Identification and Prioritization of Deforestation Drivers of the Remnant Northern Ethiopian Desa'a Forest for Developing Its Future Conservation Actions

By
Daniel Hagos BERHE
Supported By RSG

The Rufford Foundation
www.rufford.org @ruffordgrants

Identification and Prioritization of Deforestation Drivers of the Remnant Northern Ethiopian Desa'a Forest for Developing Its Future Conservation Actions

December 25, 2019
Adigrat University

The Rufford Foundation
www.rufford.org @ruffordgrants

Presentation outline

Introduction

Methods

Results and Discussion

Conclusion

Introduction

The Desa'a forest is one of the

key remnant dry Afromontane biodiversity hot spots of Eastern Africa.

59 Ethiopian national forest priority areas for conservation of biodiversity

Even though Desa'a is a protected forest, it is now severely deforested due to different factors.

Anthropogenic

Natural

Introduction

- Following its continuous deforestation, it has only now covered an area of 80,000 ha from which it was 120,000 ha in 2006.
- The continuous deforestation was not only losing its coverage but also its biodiversity
  - its native *Olea europaea* tree is now heading to extinction (Hadgu et al., 2013).

Introduction

Specific Objectives

Specific objectives

- Identification and prioritization of deforestation drivers for the remnant biodiversity hotspot of Desa'a forest
- Prioritize future community-based conservation actions for rehabilitating the degraded Desa'a forest and protecting its very valuable species
- To assess and identify deforestation drivers inside of Desa'a forest through field survey

Introduction

Specific Objectives

Developing a long and short term conservation action plans for future conservation of the degraded Desa'a forest

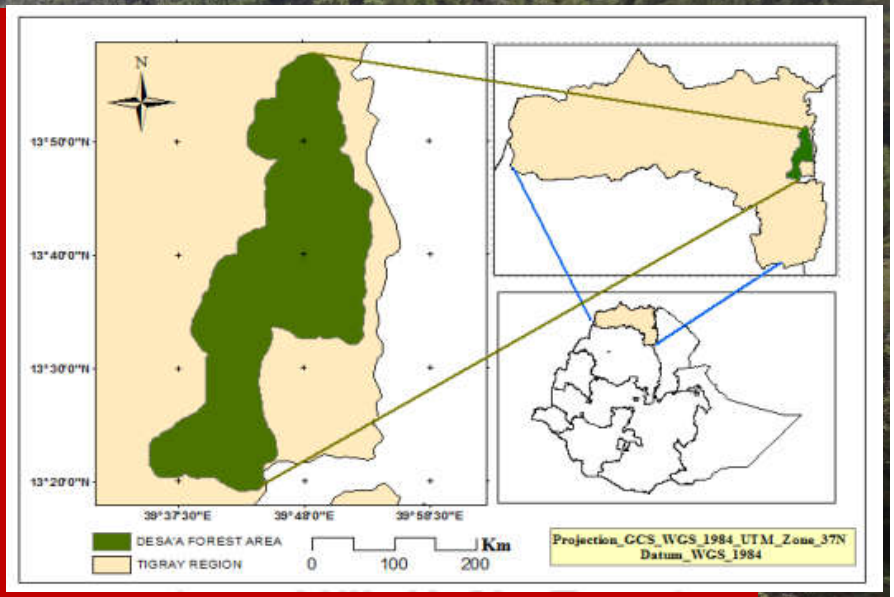
Train local community and local stakeholders for raising their awareness on deforestation drivers of Desa'a forest and its future conservation interventions

Share project results with local and national stakeholders through workshops for raising their awareness on future conservation of the forest

Methods

Area Description

- Conducted in the Desa'a Forest
  - 13°53' - 13°56' N
  - 39°48' - 39°51' E
- Elivation
  - 1400 - 2862 m asl
- Rainfall
  - 406 - 692.5 mm
- Temperature
  - 7.5 °C - 33.4°C



