

Households' demand for mitigation of *Prosopis Juliflora* invasion in the Afar Region of Ethiopia: a contingent valuation

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(agro-)pastoral Livelihoods in the Horn of Africa**

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Introduction

- Prosopis species are introduced to Africa for their beneficial uses
- Become invasive in (Pasiiecznik et al., 2001)
 - Ethiopia, Kenya, Morocco, Algeria,
 - Mali, Burkina Faso, Niger
 - Chad, Sudan, South Africa



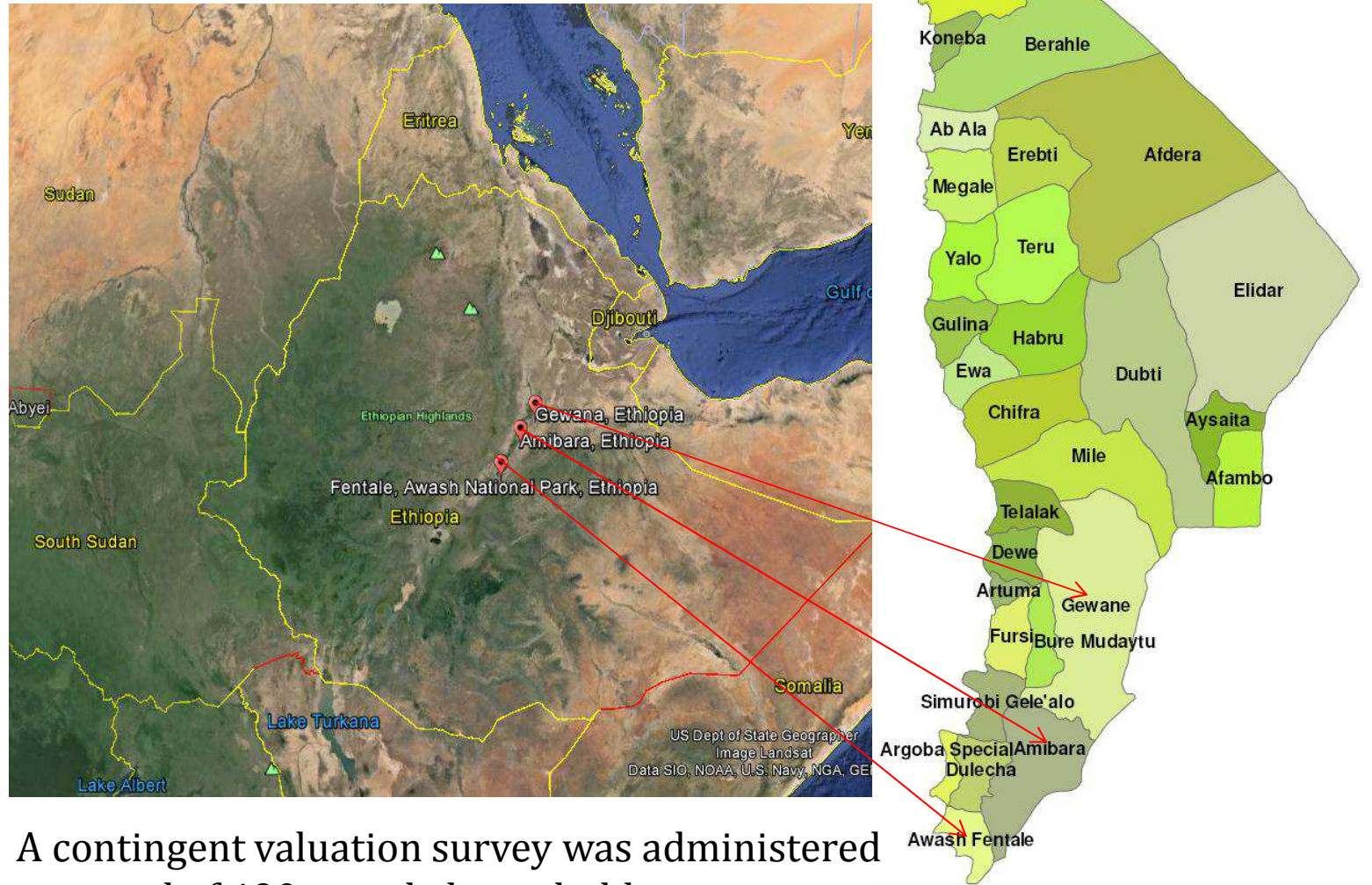
- Negative impacts as invasive species on (Mwangi & Swallow, 2005):
 - Human and animal health (physical injury) (Maundu et al., 2009)
 - biodiversity and beneficial native species
 - land uses, conflict on land

