A seminar on:

Population status of the endangered *Boswellia papyrifera* tree, and prioritizing its population declining factors and their conservation solutions by involving communities

By
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Adigrat university, Ethiopia

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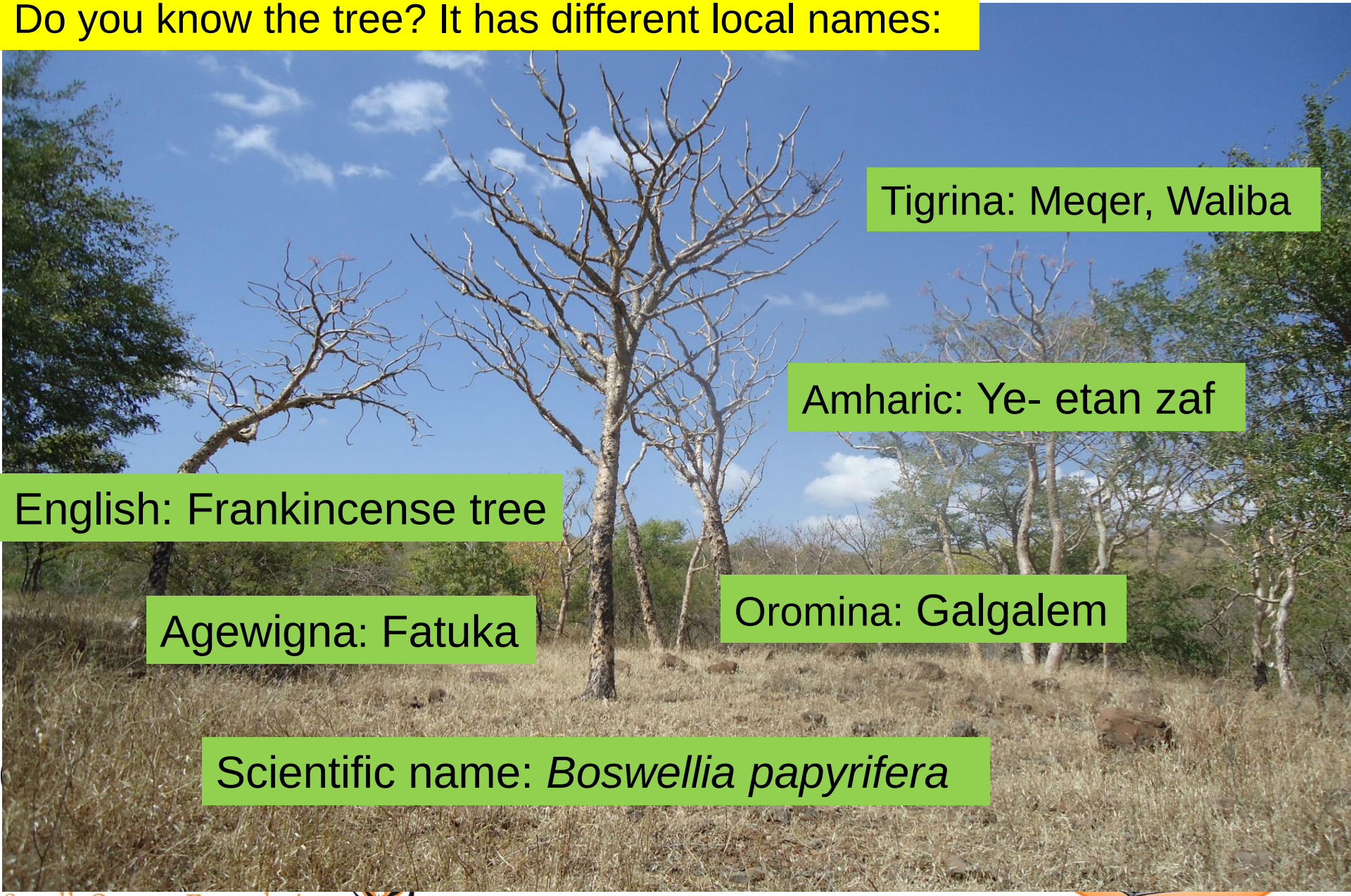
Do you know the tree? It has different local names:



Tigrina: Meqer, Waliba

Amharic: Ye- etan zaf

English: Frankincense tree

Agewigna: Fatuka

Oromina: Galgalem

Scientific name: *Boswellia papyrifera*

1. Introduction

- The tree is native to Ethiopia, growing mainly in Tigray, Amhara , Oromia and Somali regions.

- However, Tigray and Amhara regions **are (> 65%)** considered to be the main growing regions for the tree

Introduction Con't

The tree grows on degraded sites with **very shallow soils, steep rocky slopes:**

- Altitude = 950–1,800 m a.s.l.
- Average temperature = 20-29 ^{o}C
- Total annual RF < 900 mm