Methods

Sampling for social survey

- Two villages was sampled purposively
  - Desa'a village
  - Era village
- 16 key informants
  - (8 from each village)
- 80 individual households
  - (40 from each village) for interview
-

Methods

Sampling and Plot Design

- Systematic sampling
- Plots were stablished at 500 m interval
- In total 32 sampling plots were used for vegetation survey

Methods

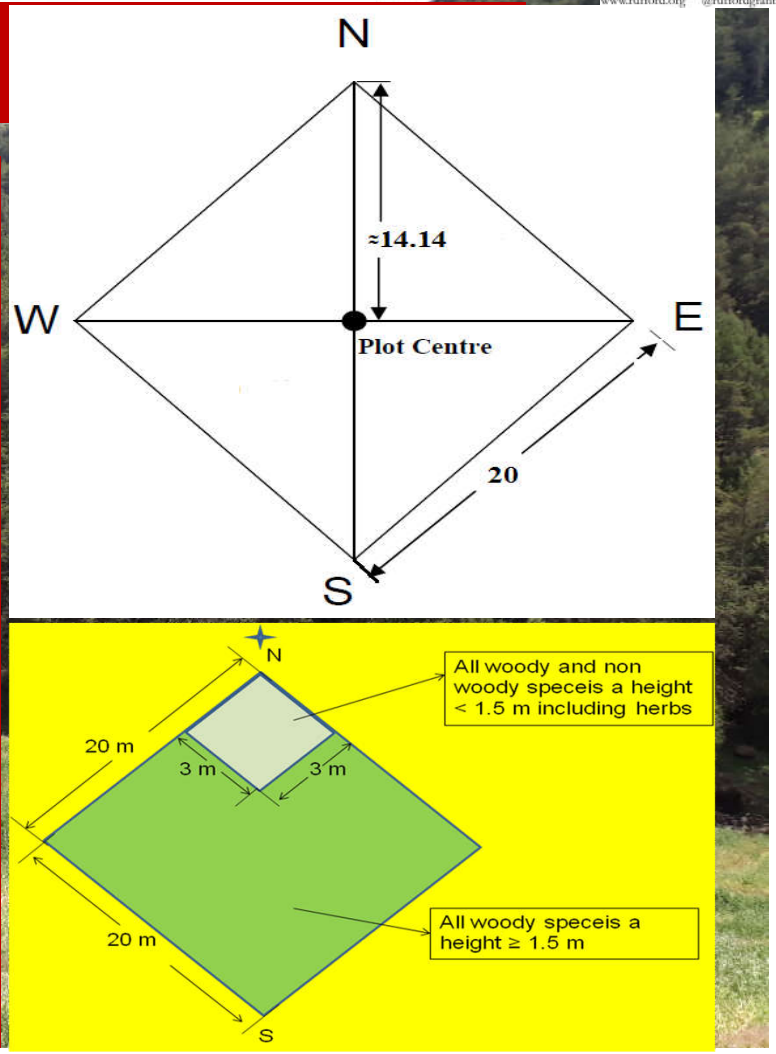
Plot based data collection

- General plot information
  - General topography,
  - Slope from plot centre,
  - Aspect
  - Soil information,
  - Fire occurrence,
  - Grazing intensity, and
  - Occurrence of invasive plants.

Methods

Vegetation Data

- Woody Vegetation (20 × 20 m plot size)
  - DBH and DSH
  - Height
  - Health status
  - Dead trees counted
  - Ecosystem health indicators (mosses and orchids)
- Woody vegetation in the nested plot of 3 × 3 m plot
  - saplings
  - Seedling regeneration counted
  - Herbaceous cover



Methods

Floristic data analysis

- Importance Value Index
- Floristic composition
- Species diversity indices
  - Shannon and Simpson
- Frequency
- Species abundance
- Relative dominance

$$\text{Relative density} = \frac{\text{Number of individual of the species}}{\text{Number of individual of all the species}} \times 100$$

$$\text{Relative frequency} = \frac{\text{Number of occurrence of the species}}{\text{Number of occurrence of all the species}} \times 100$$

$$\text{Relative dominance} = \frac{\text{Total basal area of the species}}{\text{Total basal area of all the species}} \times 100$$

