Bush Thickening Management for Palatable Pasture in the Degraded Borana Rangelands

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Background

- Rangelands are geographical regions dominated by grass and species with or without scattered woody plants (Purdon and Anderson, 1980)
- Bush thickening is a major concern to farmers of arid and semi-arid rangelands
- Hence, reactive intervention remains the norm (Haussmann et al., 2015)

The problem at Borana rangelands

- The rangelands of southern Ethiopia comprise 7.6 -12.3% of the area of the country of which Borana rangelands comprise about 95,000km^2.
- The major threats in the Borana rangeland are loss of perennial grasses and the increase in unpalatable herbs and bush cover (Oba and Kotile, 2001).
- **Pastoral livelihoods loss** due to the thick bush and unpalatable undergrowth

Livestock malnutrition and death; loss of livelihood asset

Photo by Agena Anjulo, 2009

Woody plant density at Borana

- In Borana rangelands the woody plants cover has already exceeded the woody cover of 40 % in about 40 % of the range lands (Coppack, 1994, Rischkovisky *et al*., 2003).
- According to Rocques et al. (2001), this 40 % cover of woody plants is approximately equal to a density of 2400 plants per ha which is indicated as equilibrium,

The woody plants for reactive intervention

- The main woody plant species causing the thickening problem are, among others, *Acacia drepanolobium* (whistling thorn), *Acacia reficiens, Acacia mellifera, Acacia seyal, and Acacia bussei*.

Acacia drepanolobium (whistling thorn) thickening at Negelle Borana

Earlier investigations on the ground

- In Borana the woody plants density estimate shows that it has reached 3014 plants per ha and the cover of 52% (Gemedo, 2004)
- It has already passed the critical limit of equilibrium between the shrub and grass species.

The current research intervention

In the light of the above information and taking into consideration the seriousness of the rangeland problem,

- The current research is designed to improve the pasture productivity by applying **integrated bush thickening management**.

Integration is about:

- **Enrichment seeding** in the degraded pasture with palatable grasses after bush thinning

To supplement grass and herbaceous feed shortage in the dry season,

- ***Terminalia brownii,*** a broad leaved **fodder tree** which thrives well in the arid and semi-arid region and yields substantial amount of leaf biomass, was planted in line arrangement in the pasture.

The research hypothesis

- We hypothesized that **thinning out** the thickened bush and **removal of unpalatable undergrowth** in integrated management approach will reduce the bush re-growth significantly and **improve the palatable grass diversity and biomass** with higher livestock carrying capacity per unit area

General objective:

- Contribute to enhanced food and environmental security, and improved pastoralists' livelihoods in Borana rangelands of southern Ethiopia

Specific objectives

- To examine integrated management intervention effect with different bush removal levels on herbaceous/grass composition and productivity;
- To introduce and assess establishment and fodder biomass production potential of *Terminalia brownii*
- To evaluate willingness to pay for bush thinning by the community

Materials and Methods
Study site location and climate

- Borana rangelands, extends from 3^0 N to 6^0 N latitude 36^0 E 42^0 E longitudes
- Dominated by semi-arid climate

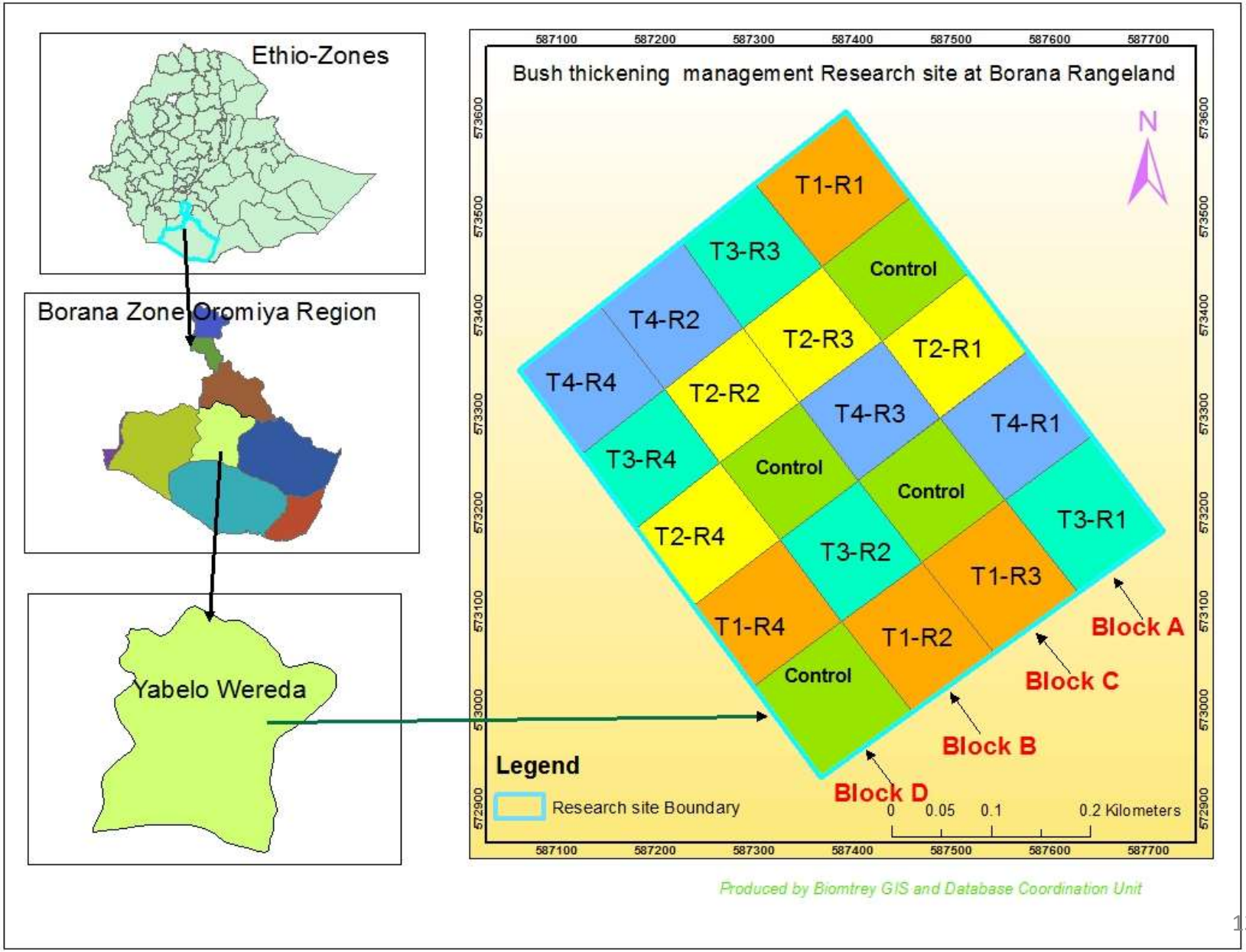
Receives bimodal rain:

