

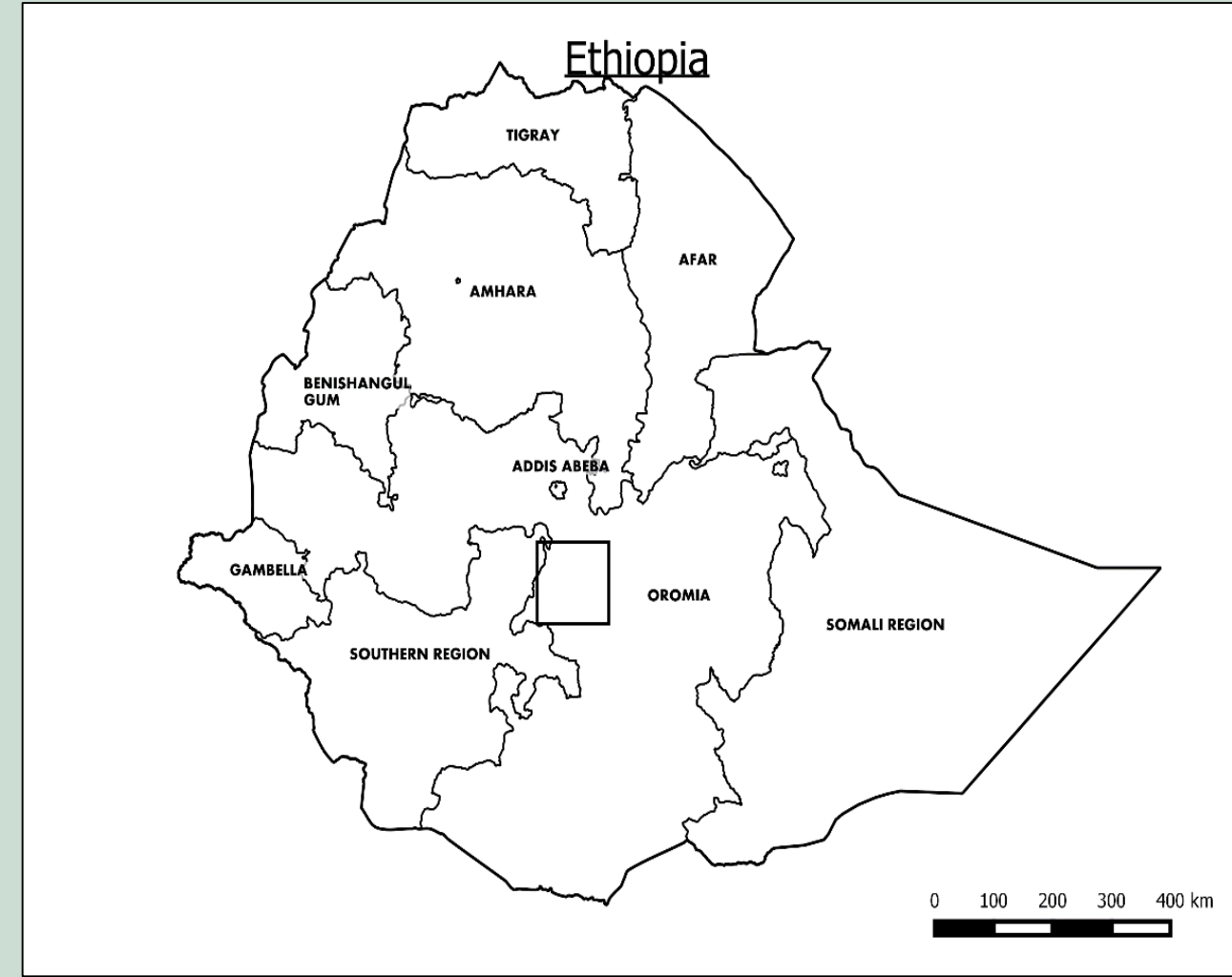
# Effects of Climate Change in the Rift Valley of Ethiopia for Small-scale Farmers in irrigated Vegetable Production