Importance Value Index=Relative density + Relative frequency + Relative dominance

Results and Discussion

Table 1: Uses of Desa'a forest by the stakeholder groups

For individual farmers	Local community	For government
• Farm equipment	• Protect health	• tourism
• House construction	• Source of good weather	• Medicinal plants
• Fuel wood	• Absorb rain	• Conservation for wildlife
• Honey production	• Protect from volcano	
• Medicinal plants	• Protect erosion and soil degradation	
• Edible fruits and grass	• Shade for animal and human	
• Source of income (for the guards)	• Aesthetic values	

Table 2. Key deforestation drives for the Desa'a forest

Ranks	Deforestation drives of the Desa'a forest
1	Illegal cutting, including indigenous trees like Juniperus procera and Olea europaea ssp. cuspidata
2	Free grazing
3	Lack of community awareness on the forest
4	Disputes and conflicts between Afar and Tigray communities
5	Lack of law enforcement
6	Settlement inside of the forest
7	Lack of sustainable management plan for the forest
8	Lack of governmental follow-up
9	Few guards with very low and uncertain salary
10	Drought
11	Charcoal making
12	Fire in side the forest

Results and Discussion

Table 3. Future Conservation Interventions For The Desa'a Forest

Ranks	Future conservation interventions for the Desa'a forest
1	Introduce alternative source of energy e.g (biogas, solar-based stoves) to nearby villages for reducing illegal tree cutting
2	Give continues awareness raising training about the forest
3	Introduce a strong law enforcement and follow-up mechanisms
4	Decrease free grazing and illegal cutting inside of the forest using different interventions
5	Solving the disputes and conflicts between the Afar and the Tigray communities
6	Introduce different conservation activities such as exclosures, soil and water conservation, planting indigenous trees and others

Ranked according their importance

Table 3. Future Conservation Interventions For The Desa'a Forest

7	Developing sustainable management plan for the forest
8	Support the locals in beekeeping
9	Introduce home garden based food production and woodlots
10	Create the forest-based business
11	Helping the poor locals using a scheme "food for work"
12	Introduce carbon credit payments into the forest
13	Relocate the settlement of the people inside of the forest
14	Introduce NGOs and other interested partners on conservation of the forest
15	Increase number of guards with affordable salary to tight protection of the forest

Results and Discussion

Floristic Composition and Diversity of the Desa'a Forests

Table 2: Floristic composition and diversity of the Desa'a

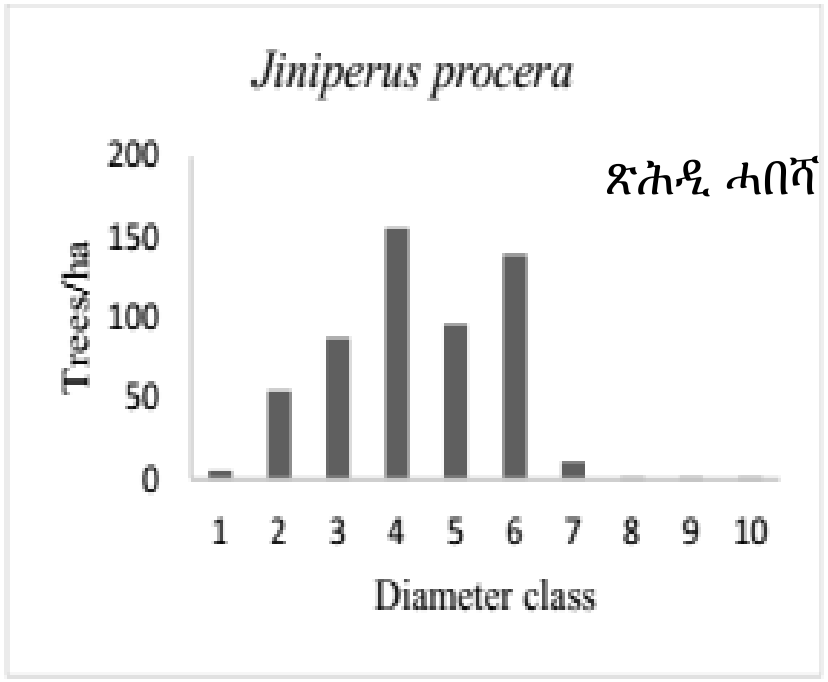
Diversity parameters	Minimum	Maximum	Forest Overall
Number of taxa (S)	2	12	**26**
Individuals	13	420	**4327**
Dominance (D)	0.25	0.69	**0.16**
Simpson index (1-D)	0.31	0.75	**0.84**
Shannon index (H)	0.66	1.70	**2.16**
Evenness_e^H/S	0.28	0.99	0.33
Equitability_J	0.39	0.99	0.66