Growing of the tree on shallow soils, rocky and sloppy areas

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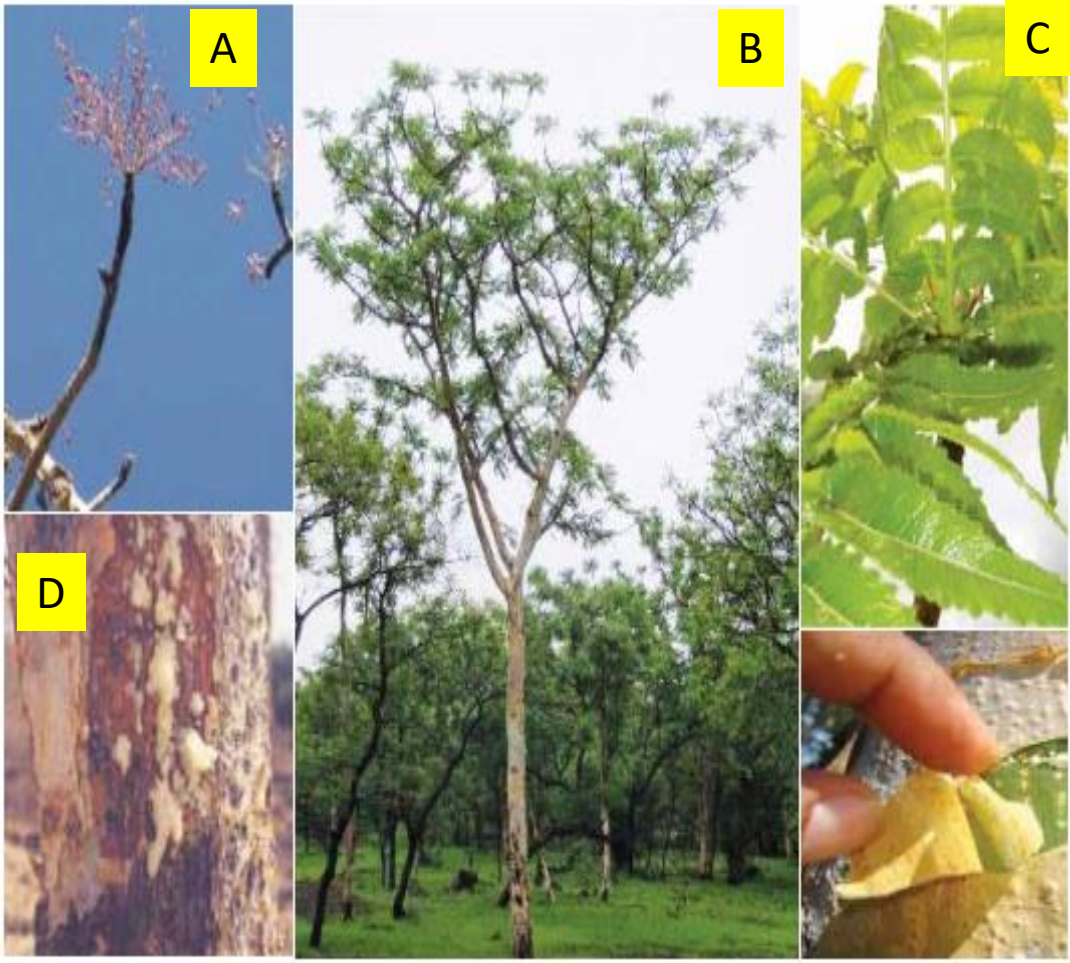
Introduction Con't

B. *papyrifera* is:

- Family: Bruceraceae
- Deciduous tree up to 12 m = **B**
- Rounded bole = **B**
- Bark is white = **B**
- Compound leaves = **C**
- Flower is monocious= **A**
- Flower is pink in color **= A**
- Resin in the bark = **D**
- Seeds are enclosed by red capsule **= A**



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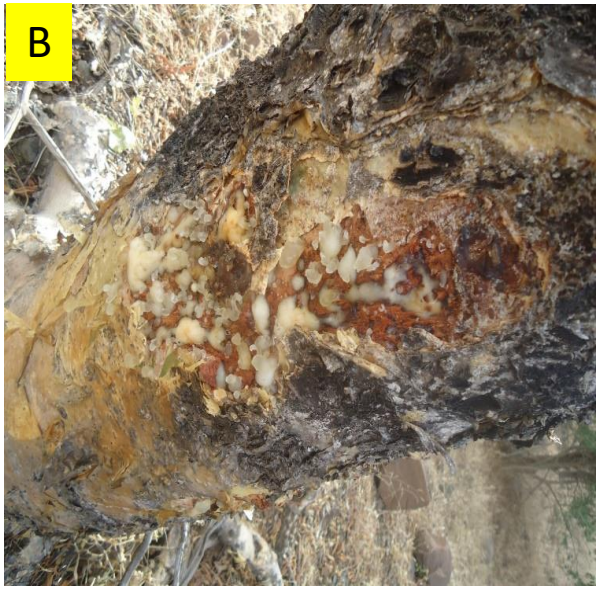
Introduction con't

- The tree has several **economic, ecological and cultural benefits for many Ethiopians.**
- It produces a very known aromatic resin known as **frankincense form its bark**



A) Tapping of the tree, B) Resin on bark after tapping and C) dry frankincense

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Frankincense is exported (China and EU) for its multi industrial uses

Multi-uses of frankincense: A) burning incense B) ingredient for incense C) ingredient for lotion D) ingredient for perfume

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- Ethiopia earns considerable foreign currency from export of frankincense, e.g 2015/2016 exported 4612 tons, and earned **US$ 7.7 million (150 million Birr).**

- Frankincense is also domestically used in the country by churches for religious ceremonies, with annual consumption **of 2 million kg (estimated 80 million Birr or US$ 2 million)**

- Frankincense collection, grading, processing and marketing creates more than **35, 000 job opportunity**

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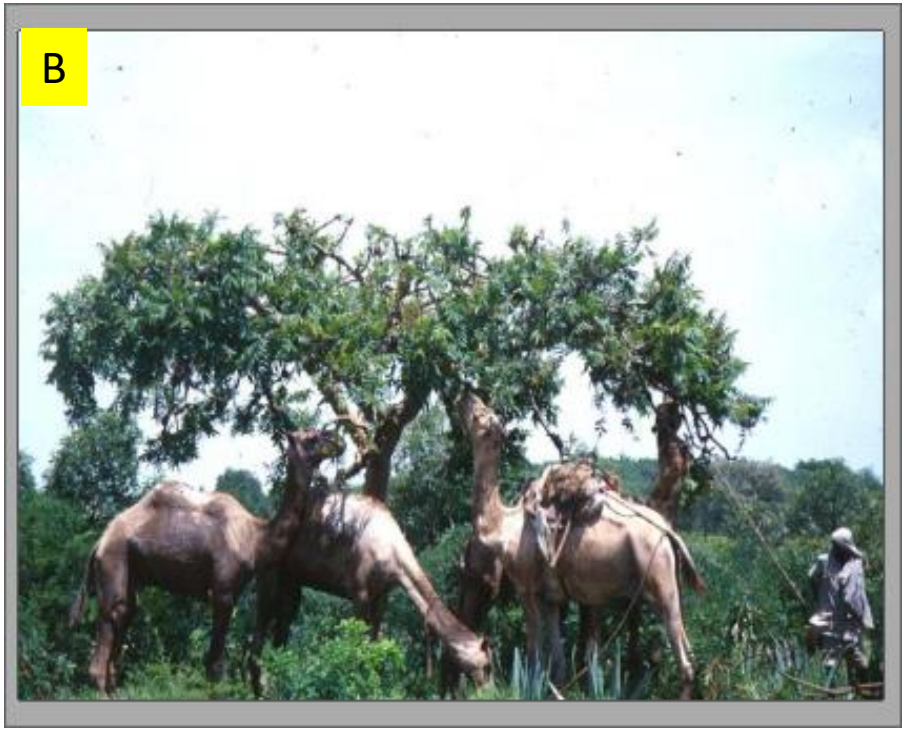
Introduction con't

