

## Participatory development of weed management strategies in maize based cropping systems of Kenya

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### INTRODUCTION

Maize (*Zea mays* L.) is a major cereal staple food crop for over 80% of the Kenyan population. It occupies the largest cropped land area in the country (Figure 1), and is often intercropped with beans. The average yield of maize is 2 t ha<sup>-1</sup> but there is potential for yields of 6 t ha<sup>-1</sup> when timely weed control is combined with the use of improved seed and fertiliser. Shortage of labour early in the season results in delayed weeding and subsequent yield losses of 15–90% due to weed competition. On-farm trials were undertaken to assess and reduce the economic impact of weeds in smallholder farms in Kenya (Figure 2).

### MATERIALS AND METHODS

On farm trials were conducted in five divisions of Kiambu and two divisions of Embu district in Kenya. Every participating farmer compared their practice of weeding maize with a plot that was treated with herbicide plus supplementary hand weeding where necessary. In all other aspects (e.g. crop variety, spacing, fertiliser use), the plots were treated identically. In Kiambu, the herbicide was a tank mixture of alachlor

plus linuron at the rate of 1.2 + 0.6 kg a.i. ha<sup>-1</sup>. In Embu, the herbicide treatment was a pre-formulated mixture of alachlor + atrazine for sole crop maize at a rate of 1.7 + 0.7 kg a.i. ha<sup>-1</sup> or linuron for maize intercropped with beans at a rate of 1.0 kg a.i. ha<sup>-1</sup>. Supplementary hand weeding was done as necessary. Weeding times on the 500 m<sup>2</sup> plots were recorded.

Ground covers and dry weight of weeds were determined 2–3 weeks and 7–8 weeks after germination (WAG) of the crop, coinciding with the first and second weeding, respectively. Grain yields were determined while socio-economic analyses were done to determine the economic returns of the treatments.

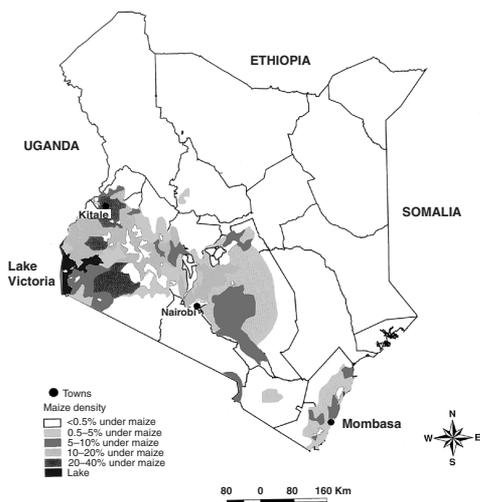
### RESULTS

There were significant differences in the percentage weed cover and weed dry matter between the treated plots and the control plots during the period 2–3 WAG (Figure 2) but none in weed cover and density at 7–8 WAG. Plots managed by farmer's practice of hand weeding had more weeds than those treated with herbicides (Figure 3).

Mean grain yields from 16 farms in Embu were significantly higher with herbicide treatments than with the farmer's practice but not quite significant ( $P = 0.056$ ) for eight farms in Kiambu (Figure 4).

For eight farms at Embu with maize intercropped with beans, both crops had significantly higher yields ( $P < 0.05$ ) with the herbicide treatment (Figure 5).