Important Value Index of Desa'a Forest

Table 2: Tree density ha^{-1}, Relative Frequency (RF), Relative Abundance (RA), Relative Dominance (RD) and Importance Value Index (IVI) of woody species

Scientific Name	Density (Trees/ha)	Frequency	BA	RA	RF	RD	IVI
Juniperus procera Hochst. ex Endl.	547	20	45388.94	13.15	77	25.21	115
Rhus natalensis Bernh. ex Krauss	359	24	14775.88	8.62	92	8.21	109
Carissa edulis Vahl	795	19	15448.13	19.11	73	8.58	101
Cadia purpurea Ait.	1161	10	36505.19	27.89	38	20.27	87
Olea europaea L. subsp. cuspidata (Wall. ex G. Don) Cif.	83	17	25431.96	1.99	65	14.12	81
Maytenus arbutifolia (Hochst. ex A. Rich.)	174	13	4692.97	4.18	50	2.61	57
Tarchonanthus camphoranthus	299	10	19102.31	7.19	38	10.61	56
Calpurnia aurea Benth.	417	10	6489.22	10.03	38	3.60	52
Euclea racemosa Murray subsp. schimperi (A. DC.) F. White	89	11	2045.24	2.15	42	1.14	46
Combretum aculeatum	42	10	523.17	1.02	38	0.29	40

