

# Economic Impacts of Invasive Weed Species in Developing Countries: The Case of *Parthenium hysterophorus* L. in Ethiopia



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## Problem

- **invasive species**: plants or animals that are not native to a specific ecosystem and whose introduction threatens biodiversity, food security, health or economic development (McNeely et al. 2001)
- especially in **developing countries** the impact of invasive plants can be devastating due to the **vulnerable situation** of many parts of the population
- *Parthenium hysterophorus* is a **competitive and adaptable weed** originated in Tropical America and believed to be introduced to Ethiopia in 1970s
- **major weed in northern and eastern parts** with a frequency of over 20 plants per m<sup>2</sup> in grazing lands as well as on crop land (Taye et al. 2004)
- approx. **200.000 ha** of agricultural land are currently **infested** by *Parthenium*
- *Parthenium* has a **strong impact on health** of human beings: its allergenic components particular its pollen can cause severe allergic reactions such **dermatitis** and **asthma** in people
- aim of the study: to **assess the social cost** of diseases caused by *Parthenium* in Ethiopia



Figure 1: *Parthenium hysterophorus*  
Photo: <http://www.weeds.crc.org.au/publications/media.html>

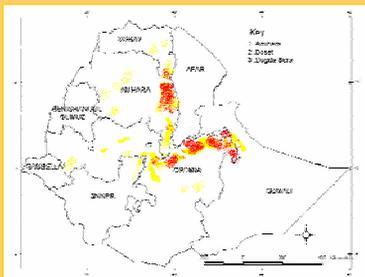


Figure 2: *Parthenium* distribution in Ethiopia: red – high density, yellow – medium density (source: Rezene Fessehaie, 2005)

## Methodology

- with the help of **semi-structured questionnaires** a number of quantitative and qualitative data were collected during four **group interviews** in *Parthenium*-infested areas in Oromia and Amhara Region (see figure 2)
- the impact of diseases due to *Parthenium* (such as asthma, dermatitis) is analyzed within the **DALY framework** developed by the World Health Organization (WHO)
- disability-adjusted life years is a measure which is based on the **number of years lost to disease** through time lived with a less than perfect health
- DALYs lost by each case of sickness due to *Parthenium* in Ethiopia for the year 2006 were estimated by using the **formula**: 
$$-\frac{DCe^{-ra}}{(\beta+r)^2} [e^{-\beta-r} - \beta C; (1+(\beta+r)(L+a)) - (1+(\beta+r)a)]$$

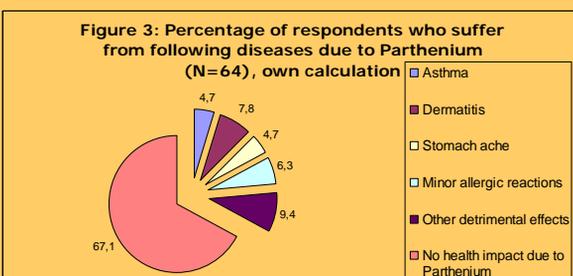
where  
D is the disability weight; C and  $\beta$  are parameters from an age weighting function; a is the onset of the disease; L is the duration of the disease  
r is the social discount rate

## Results

- **total loss** in productive years in 2006 was about **151.601 years** (table 1)
- to calculate the loss in production resulting from *Parthenium* the sum of DALYs was multiplied by the average labour productivity of US \$ 156 per person and year
- the **social loss of *Parthenium*** in Ethiopia in 2006 was about **US \$ 17.2 million**
- this is a loss of **0.26 per cent of the gross national product** (the social loss of diarrhea in Rwanda in 2000 was in the range of 2.5 and 5.0 per cent (von Witzke et al. 2005))

Table1: Aggregate Measures of Years of Productive Life (ages 11-59) lost to diseases due to *Parthenium* in Ethiopia, 2006, own calculation

Disease	Asthma	Dermatitis	Stomach ache	Minor allergic reactions	Other detrimental effects	TOTAL
Region						
Tigray	1375	2281	1375	2130	1387	8547
Afar	2456	4077	2456	3807	2479	15275
Amhara	3768	6253	3768	5839	3802	23428
Oromia	10025	16637	10025	15536	10115	62339
Somali	2981	4947	2981	4620	3008	18536
SNNPR	3775	6265	3775	5851	3809	23476
<b>TOTAL</b>	<b>24379</b>	<b>40460</b>	<b>24379</b>	<b>37783</b>	<b>24600</b>	<b>151601</b>



## Conclusion

- the **social cost** of diseases due to *Parthenium* in Ethiopia is very high and is estimated to **increase significantly in the future** since the weed spreads out over the whole country very fast
- governmental authorities should put significant emphasis on the fight against *Parthenium*

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