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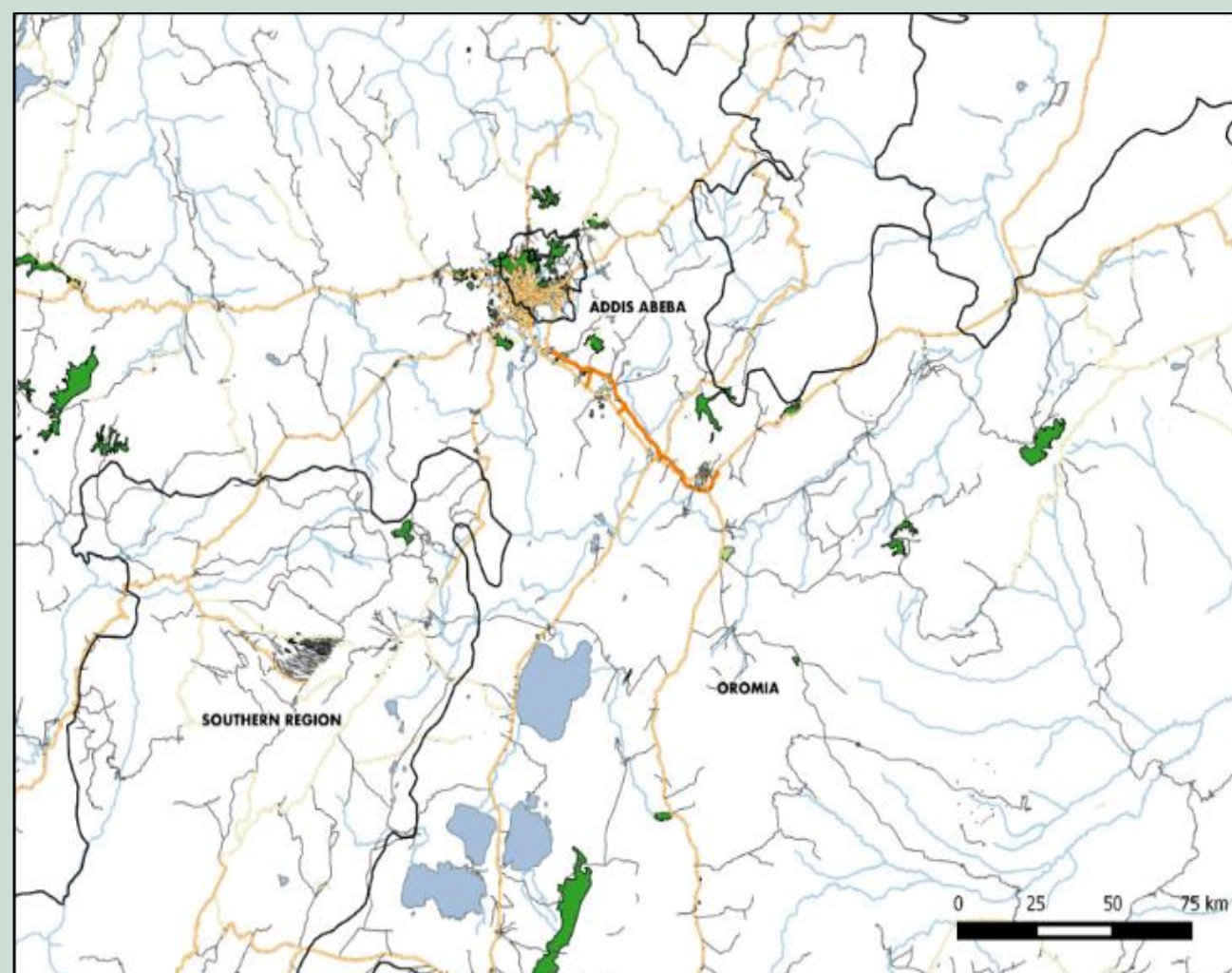
## Introduction

Ethiopia is currently facing the effects of severe droughts caused by partial and in some areas total failure of the two main rainy seasons. Worsened by El Nino, this drought is threatening wide parts of the country with famine. Official reports of December 2015 stated that 10.2 million people were in need of emergency food assistance. Ethiopia's mean annual temperature is showing a significant warming trend. Future projections show that the mean maximum temperature will increase by 2 - 2.3°C until 2030 and by 2.2 - 2.7°C until 2050 while the mean minimum temperature will rise by 0.8 - 0.9°C until 2030 and 1.4 - 1.7°C until 2050.