The tree has **also ecological benefits:**



A) Growing of the tree in sloppy areas thereby reducing soil and water erosions
B) Source of animal feed during dry periods

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- Though the tree has several benefits, it is now under great threatening (declining of its populations due to different factors)

- For example, in Tigray region, North Ethiopia, where the main growing area of the tree:

  ➢ **510,000 ha** of land was covered by the tree (in 1980) and this declined into **332,562** ha in 2000 (deforestation rate of 1.8% per annum)

  ➢ The remaining populations of the tree are so mature (e.g. **> 76% of the trees have a DBH greater than 30 cm DBH** (lack of small trees) (Kindeya *et al*. 2003**)**

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- Due to the declining populations of the tree, incomes from **the tree also in decreasing trend in Ethiopia**

- Considering the population declining, the tree has been listed by **TRAFFIC (monitoring program of WWF and IUCN)** among the **endangered** species that need priority in conservation

- Therefore, it needs an urgent research to study current population status of the tree and factors that decline its populations

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- This project comes to study about the tree with following objectives:

➢ to quantify the current frequency, structures and regeneration of the tree species

➢ to prioritize the factors that diminish population of the tree species by involving the local communities

➢ to prioritize community-based conservation solutions for the tree by involving local communities and relevant stakeholders

➢ to share results of this project with community, experts, researchers & students to improve their awareness on conservation of the tree

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2. Methods used

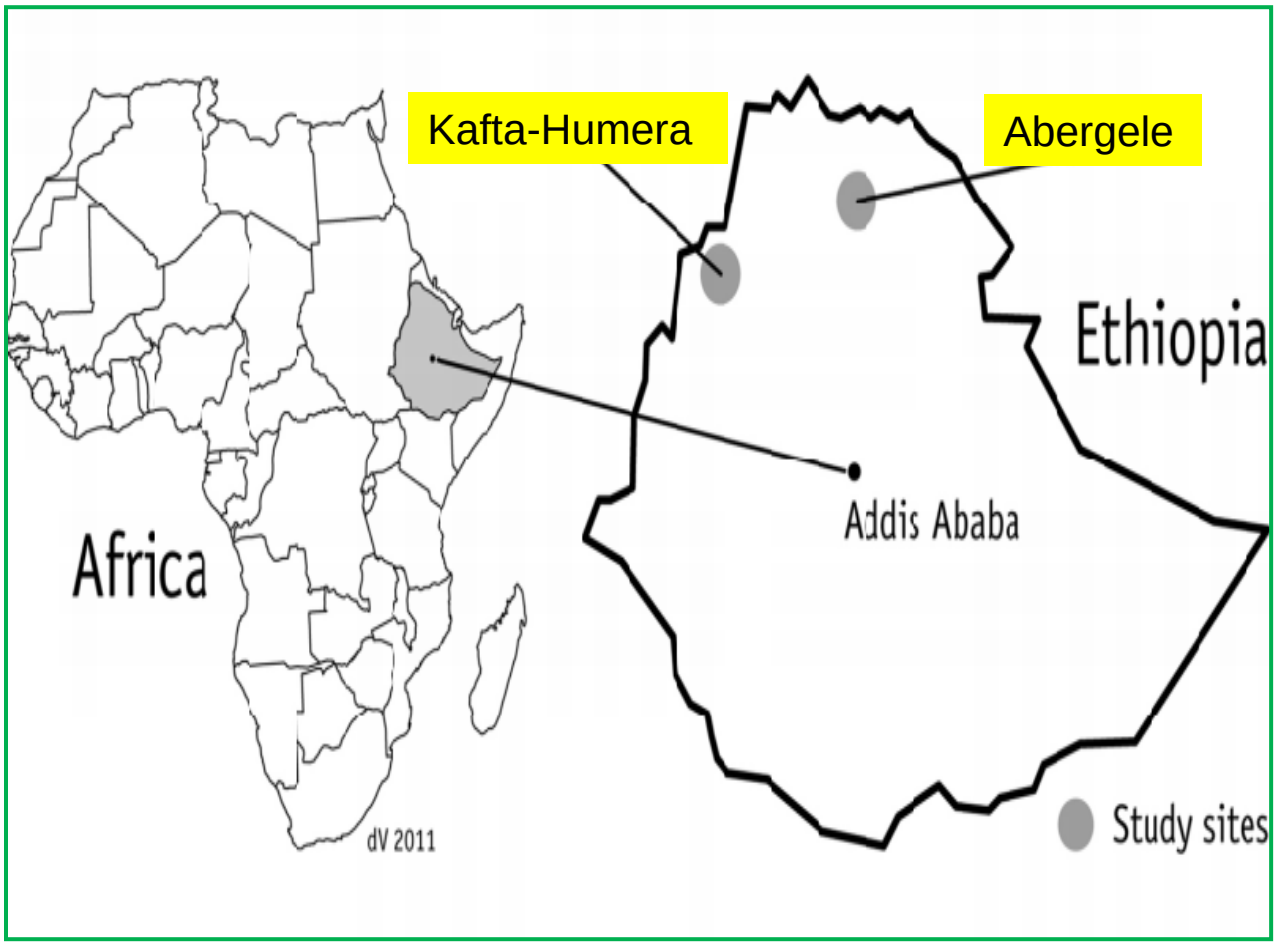
2.1 study districts

- Kafta-Humera distract, Western Tigray, Ethiopia

- 95, 000 ha of the tree
- Temp= 23-40 ^{o}C
- RF= 400-700 mm

- Abergele district, central Tigray, Ethiopia

- 2,300 ha of the tree
- Temp= 23- 36 ^{o}C
- RF= 450 mm



Map adopted from Abeje et al. 2011

Methods con't

To study the **current population structures** of the tree:

- 20 sample plots (20m x 20 m) from each of the study were used
- From these plots, **DBH and regeneration** were measured

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Methods con't

To prioritize factors that **declining populations** of the tree and its conservation solutions:

