sawing, charcoal production and late bushfires



Data Sets and data collection

- Downloaded Landsat TM and ETM+ satellite data for the years 1990 and 2014

Land Use and Land Cover Classification

- Five classes identified: water bodies, bare land, agriculture (cultivated land), forests and built-up

Land Use and Cover Change Detection Analysis

- Use ArcGIS to classify the data
- Land Change Modeller used to detect the changes between the two data sets

Outcomes of the Fellowship

- Learnt knowledge and skills in the use of remote sensing and GIS tools
- Networking with very prominent researchers
- Opened doors for PhD opportunities
- Started development of manuscript for publication

Future Plans and Cooperation

- Manuscript development and publication
- Pursue PhD in Geography at University of Pretoria, South Africa
- Develop collaborative research and trainings between University of Missouri and Department of Forestry
- Host my mentor in Malawi in 2016

Acknowledgements

- Mentors (Dr. Francisco Aguilar and Prof. Hong He)
- Members and staff of CAFNR, International Programs
- Staff of US Forest Service
- PhD GIS students
- USDA (Foreign Agricultural Service), Borlaug Fellowship Program



**THANKS FOR YOUR
LISTENING**