Bilan hydrique agricole et sécheresse en Afrique tropicale
Ed. John Libbey Eurotext. Paris © 1994, p. 67-75

7

Crop yield estimation and forecasting in Niger using NOAA AVHRR data

C. CONESE, F. MASELLI, A. DI VECCHIA, B. SENNI, G. MARACCHI
IATA-CNR., P. le delle Cascine 18, 50144 Firenze, Italy

Introduction

The use of remotely sensed data has shown its maximum potential in arid and semi-arid countries mainly for the study and assessment of vegetation type, density and status on a regional scale. In particular, in the last few years many studies have been conducted concerning the utilization of NOAA NDVI (Normalized Difference Vegetation Index) data to monitor tropical and sub-tropical landscapes. NDVI maximum value composites (MVCs) accumulated throughout a rainy season have been demonstrated to be a good indicator of environmental conditions in semi-arid environments, and have been particularly tested in the Sahel [1-3]. In this area, such data have been found to be linearly related to global primary productivity [4].

Some advances are however still necessary to practically utilize NDVI data for crop monitoring and forecasting, which would clearly be a major application. A marked geographical variability has in fact been found in the relationship NDVI/active green biomass, depending on many environmental factors (vegetation and soil types, terrain

topography, etc.). Moreover, agricultural production is an extremely variable proportion of total primary production, so that its identification is highly problematic when working on a regional scale. Also, the use of data accumulated during a whole rainy season tends to limit practical applications for yield forecasting.

In this context, the present work has been carried out in collaboration with a STD Program of the CEE ; the objective of the work has been the development of an operative method for NDVI data processing aiming at environmental monitoring, and, more specifically, at crop yield assessment and forecasting in sahelian regions. Some quantitative tests of the procedure developed have been made with data taken from four successive rainy seasons in Niger. The first results, reported in the present paper, are quite encouraging also for applications.

Materials and methods

Study site, ground and satellite data

Niger has been selected as study area ; this is a typical sahelian country, characterized by high temperatures throughout the whole year and scarce precipitations during the brief rainy season. Its landscapes range from woodland in the southern part to brushland, grassland and desert going towards north. The country is divided into seven administrative departments, which cover the whole environmental variety (figure 1).

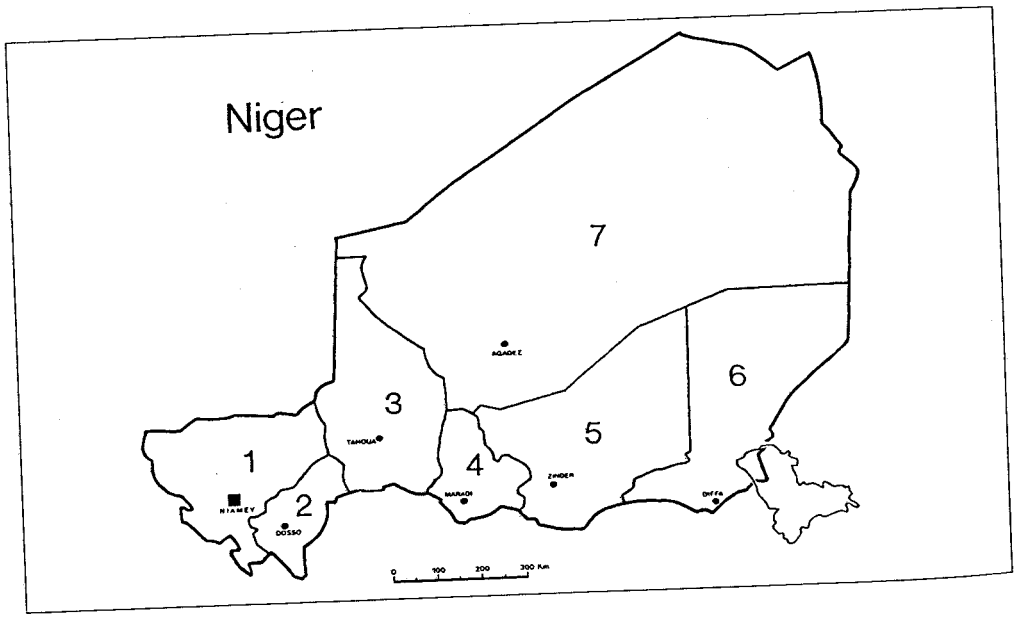

Figure 1. Study country divided into seven administrative departments.