- 50 local community from each of the study district were interviewed
- Experts were also interviewed

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Methods con't

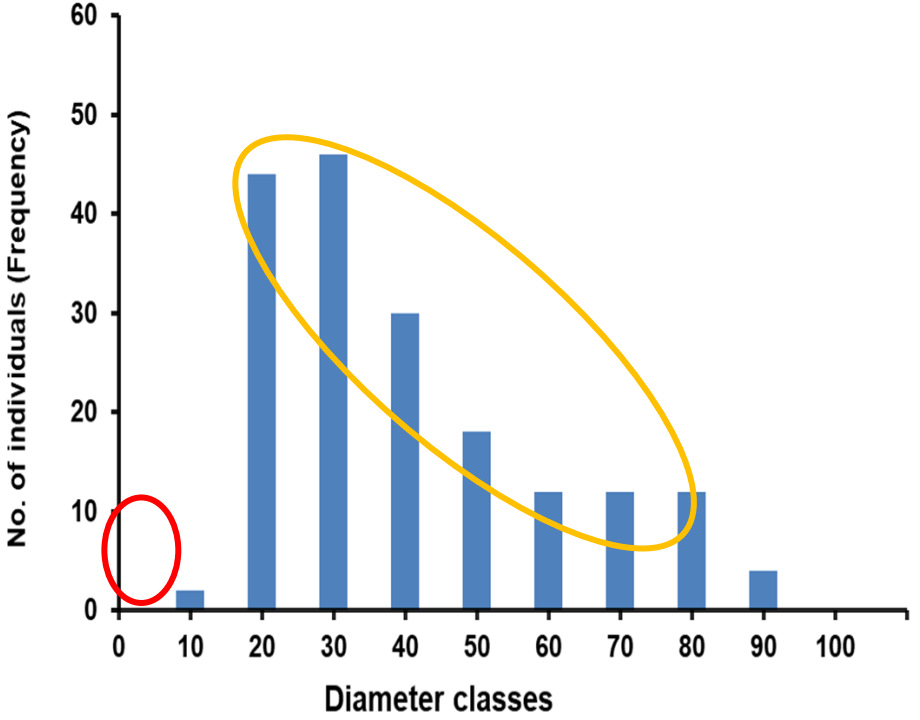
- To prioritize, rank and sum the data collected from community and experts, **Analytical Hierarchy Process (AHP) model** was used
- AHP model compares the factors using mathematical scales (1-7)

Intense	Reciprocal	Definition	Explanation
1	1	Equal importance	Tow factors are equally affecting the tree
2	1/2	Equally to moderate	One factor slightly affect than the other
3	1/3	Moderate important	One factor is moderately affect
4	1/4	Moderately to strong	One factor is moderately plus
5	1/5	Strongly important	One factor is strongly affect
6	1/6	Strongly to very strong	One factor is strongly plus affect
7	1/7	Very strong important	One factor is very strongly affect

3. Results

Current population status of **the endangered B. *papyrifera* in Kafta-Humera district,** Western Tigray, Ethiopia

- The tree is with **zero regeneration**
- Absence of small tree **(DBH <10 cm)**
- More than 90 % of the tree have **a DBH > 20cm**



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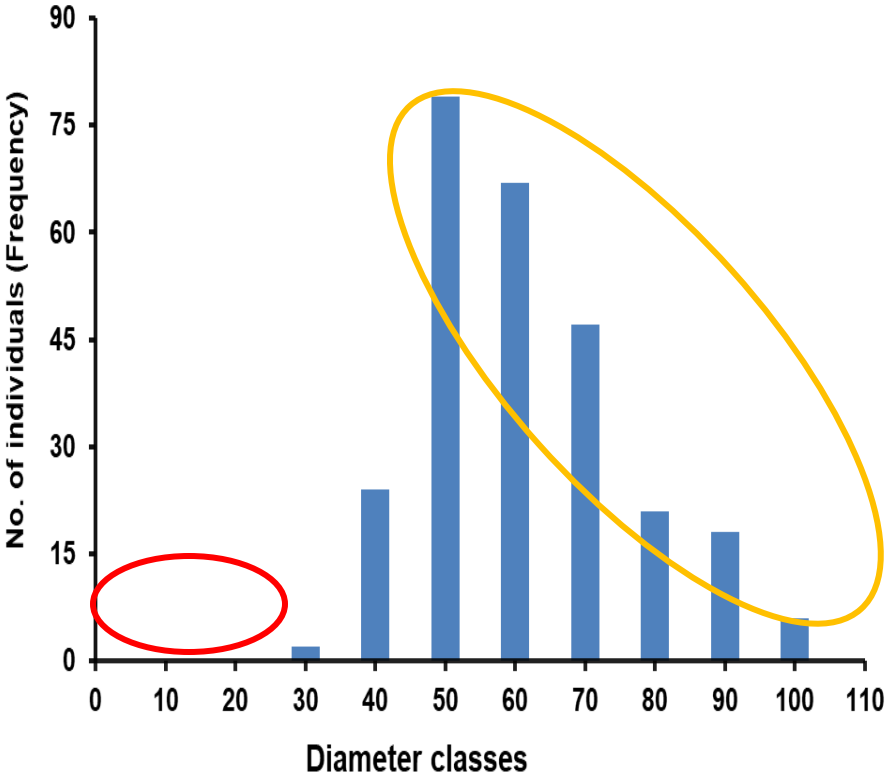
Results con't

Current population status of **the endangered B. *papyrifera* in Abergele district,** Central Tigray, Ethiopia

- The tree is with **zero regeneration**
- Absence of small tree **(DBH <20 cm)**
- More than 98 % of the tree have **a DBH > 30cm**