As the number of rainy days decreases, dry spells become more severe in their impacts and result in crop moisture stress in the growing season. Furthermore, the considerable inter-annual variability in the duration of growing season is decreasing reliability.

All these developments ask for a close examination of how well the country's most affected inhabitants, small-scale farmers, are aware of the phenomenon climate change and what counter measures they are undertaking. Additionally, it is useful to examine the governmental bodies' dealing with the effects and challenges of climate change.

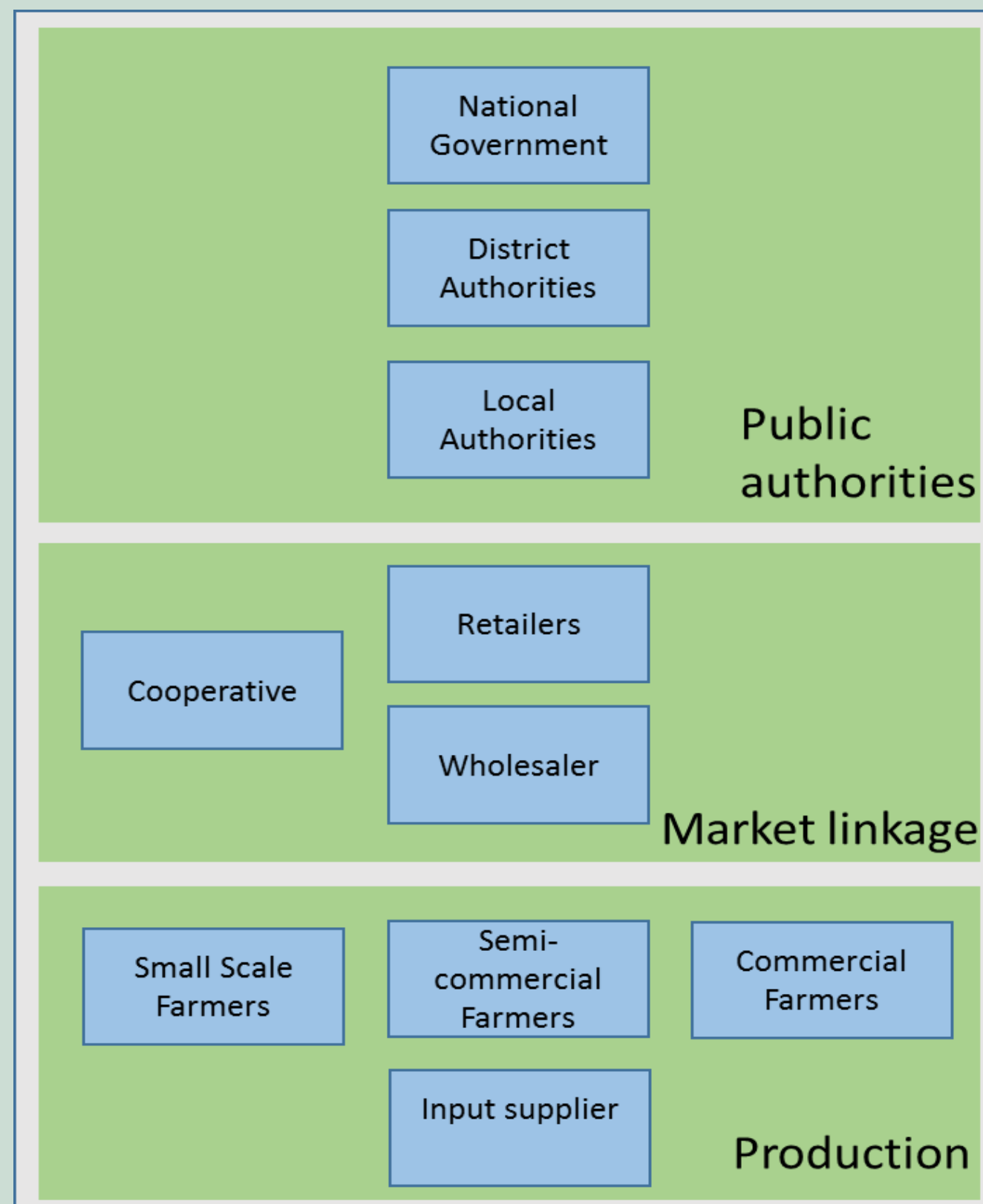


## Materials and Methods

During the field work in September 2015 representatives of the different stakeholders have been interviewed, with key focal points such as awareness of climate change, knowledge and employment of mitigation strategies, adaption measures and available technologies.