Objectives

- To assess households' demand for mitigating prosopis invasion
 - Complete eradication
 - Controlling expansion through productive use
- To assess the amounts and determinants of households':
 - willingness to pay in cash
 - willingness to contribute labour

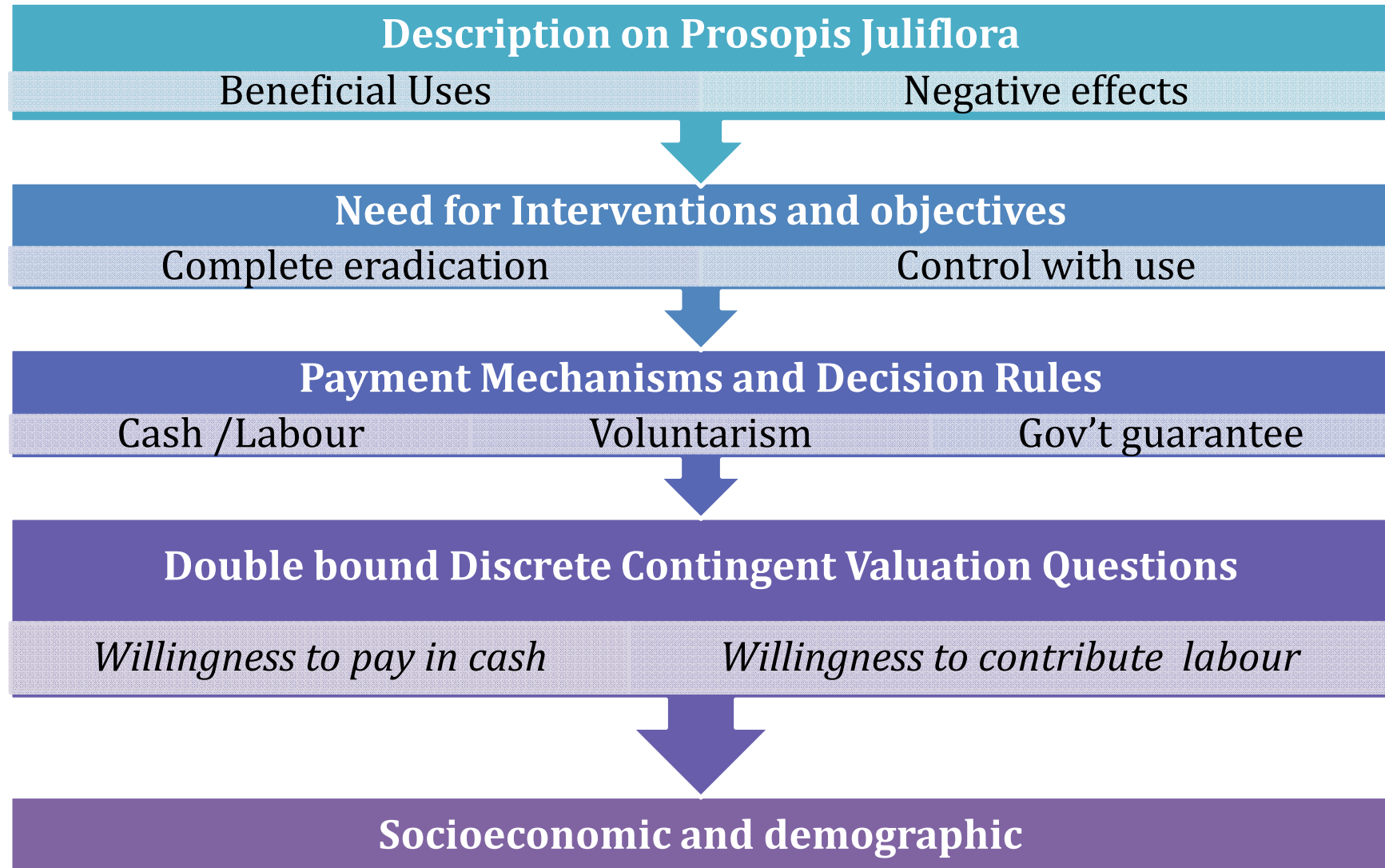


Study Area



A contingent valuation survey was administered on a total of 490 sample households

Structure of the Contingent Valuation Survey



Bids for the Contingent Valuation

- Five initial bids were determined based on data from a pre-test survey on 30 samples.
- Initial bids (in Birr/household/year) for willingness to pay:
 - Birr 36, 83, 125, 172, and 214 for the complete eradication
 - Birr 6, 14, 21, 29, and 35 for controlling further expansion
- Initial bids (in Days/household/year) for the willingness to contribute labour:
 - 5, 12, 18, 25, and 30 for complete eradication
 - 3, 6, 9, 13, and 16 for controlling further expansion
- The follow up bid is double if the households' response to the initial bid is YES and halve if the response is NO.
- Respondents were randomly assigned for each bid (98 per bid X 5 bids = 490).