✓ with long rainy season March - May and

✓ short rainy season b/n Sep-Nov (400 mm in the south to 600 mm in the north (Negasa et.al, 2014).

- annual mean temperatures vary from 19 to 24°C
- Altitude 1000 – 1700 masl, having peaks up to 2000m (coppock, 1994)

Study site, experimental design and treatments



Experiment I: Impact of various levels of woody species selective thinning and undergrowth management on forage and browse species of the rangeland

Treatment Details: in RCBD with 4 replications (20 plots of a ha)

T1 = Surface clearing of unpalatable undergrowth and scraping of dead wood and dead vegetation (at existing mean tree density)

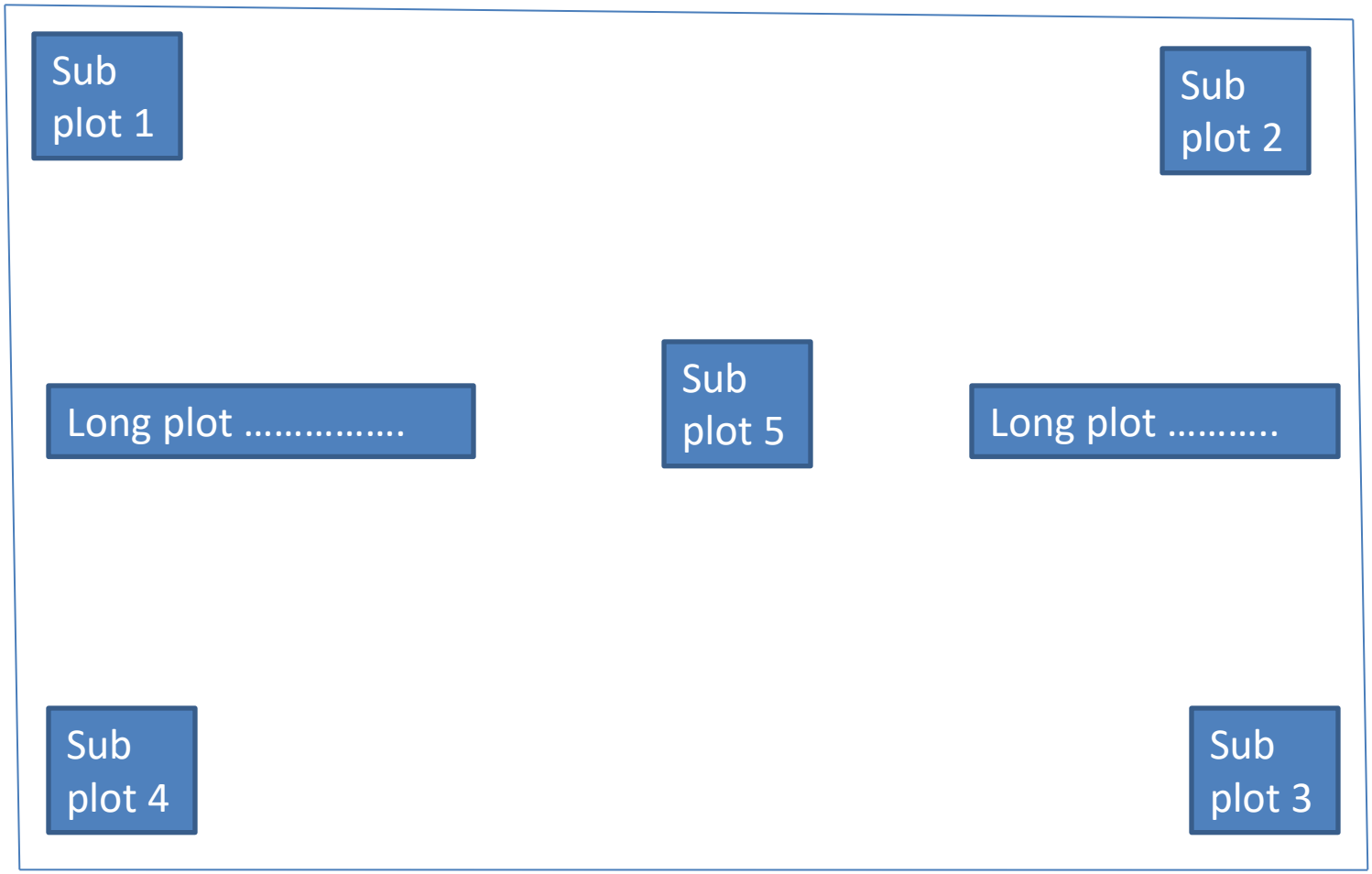
T2 = Bush removal at 40% existing mean density (Equilibrium) + Herbicide treatment on stump + Enrichment grass sowing;