Population Structure of Desa'a Forest



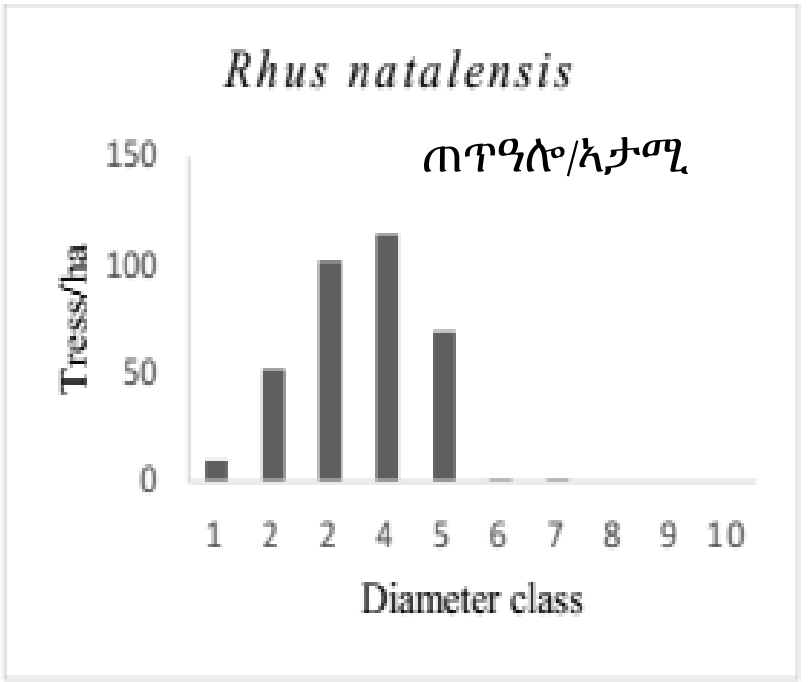
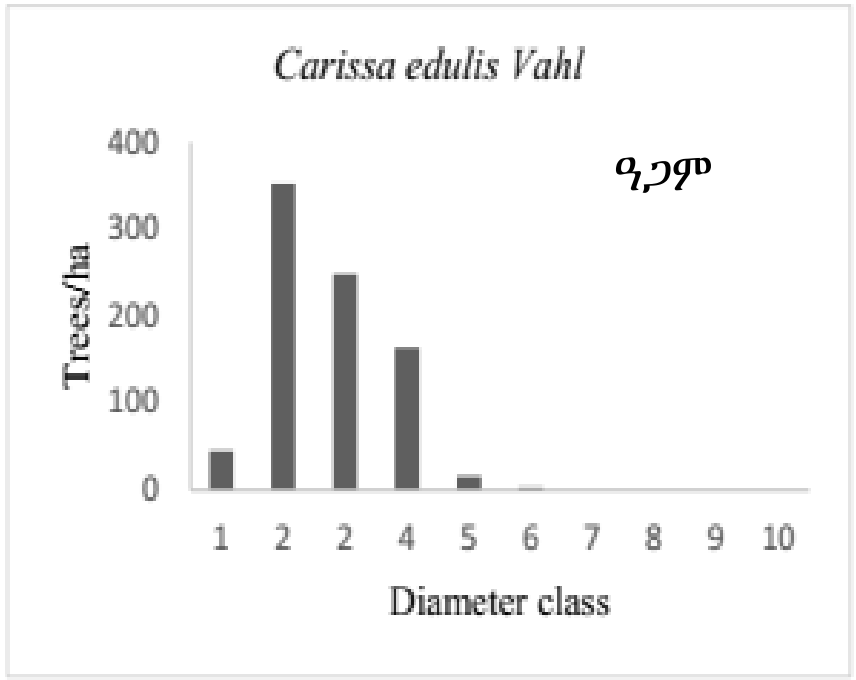


Figure 1: Population structure of dominant shrub and climax tree species . Diameter class's number referees: (1) <2 cm, (2) ≥2<4, (3) ≥ 4<6, (4) ≥6<8, (5) ≥8<10, (6) ≥10<20, (7) ≥20<30, (8) ≥30<40, (9) ≥ 40 < 50, (10) >50 cm.