Econometric Analysis

- We applied the random utility model (McFadden, 1974; Henemann, 1984) as a conceptual framework for the analysis.
- We applied the following econometric models :
 - Probit
 - Bi-variate probit, and
 - Interval data regression

Results: Livestock

- Livestock rearing is the main livelihood system
 - Close to 89% of respondents are pastoral and agro-pastoralists
 - Income from livestock products account 58% of the household income
- Majority (75%) reported low to high level of prosopis invasion on pastureland
- Loss of livestock due to prosopis

Type of livestock in Tropical Livestock Units (TLU)	Mean Livestock Holding	Loss of livestock due to prosopis in 12 months	% of loss
Cattle	9.84	1.09	11.08
Camel	4.72	0.23	4.87
Goats	1.86	0.18	9.68
Sheep	1.41	0.12	8.51
Equines	0.17	0.02	11.76
Poultry	0.01	0.00	0.00
Total TLU	18.00	1.64	9.11

Results: Protest and hypothetical bias

- More than 90% respondents knew uses and negative effects of prosopis
- About 84% of the respondents prefer complete eradication
 - Majority (70%) choose mechanical removal of tree with burning of the root system
 - Only about 18% choose use of chemical control
- Protest response rate:
 - About 5-8% of respondents have zero willingness to pay and
 - 6-9% have zero willingness to contribute labor
- The hypothetical biases
 - 23-28% for Ye-Yes responses of willingness to pay in cash
 - 19-23% for Yes-Yes responses of the willingness to contribute labour

Results: Major factors affecting willingness to pay and contribute labour

Positively

- Incidence of physical injury caused by prosopis on household member
- Level of prosopis invasion on pastureland
- Off-farm income
- Number of livestock holdings
-
- Loss of livestock due to prosopis
- **Level of benefit from prosopis**
- Occupation of the household heads (Pastoralists are more willing)

Negatively

- Bid level
- Level of prosopis invasion on government land

Results: **Upper** and **lower** bound median willingness to pay and contribute labor

Model	Intervention	Willingness to pay in Birr/Household/Year	Willingness to contribute labour in Days/Household/Year
Probit	Complete eradication	246	38
	Control	68	24
Bivariate probit	Complete eradication	244	38
	Control	71	24
Interval data	Complete eradication	209	33
	Control	41	19

Summary

- Majority (more than 90%) of the respondents answered the contingent valuation survey with reasonably sufficient understanding of the contingent interventions.
- Majority of the respondents (84%) prefer complete eradication of prosopis
- The low protest rates (5-9%) indicate high level of interest among respondents to contribute for the mitigation of prosopis invasion
 - Meyrhoﬀ and Liebe (2010) reported 17.97% mean protest rate for 108 studies with dichotomous choice format.

Summary

- The livelihood of respondents in the study area is highly threatened by prosopis invasion on :
 - On community pastureland (75%)
 - Loss of livestock due to prosopis (1.64 TLU per HH = 9.1% of existing livestock holdings per HH)
 - Incidence of physical injury on household members (21%)
- In response to the above facts:
 - For complete eradication of prosopis through mechanical clearing, households in the study area are:
 - Willing to pay 209 to 246 Birr/household/ year
 - Willing to contribute 33 to 38 full labor days/household/ year
 - They are willing to contribute lower amounts for controlling further expansion through productive use

Summary

Aggregate Willingness to Pay in Birr/year (For 25,268 households)

- Complete eradication
 - 5.28 to 6.21 Million Birr
- Controlling further expansion
 - 1.03 to 1.72 Million Birr

Aggregate Willingness to contribute labour in days per year

- Complete eradication
 - 823,000 to 968,000 labor days
 - Monetary value at daily per capita income of 22.29 Birr = Birr 18.34 to 21.56 Million
- Controlling further expansion
 - 482,000 to 599,000 labor days
 - Monetary value at daily per capita income of 22.29 Birr = Birr 10.73 to 11.35 Million

Key Message

- Majority (more than 90%) of pastoral and ago-pastoral communities are willing to contribute either in cash or labour for the mitigation of prosopis invasion in the study area if:
 - They are provided with full information on the negative effects as well as beneficial uses of the species
 - The contributions are on voluntary basis
 - There is a strong and sustainable institution that can create the awareness and mobilize them
- Although majority of the respondents prefer the complete eradication option, they are still interested to contribute for the controlling further expansion option
- In the second option, it is important to create incentive to local people through
 - Empowering them to benefit from the productive uses of the resource
- The respondents are more willing to make contributions in labour than in cash

Thank You!!

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