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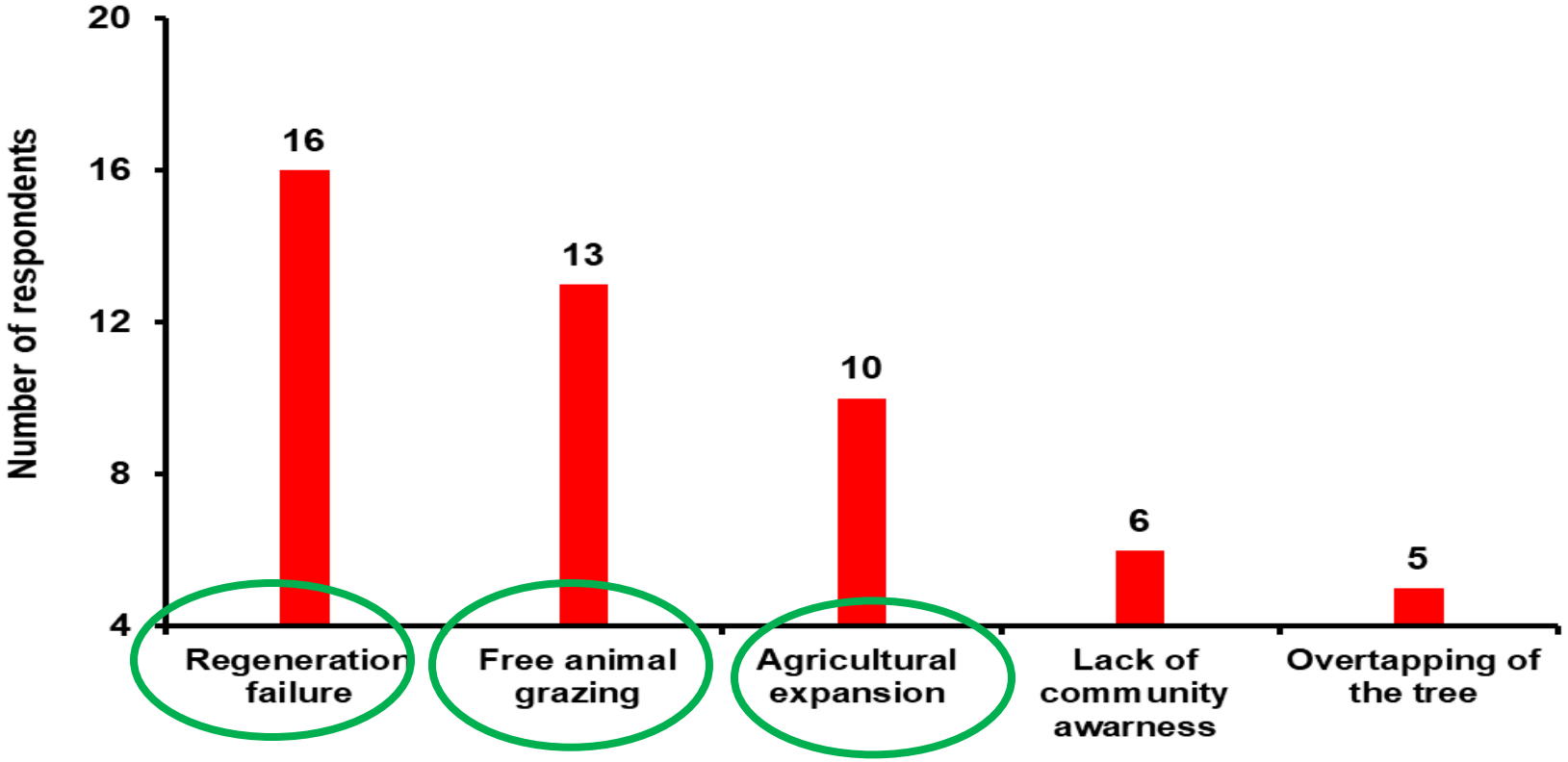
Results con't

Prioritize factors currently **declining populations** of the tree species by involving local community in Western Tigray, North Ethiopia



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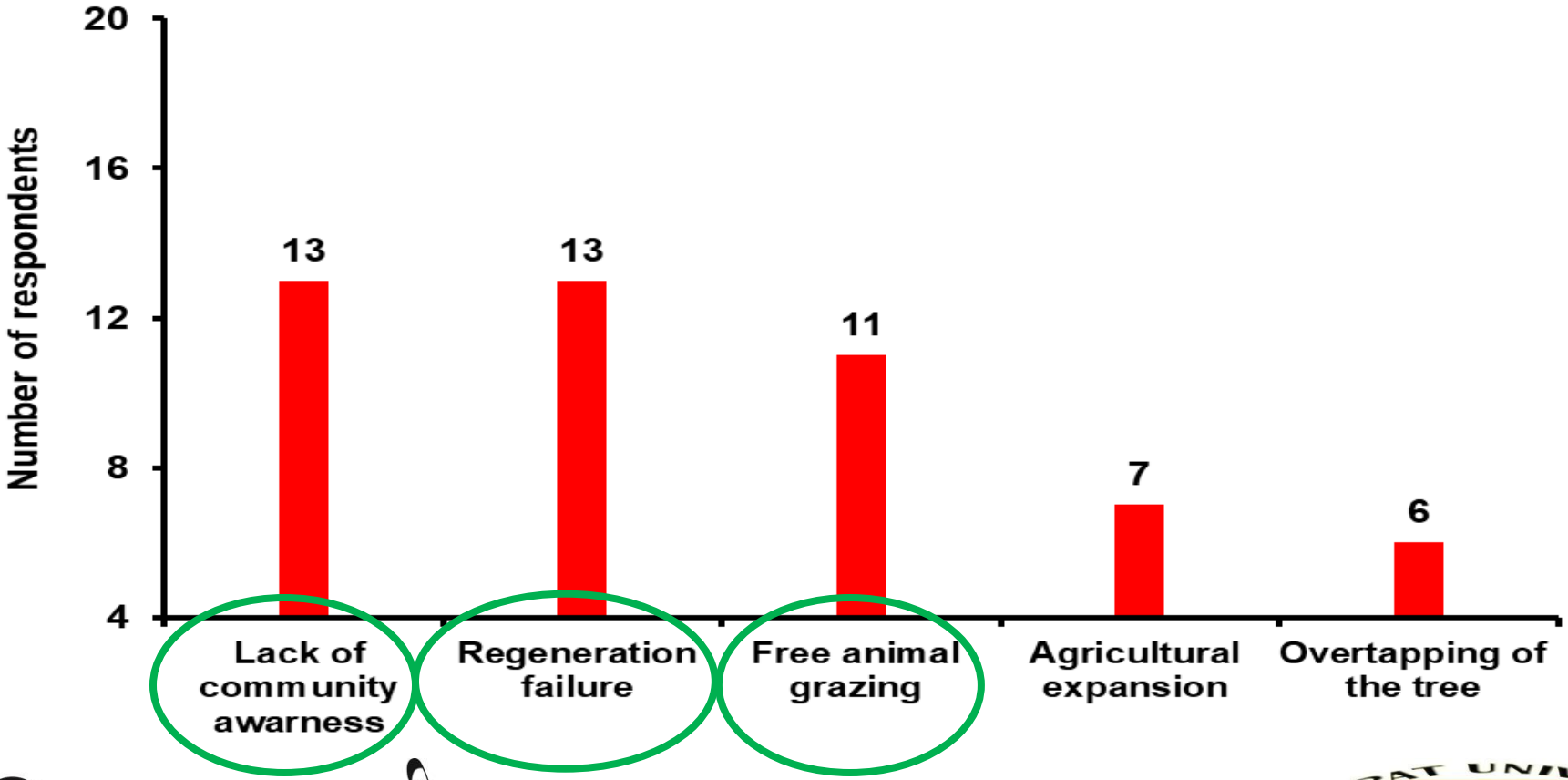
Results con't

