1 Introduction

Water is the most limited resource for agriculture in Yemen. The optimised use of this resource is determining the agricultural and economical development of Yemeni rural areas. The amount of water that is available for agriculture and domestic use correlates with the social and economic standard of living.

Scientific Objectives

The goal of this study is to quantify agricultural water availability and deficit in the semi-arid mountainous region of the southern uplands of Yemen. This area, although highly populated and under intensiv terraced agriculture, lacks agro-hydrological work. It appears as a white spot on hydrologic and agronomic maps of Yemen. In particular, this study wants to address the following questions:

- Is the rainfall in the vegetation period sufficient for the major agricultural crop sorghum or does the region permanently lack rainfall?

- How is the temporal rainfall distribution of the vegetation season related to the plant water requirements? Which is the period where the water scarcity is high?

- How large is the beneficial effect of water harvesting irrigation schemes compared to rainfed agriculture?

- Do tillage and management measures have an effect on the crop water requirement?

Outline of the Thesis

Chapter 2 starts with a geographically oriented overview of the available literature about agriculture in Yemen. Then it shifts to a short discussion on water availability and the discuss the aspects of different water shortages and some of its socioeconomic implications. Finally, it closes with an outline of water harvesting and runoff irrigation.

Chapter 3 focuses on the methodological aspects of the thesis. It starts with the geomorphological terrain analysis which leads to the runoff-runon distribution scheme. After that the methodology for the rainfall reliability analysis is developed which is used to calculate the agricultural water availability. The major part is an approach to crop evapotranspiration and the construction of the crop coefficient curve.

Chapter 4 gives an introduction to the physical-geographical setting of Yemen and the immediate vicinity of the working area Mia'amirah. This leads to the description of the fieldwork and the explanation of the used field techniques in chapter 5.

Chapter 6 provides the data analysis and modelling. The Ta'izz precipitation data are analysed and used to provide the climatic/agricultural water availability for the reference crop sorghum. The Mia'amirah data are analysed and used for the non-calibrated semi distributed crop evapotranspiration model. For the model two scenarios are derived: the hypothetical pure rainfed scenario and the scenario with a water harvesting component. An additional conceptional run of the model shows the impact of agricultural measures such as "thinning" and "leaf picking". Finally, the results of the reliability analysis of agricultural water availability and the crop evapotranspiration model are compared and discussed.