T3 = Bush removal at 30% existing mean density + Stump regrowth removal + Enrichment grass sawing + Integrating *Terminalia brownii*;

T4 = Bush removal at 20% existing mean density + Stump regrowth removal + Integrating *Terminalia brownii*;

T5 = Control (bush invaded pasture)

Sampling plots set up



The research undertakings and progress made so far

Yabelo woreda, Harweyu kebele, pastoral community gathering for bush thinning operation at the research site

The thick bush and unpalatable undergrowth as it is

Operation 1: Initial opening for experimental blocks layout

Operation 2: Clearance for opening up Treatment plots

Operation 3: clearing weedy and unpalatable undergrowth

Operation 3.1: Sisal undergrowth removed for facilitating grass growth

Operation 4: collecting thinned out bush and undergrowth between experimental blocks and plots

Operation 5: Bush thinning and undergrowth removal waiting for **surface scraping of debris**

Operation 5.1: Bush thinning and undergrowth removal waiting for **surface scraping of debris**

Operation 6: Scattered trees in the rangeland after thinning, undergrowth removed and surface cleared for grass growth

Operation 6.1: Scattered trees in the rangeland after thinning, undergrowth removed and surface cleared for grass growth

Operation 6.2: Scattered trees in the rangeland after thinning, undergrowth removed and surface cleared for grass growth

- Operation 7: Rhodes grass sown by surface scrapping for enrichment of the native grass

Operation 8. Rhodes grass after first rains

Operation 8.1: Mixture of native grass and Rhodes after the first long rains of the region (March to May)

Operation 8.2: Native grass returning after long years of suppression by unpalatable undergrowth

Operation 8.2: Native grass returning after long years of suppression by unpalatable undergrowth

Operation 9: *Terminalia brownii* 88% survival and establishment after first rains

Operation 10: Triumphant pastoralists posing for picture in the lush green pasture of Borana

- Borana Grass and herb species identied after bush thinning.doc
- Woody plants collected and identified from Yabelo EEFRI site.doc

Preliminary results

- All the treatments T1, T2, T3 and T4 employed in the experiment have shown significant difference in rehabilitating the degraded range with palatable pasture as compared to the untreated control (T5).
- Visible difference among treatments T1, T2, T3 and T4 in the range in terms of grass composition and biomass/unit area (data under processing)
- Pastoralists achieved reliable seasonal grass biomass harvest and storage for the dry season

Grass and palatable herbs along with tree/shrub species identified

- About 34 livestock palatable grass and herbaceous species from 6 families have been identified
- About 23 browse and non browse tree/shrub species from 12 families have been identified in the rangeland after bush thinning and rehabilitation operation

Pastoralist willingness to pay for the rangeland improvement

- The binary logistic model and bivariate probit model were used, respectively to evaluate factors influencing pastoralists' decision on WTP and to estimate mean willingness to pay (MWTP) for the rangeland improvement.
- Results indicated that by total hhs of 1080 in two kebeles, MWTP for the improvement was 11.86 man-days/month, which is equivalent to 830.2 ETB/month.
- And the aggregate WTP for the improvement was 38,426 man-days per year which is 2,689,820 ETB/year
- *The total number of months that pastoralists' are willing to contribute per year is three*.

Recommendations

- Extend the technology to other areas ……

Pastoralists should be assisted at list with:

- Bush thinning operation
- Availing water points at certain distance
- Availing technology for using the thinned out bush into value added biomass energy

Thank You