Prioritize factors currently **declining populations** of the tree by involving community in Central Tigray, North Ethiopia



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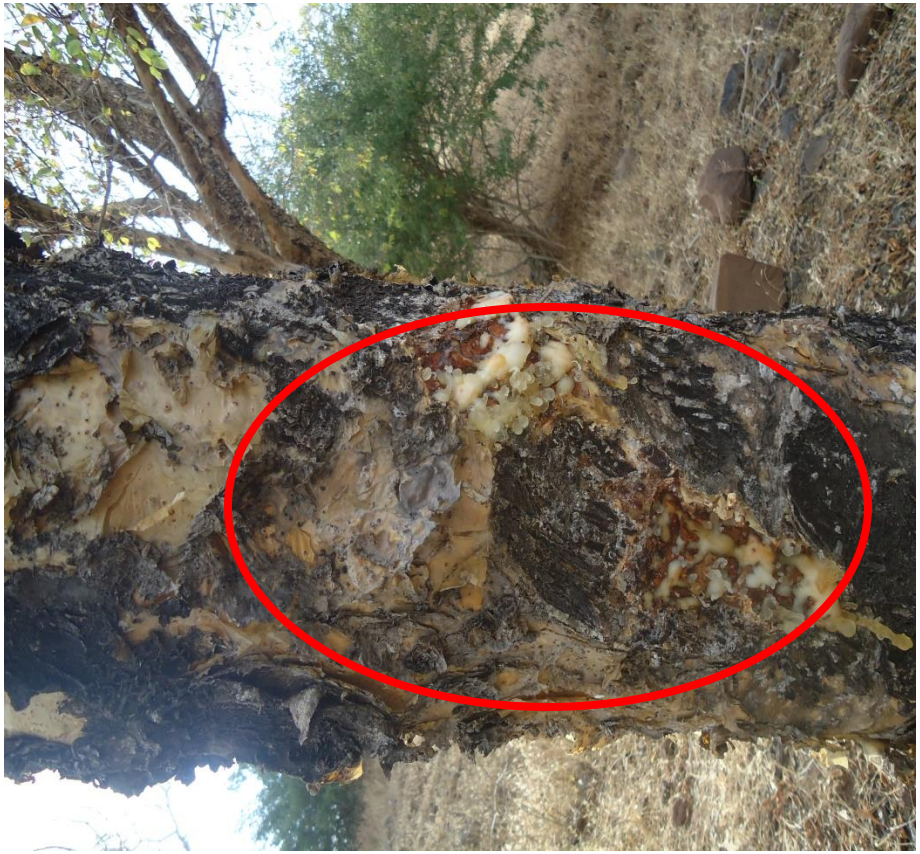
Results con't

- As the community prioritized, we also observed these factors still affects populations of ***B. papyrifera***