Population Structure of Desa'a Forest



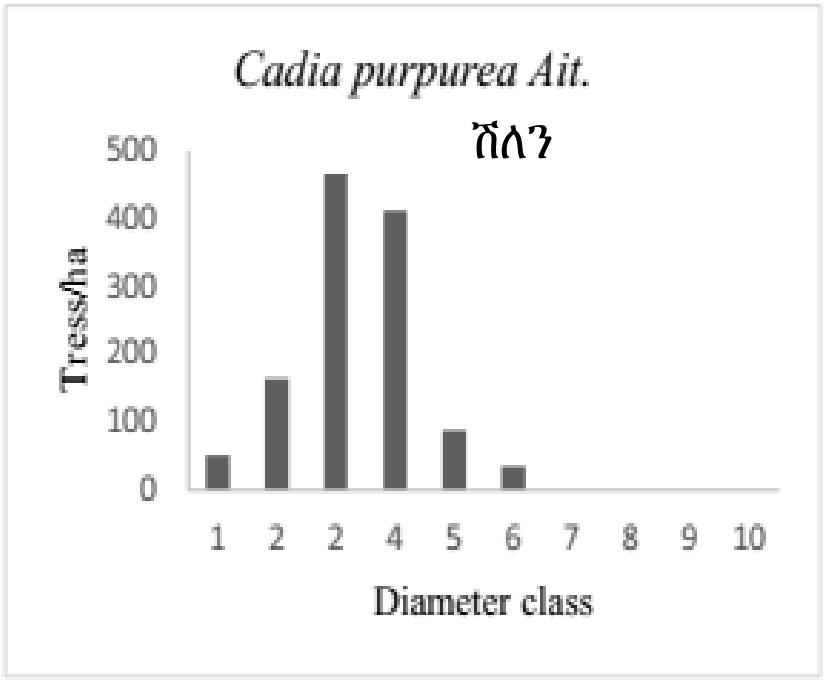


Figure 2: Population structure of dominant shrub and climax tree species . Diameter class's number referees: (1) <2 cm, (2) ≥2<4, (3) ≥ 4<6, (4) ≥6<8, (5) ≥8<10, (6) ≥10<20, (7) ≥20<30, (8) ≥30<40, (9) ≥ 40 < 50, (10) >50 cm.

Population Structure of Desa'a Forest

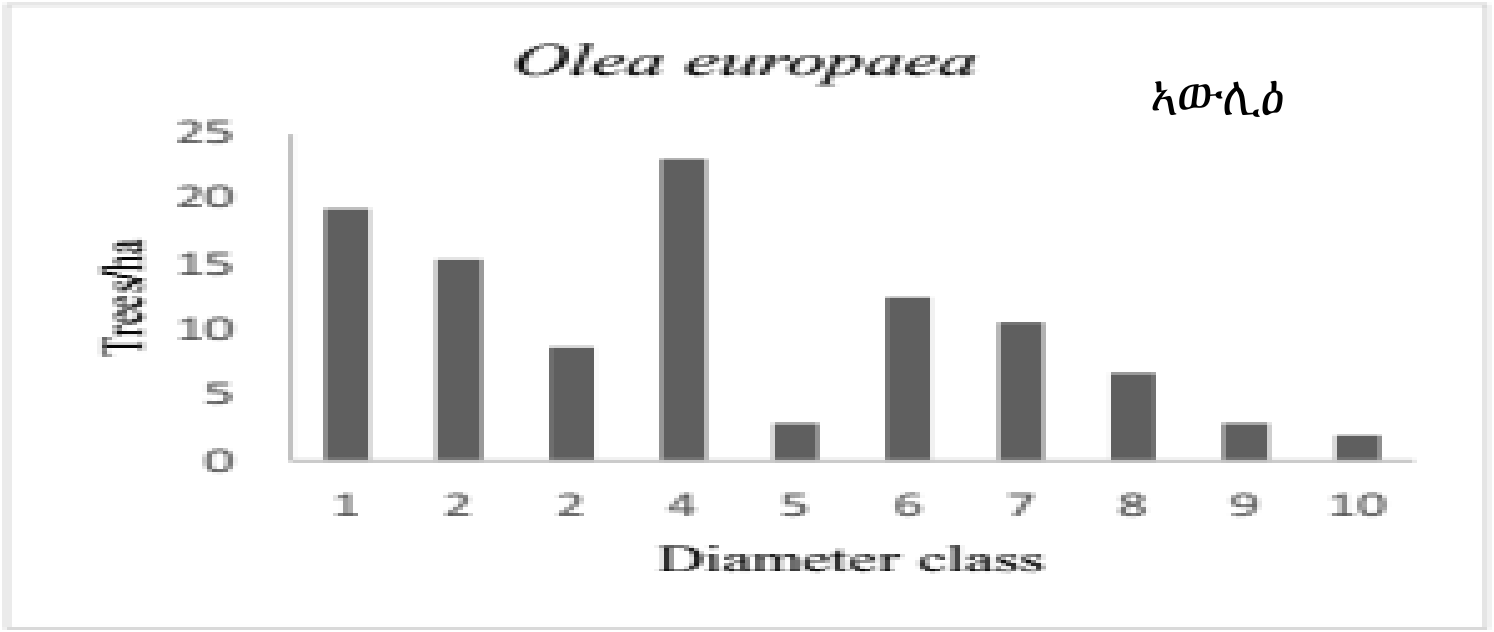
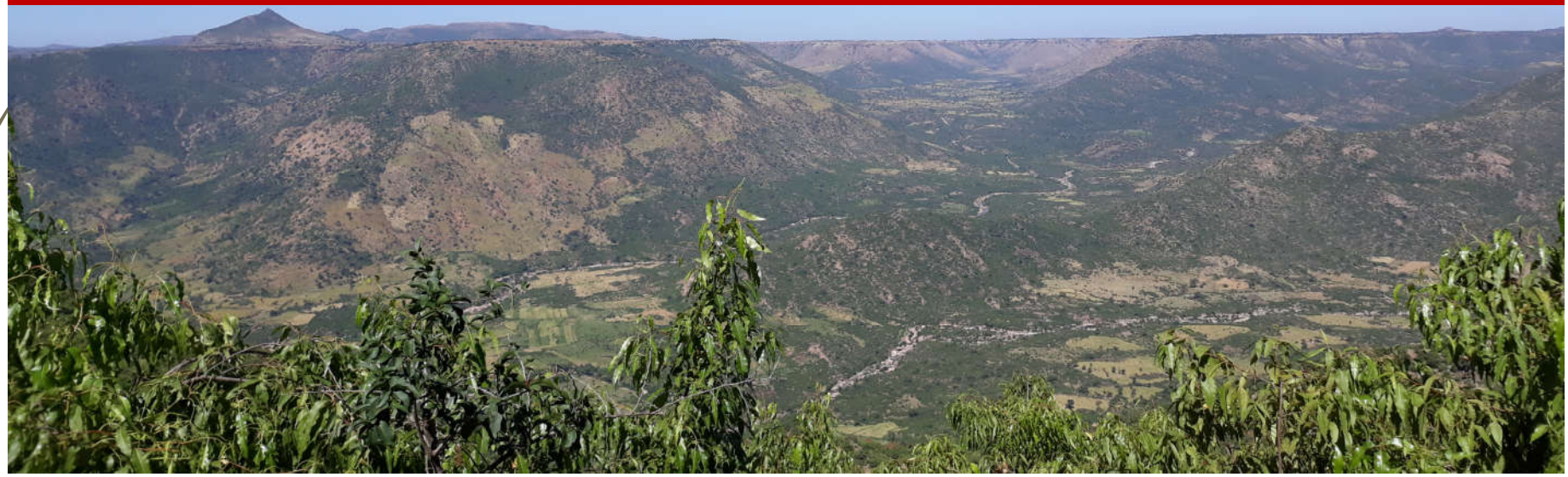