The stakeholders can be grouped in three clusters. The first cluster contains the horticultural producers, the second the market linkage actors while public authorities and law legislative bodies form the third cluster, this is shown in the figure to the right.

In this study project semi-structured interviews were used as they allow for theory construction and the verification of hypotheses at the same time.



## Results

### Farmers

Unreliable, insufficient or total failure of rainy seasons  
Unreliable temperatures, with increasing trend

Increasing Pressure on water bodies

Land use and land cover change is accelerated, especially with respect to decreasing lake sizes.

Occurance of new pests

Low technology production systems and inadequate management

Lack of soil conservation strategies

Lack of knowledge about the correct use of agricultural inputs

Furrows and channel irrigation systems prevail (instead of drip irrigation), leading to high losses of irrigation water due to leaking tubing, seepage and evaporation

Outdated technology, maintenance and missing responsibility for irrigation systems

Insufficient knowledge and awareness of water use efficiency among farmers.

Lack of water-saving technology

Overuse of pesticides

Decreasing genetic variety of seeds and crops and use of inadequate seeds and water intensive crops

### Government/Institutions

The government is not able to distribute timely and fitting information about weather and climate developments

Focus on mechanisation and greenhouse gas reduction instead of sustainable adaptation and mitigation strategies. (Partly due to the interests of international aid)

Lack of institutional capacity and private sector involvement together with food insecurity lead to the dilemma of cost recovery by growing food crops instead of cash crops, representing obstacles for the development of functioning irrigation schemes

Lack of control mechanisms and unplanned development

Informal system of water usage

Land tenure system based on lease instead of ownership

Knowledge transfer with extension system is ineffective

Lack of maximum extraction amounts from water bodies

Lack of monitoring system for water usage

Lack of soil protection and water saving strategies

Climate Change

Structural Problems

Technology

## Conclusion/Discussion

### Water & Climate

It is unlikely to ever be able to prevent and control hydrologic variability. Therefore, it is crucial to conduct studies about the hydrological properties of the study area.

Irrigation is the major mitigation strategy as it can alleviate failed harvests in droughts or dry years and increases yields compared to rain-fed production. To increase water use efficiency first a shift from furrow irrigation to drip irrigation is highly recommended. Furthermore, groundwater use should be fostered. Decentralized Climate information services (CIS) are required, other interventions such as improved seed varieties might otherwise be inefficient. A simple method is the installation of rain gauges to document rainfall on a very local level. If accepted and applied correctly farmers do not have to exclusively have confidence in traditional crop calendars for planting times and irrigation but can react more flexibly to changing rainfall patterns.