A) Free animal grazing

B) Agricultural expansions

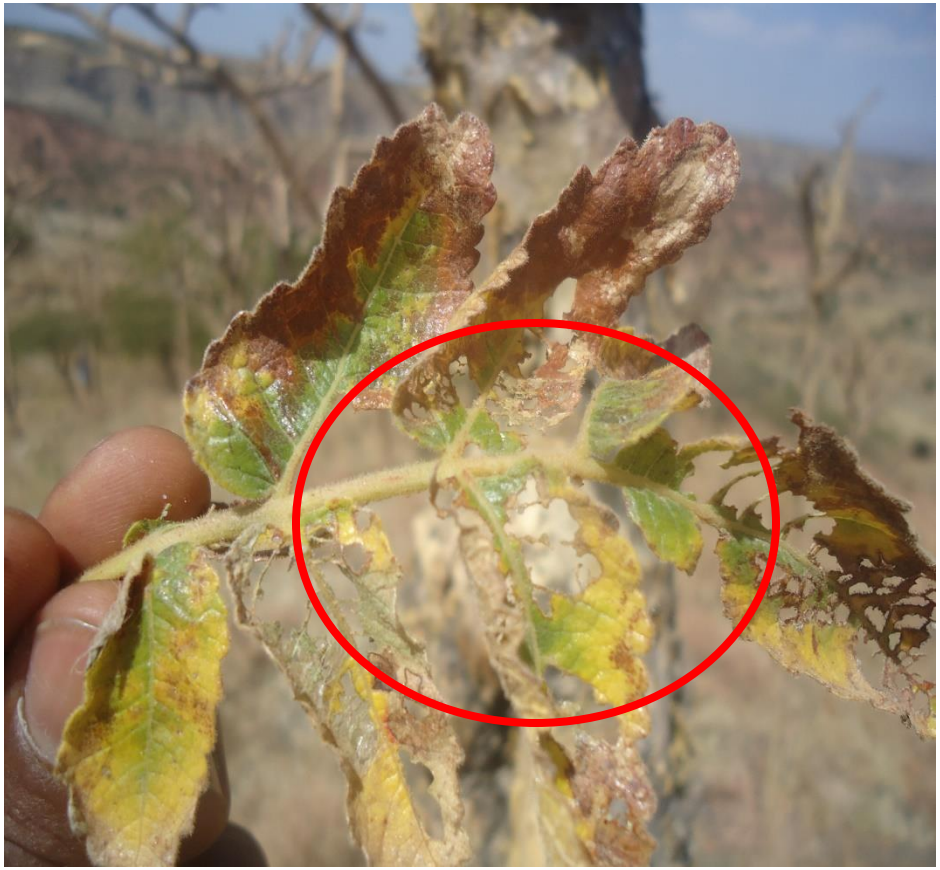
Results con't



C) Over tapping

D) Wind

Results con't



E) May be an insect/disease

F) May be an insect/disease

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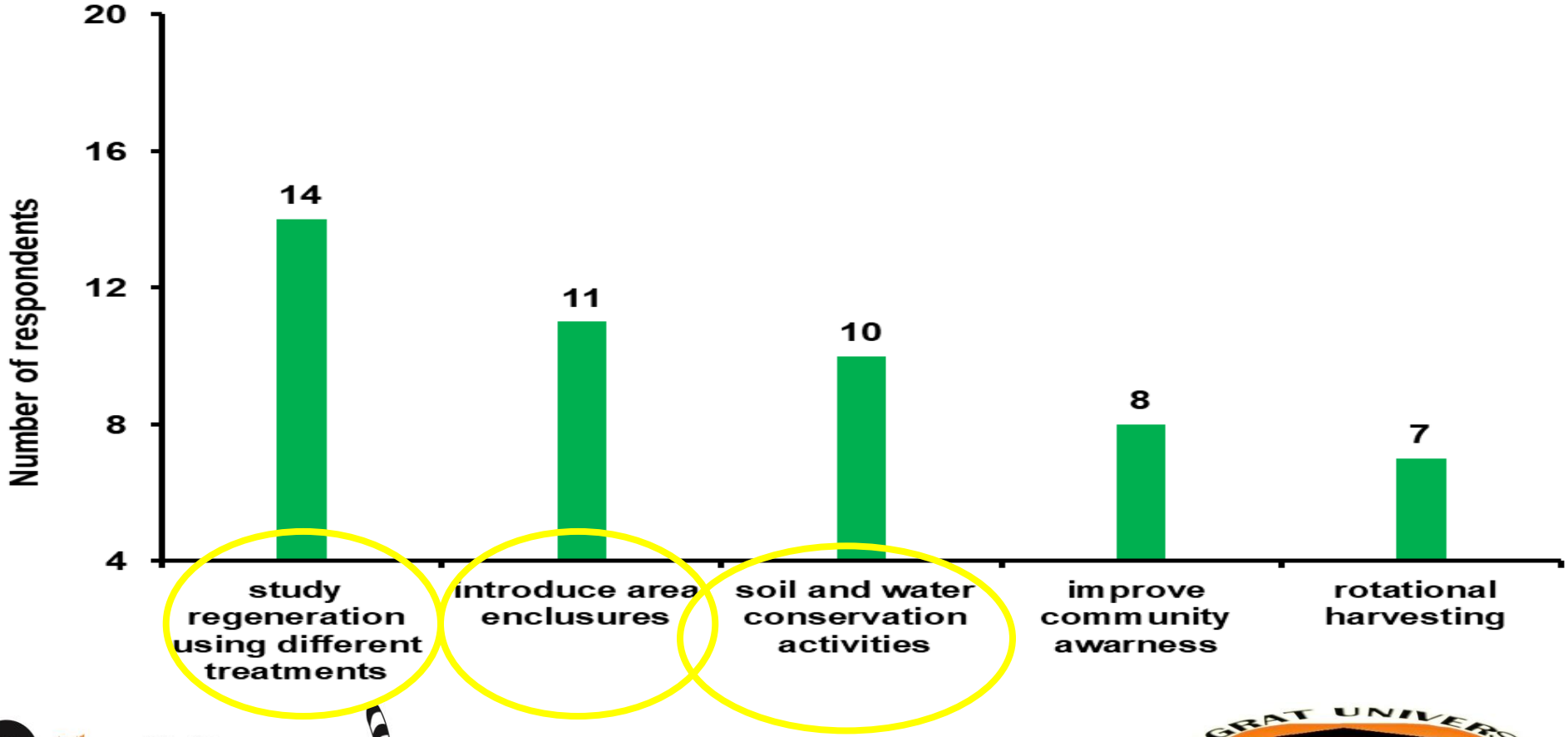
Results con't

Prioritize **conservation solutions** for the tree species by involving local community in Western Tigray, North Ethiopia



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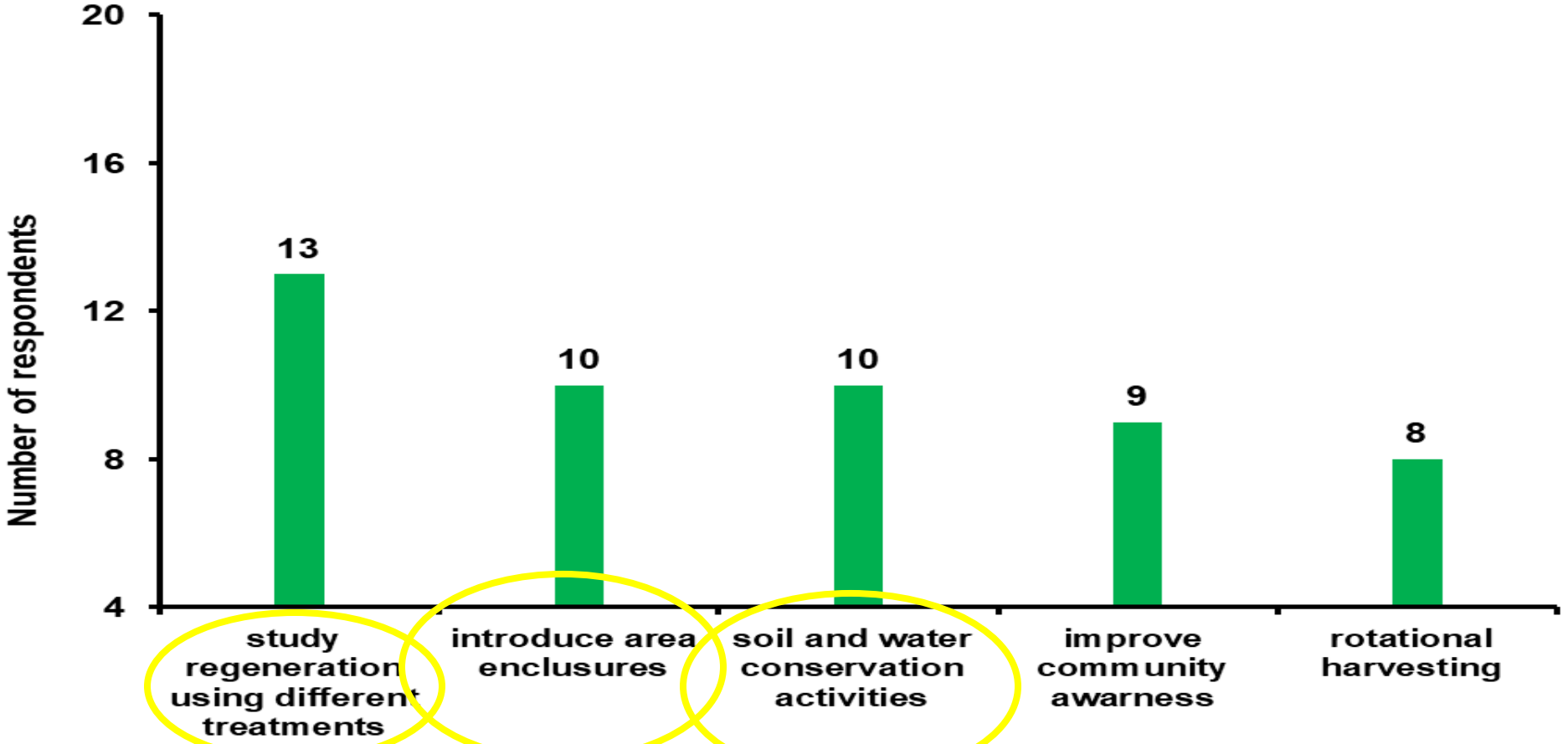
Results con't