Figure 3: Population structure of dominant shrub and climax tree species. Diameter class's number referees: (1) <2 cm, (2) ≥2<4, (3) ≥ 4<6, (4) ≥6<8, (5) ≥8<10, (6) ≥10<20, (7) ≥20<30, (8) ≥30<40, (9) ≥ 40 < 50, (10) >50 cm.

Challenges



Challenges

- Settlement inside the forest
- Conflict
- Illegal cuttings
- Free grazing
- Drought
- Tree dieback/Forest dieback

Pile of wood collected for fuelwood

Challenges

Pile of wood collected for fuelwood

Illegal cutting inside the forest

Settlement inside the forest

Sever erosion and land degradation inside the forest

Free grazing inside the forest and destruction of SWC measures

Free grazing inside the forest

Deforestation and forest degradation

Conclusion

- The forest is under sever degradation
  - Farmland expansion
  - fire and charcoal making
  - free grazing
  - new settlements
  - illegal logging
  - Conflict

Future Prospects and Management Recommendations

- Enrichment planting and water harvesting
- Relocating the people illegally reside inside the forest
- A community based cobservation of the Forest
- Apiculture/Beekeeping
- Agroforestry
- Alternative energy sources
- Eco-tourism
- Payment for Ecosystem Services
- The recognition of Desa'a forest as UNESCO world Heritage or biodiversity hotspot

Acknowledgments

The Rufford Foundation

www.rufford.org @ruffordgrants


The Rufford Foundation
www.rufford.org @ruffordgrants
Thank You
For
Your Attentions
The Rufford Foundation
www.rufford.org @ruffordgrants