### Institutions

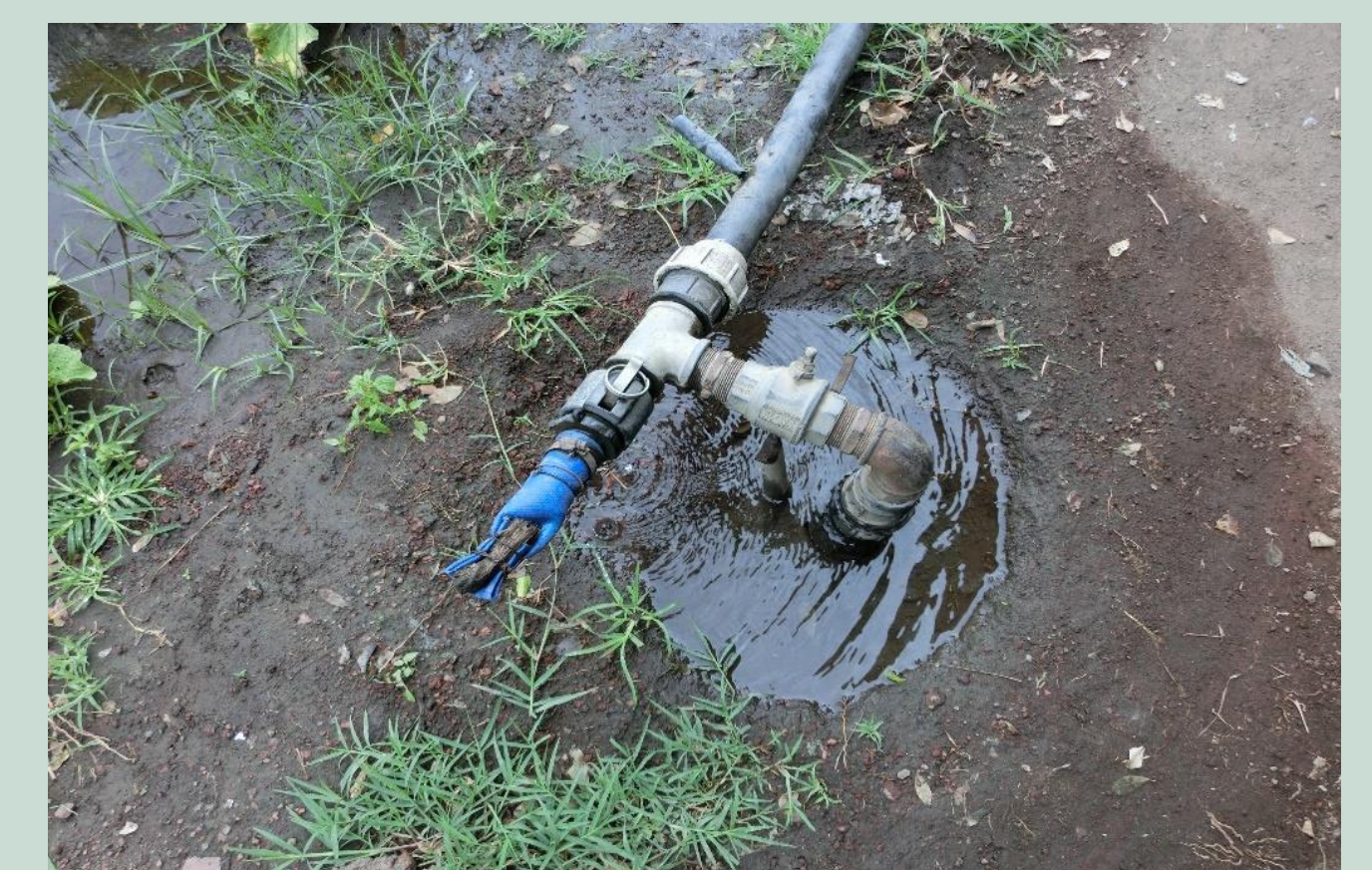
The effectiveness of Government employed Development Agents (DAs), is questionable. Their education is mostly inadequate to train farmers in appropriate mitigation techniques.

The land tenure system currently facilitated by the government is based on lease and not on ownership and water can be extracted for free. This creates wrong incentives. Farmers are not encouraged to cultivate their land sustainably because they have no security that the land they are currently holding will still be theirs in the years to come. Consequently, the government is contributing to unsustainable soil management practices and encourages the overexploitation of water resources.

### Adaption Strategies

Mitigation and adaption strategies such as diversification, saving, keeping of livestock as secondary income and use of adapted seeds are known but especially poor farmers cannot afford them. Leaving the agricultural sector is not seen as a viable option. It is important to adapt the cropping system by introducing formerly uncommon crops and adapting crop cycles. Organic farming practices enable to maintain soil productivity in the event of drought. Impulses for soil conservation should be created and soil protection measures should be implemented.

Water resources are perceived to be infinite and irrigation is seen as the sole mitigation strategy, prohibiting innovation. Research by local universities is lacking but could help closing knowledge gaps.



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## Acknowledgement

This research is based on a study project for master students at the Humboldt-Universität zu Berlin. The project was organized by the ValueSec Project (Value Chain Development for Food Security in the Context of Climate Change), initiated by the Department of Horticultural Economics at the Humboldt-Universität zu Berlin and received funding from the Heinrich-Böll Foundation in the context of their Teaching EcoFair Trade project in collaboration with partner universities from Ethiopia and Kenya. The ValueSec project is co-financed by the ACP-EU Cooperation Programme in Higher Education (EDULINK II), a programme of the ACP Group of States with the financial assistance of the European Union.