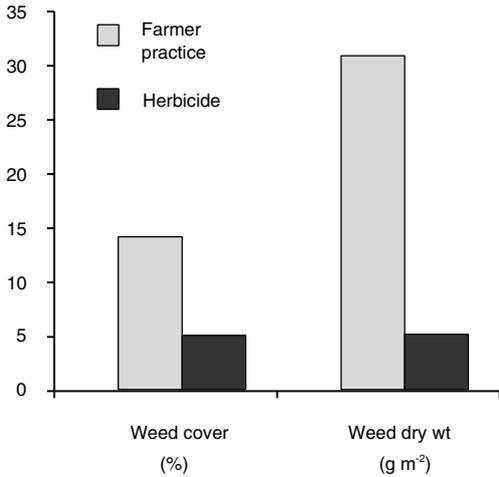
Net benefits from sole crop maize in Kiambu and



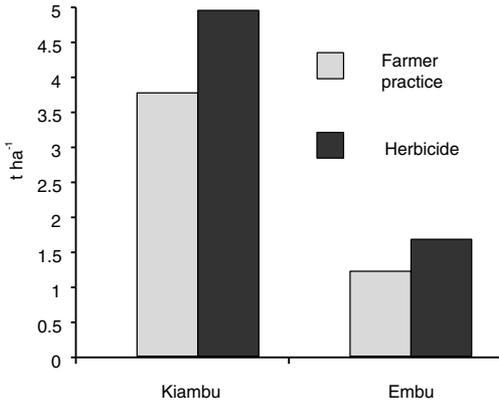
**Figure 1.** Maize-growing areas of Kenya (Hassan 1998).



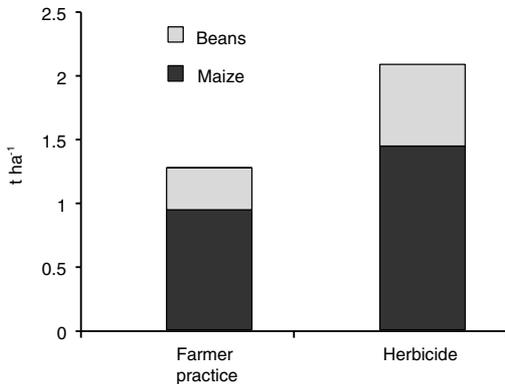
**Figure 2.** Smallholder maize field in Kenya.



**Figure 3.** Weed cover and dry weight 2-3 WAG at Kiambu.



**Figure 4.** Grain yields of sole maize at Kiambu and Embu.



**Figure 5.** Yields of intercropped maize and beans at Embu.

Embu were both positive. They were also positive for intercropped maize and beans at Embu (Figure 6).

**DISCUSSION**

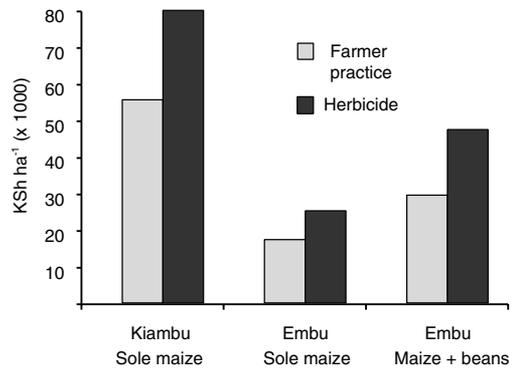
The results indicated that herbicides can improve the economic returns of smallholder farms. The main reasons for this are increased yields of maize and beans due to more effective weed control during the critical period of crop growth when there is a shortage of labour for manual weeding. The removal of this constraint by use of herbicides increased the yields by 53% in maize and 94% in beans in the maize/bean intercrop, and 38% in the maize monocrop in Embu district. The net benefits increased as a result of reduction in production costs associated with herbicides. The herbicides allowed large reductions in labour required for weeding. The net benefits in Embu increased by 61% in the maize/bean intercrop and by 46% in the maize monocrop, while in Kiambu there was an increase in net benefits of 47% in the maize monocrop. The potential impact of these findings is that herbicide use in maize can improve the economic status of rural communities, enhance food security and improve livelihoods. The reduced drudgery for weeding would also increase the ability of farmers to cultivate more land with higher economic returns.

**ACKNOWLEDGMENTS**

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**REFERENCE**

Hassan, R.M. (1998). Maize technology development and transfer. (CAB International).



**Figure 6.** Net benefits from maize and maize/bean intercrop.