Climate change as a reality for small scale teff farmers in Ethiopia:

Environmental and socio-economic indicators of climate change effects

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BACKGROUND

The issue of climate change has largely been accepted as a reality. The phenomena has been modelled and studied at a global level, but studies rarely deal with how it is experienced on the ground by small scale farmers who depend on crop production for their livelihoods, and what next steps or opportunities are at farmer level. Biodiversity in general will also be affected by climate change, but how and to what extent crop genetic diversity will suffer from changes in our climate is not well understood.

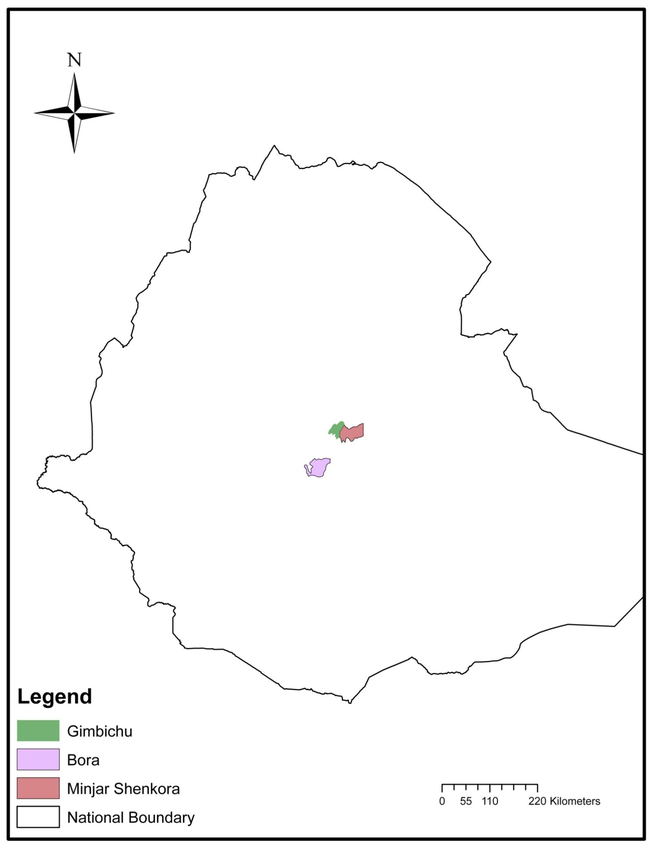

Figure 1: Ethiopia and the three study districts Bora, Gimbichu and Minjar Shenkora

OBJECTIVE

The objective of this study is to identify climatic changes and the effect they have on small scale farmers, with a special focus on cultivation of *Eragrostis tef* (teff).

METHODOLOGY

A survey was conducted in three districts in central Ethiopia: Bora, Gimbichu and Minjar Shenkora (Figure 1). The districts represent three different climatic zones: Bora is described as warm, semi-arid lowlands, Gimbichu as cool, humid highlands, and Minjar as temperate, cool, sub-humid highlands. By means of structured interviews, information was collected from 300 farmers, 100 in each district, about growing of cereals and teff in particular, and their observations of climatic conditions and changes and teff yields.

	Bora (n=100)	Gimbichu (n=100)	Minjar (n=99)
Less rainfall	98 *(1)*	90 *(1)*	69 *(2)*
Decreased reliability of rainfall	64 *(4)*	66 *(3)*	42 *(5)*
Temperature increase	82 *(2)*	28 *(5)*	61 *(4)*
More floods	12	0	2
Increased failure of crops	30	0	4
Increased weeds and pests	60 *(5)*	73 *(2)*	12
Less forest cover, environmental degradation	82 *(2)*	66 *(3)*	65 *(3)*
Less wildlife	19	28 *(5)*	74 *(1)*
	Rates in percentage % of n respondents Between brackets is the ranking of most rapid changes as perceived by respondents in that district		

Table 1: Most rapid changes observed by respondents in the three districts.

RESULTS

The length of the rainy season, according to the respondents, has decreased slightly over the years. This change was not significant in any of the districts, comparing today's length of the rainy season with that of 3 to 5 years ago. However, other indicators such as amount and reliability of rainfall and occurrence of floods, confirm that the rainy season has become less favourable (Table 1).
Temperature increase was clearly observed by the respondents as well.

	Today	3-5 years ago	Student's T-Test
Bora	0.9 (n=99)	0.8 (n=100)	0.004*
Gimbichu	1.8 (n=99)	1.2 (n=97)	0.000*
Minjar	1.6 (n=100)	1.4 (n=98)	0.015*
Overall	1.4 (n=298)	1.1 (n=295)	0.000*
	rates in ton/ha **significant at 0.05 level, Student's T-test, 2-tailed*		

Table 2: Yields of teff today (i.e. 2010) and 3 to 5 years ago (2005/2007) according to respondents in the three study districts. Student's T-test results give the significance for testing for the difference in yields today and yields 3 to 5 years ago within each district.