Prioritize **conservation solutions** for the tree species by involving local community in Central Tigray, North Ethiopia



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4. Conclusion

Key conclusions of the project:

- In Central and Western Tigray, North Ethiopia ***B. papyrifera*** **is heading to extinction** (absence of regeneration and small trees)

- The key factors **for declining populations** of the tree are prioritized as:

  i) regeneration failure

  ii) free animal grazing

  iii) lack of community awareness

  iv) agricultural expansion

  v) over tapping

Conclusion con't

- The **key conservation solutions** for the tree are also prioritized as:

i) study regeneration of the tree using different treatments
ii) introduce area enclosures into the areas
iii) introduce soil and water conservation (SWC) activities
iv) improve community awareness
v) rotational harvesting

5. Recommendation

Key recommendations of the project:

- **Regeneration (germination) of the tree** should be studied using different treatments (e.g cultural, chemical and biotechnological)
- Roles of **area enclosures and SWC activities** on conservation of the tree species should be studied
- Awareness of the community **on utilization and conservation** of the tree species should be improved

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Acknowledgement

- Kindly acknowledged **The Ruffor - UK based foundation** for its full fund for the project

- Kindly acknowledged **Idea Wild- USA** based charity for its equipment support for the project

- **All stakeholders** who participated in the project

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Thank you very much!

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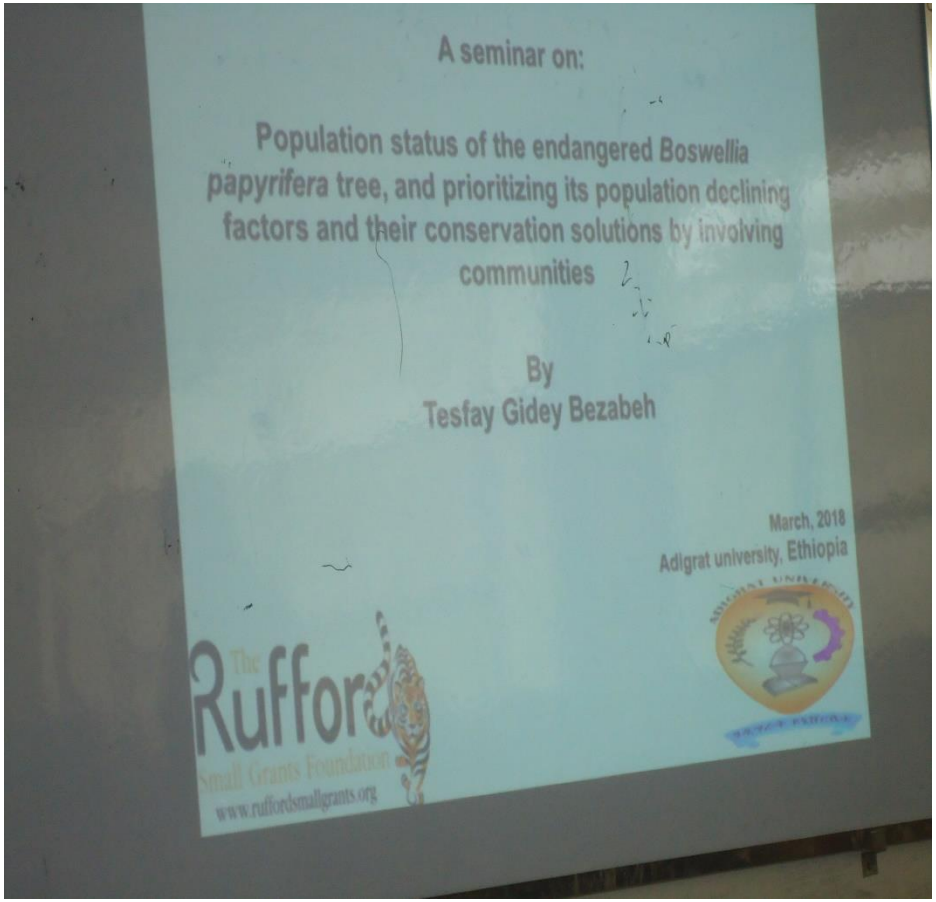
Some pictures during the workshop



Opening speech for the workshop by Department head of plant science, Adigrat University

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Some pictures during the workshop

During my presentation for stakeholders (researchers, experts and students)

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Some pictures during the workshop

Discussion on results of the project with participants (including questions and answers)

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Group photo at the end of the workshop

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