Figure 2 illustrates how rainfall influences teff yields. The graph presented shows a correlation (linear, $R^2 = 0.29$) that a longer rainy season gives higher yields. It also shows how yields can differ within one climatic zone: in dry and warm Bora all reported yields appear to be generally low whereas in the other cooler and more humid districts, reported yields are higher and vary more. It is likely that other factors, besides length of the rainy season, may also have effects on yields in these cooler and more humid areas than in drier and warmer areas, explaining the greater variability in yields.
Despite the reported decrease in rainfall, teff yields in all three study districts today are significantly higher than 3 to 5 years ago, but the increase was clearly smallest in Bora (Table 2).

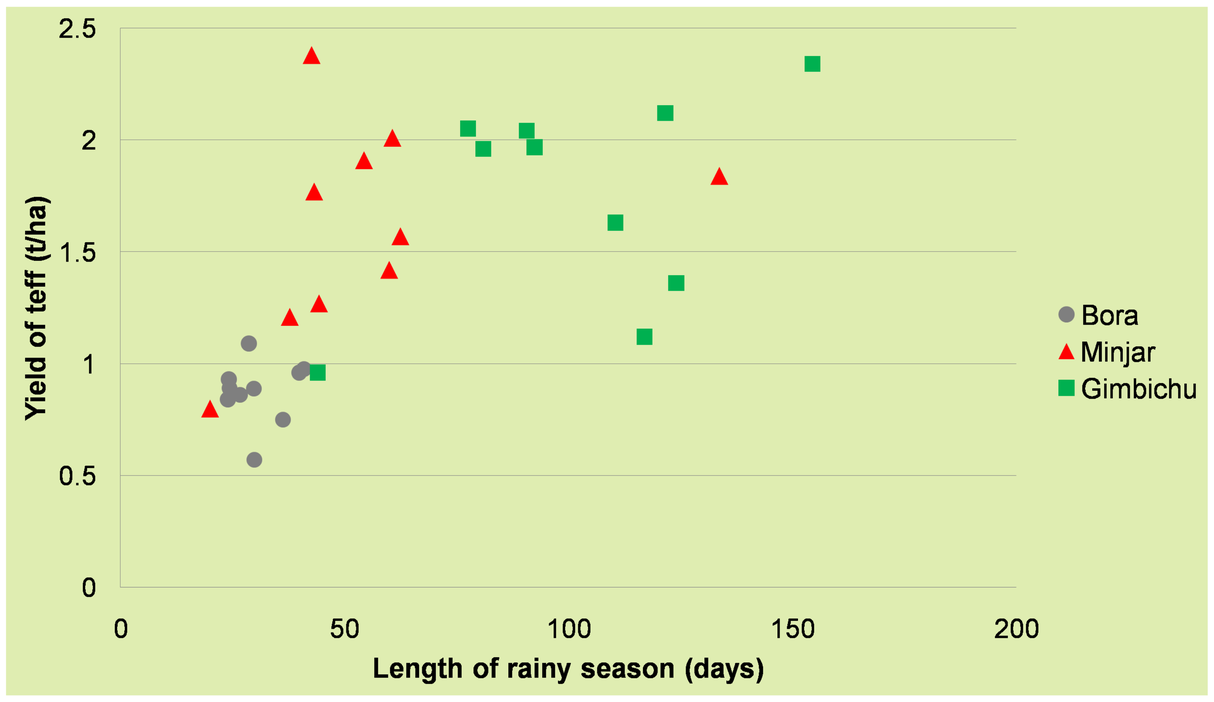

Figure 2: Yield of teff (today) changing with length of rainy season, as reported by respondents in the three study districts

CONCLUSION

The results of this survey show that farmers in the three districts have experienced temperature increases and rainfall changes. Climate change modelling for this area confirms these changes and predicts further rainfall variability and temperature increase in the study area (Yumbya et al. 2011).
The reported decrease in rainfall and temperature increase will cause net drier circumstances due to decreased water availability to crops and excessive evapotranspiration. Secondly, observed and projected changes in rainfall patterns and distribution increase the uncertainty regarding water availability for crops. Teff cultivation, as practiced by small scale farmers today, will become increasingly difficult or even impossible in some areas while in some areas the yields will decrease significantly (Yumbya et al. 2011).
However, further research is needed to generate more information on other factors affecting teff yields, such as teff variety selection, tillage methods and use of inputs, to assist farmers in adapting to climate change, thereby enhancing teff yields and food security. Moreover, policy, scientific and community level responses are needed in order to have an integrated approach to mainstreaming climate change strategies in agricultural research in general and teff production in particular.

REFERENCES

J. Yumbya, J., D. Kiambi, F. Kebebew and K.P.C. Rao, 2011. Climate change effects on Tef geographic ranges and its impacts on yield. Poster, African Biodiversity Conservation and Innovations Centre (ABCIC), Kenya

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