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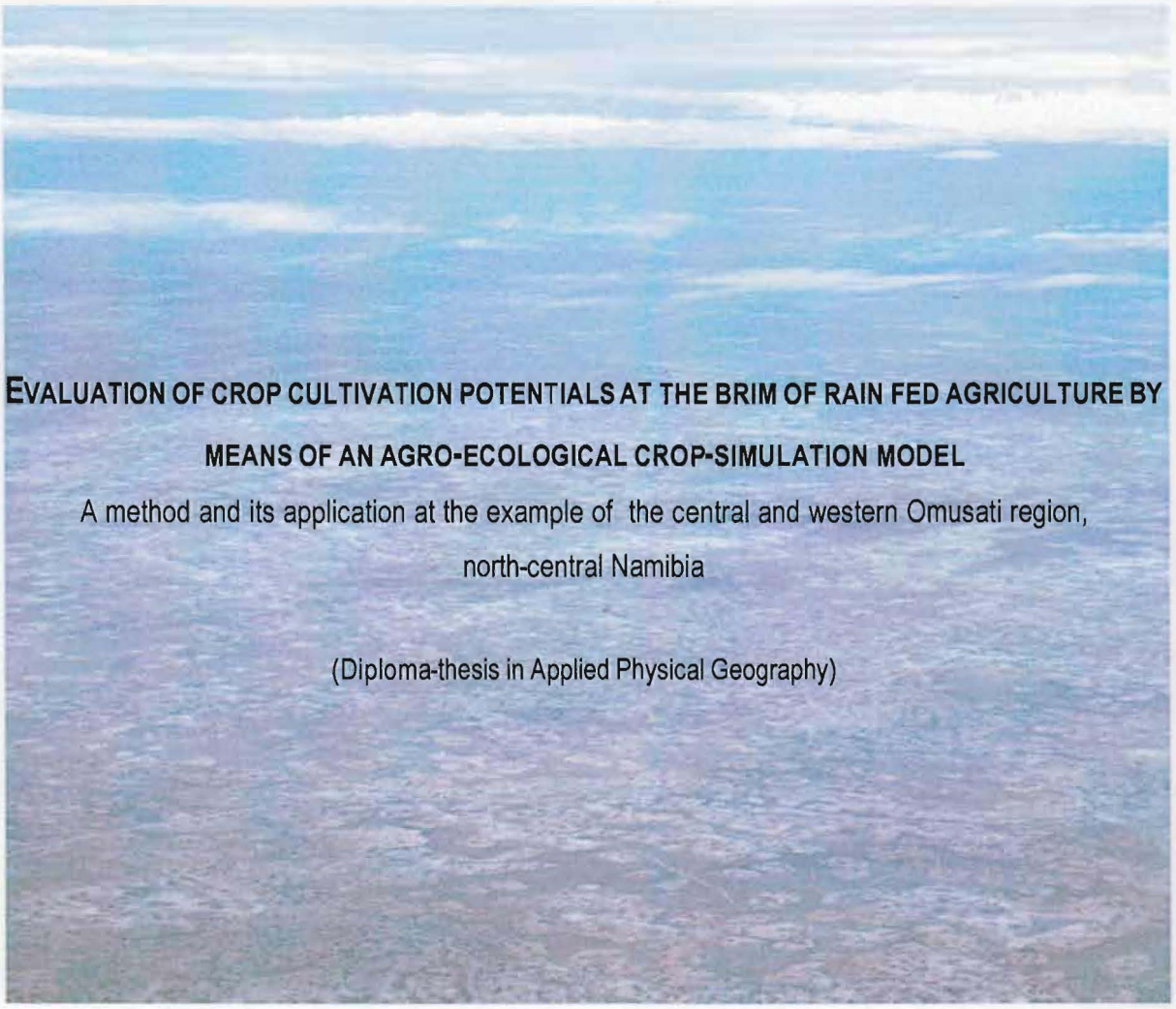

EVALUATION OF CROP CULTIVATION POTENTIALS AT THE BRIM OF RAIN FED AGRICULTURE BY MEANS OF AN AGRO-ECOLOGICAL CROP-SIMULATION MODEL

A method and its application at the example of the central and western Omusati region, north-central Namibia

(Diploma-thesis in Applied Physical Geography)

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6 SUMMARY

In Namibia an ever growing population is looking for jobs to earn a living, but the potentials to create formal employment opportunities are relatively limited, because of the *"smallness and weakness of the Namibian economy"* (SOCIAL SCIENCES DIVISION & MULTI-DISCIPLINARY RESEARCH CENTRE UNIVERSITY OF NAMIBIA, 1995, p.74). In urban areas, unemployment is already high and the advancing rural-urban migration *"is merely to increase the incidence of poverty in the low-income suburbs and peri-urban informal settlements"* (SOCIAL SCIENCES DIVISION & MULTI-DISCIPLINARY RESEARCH CENTRE UNIVERSITY OF NAMIBIA, 1995, p.26). The rural-urban migration is often accelerated by droughts like in 1992/93, when drought-prone farmers searched for jobs and steady income in towns.

Of course, development of the secondary and tertiary sector in Namibia is necessary to support the growing population. But several publications (e.g. SOCIAL SCIENCES DIVISION & MULTI-DISCIPLINARY RESEARCH CENTRE UNIVERSITY OF NAMIBIA, 1995; NATIONAL PLANNING COMISSION, 2000; SPRINGER, 2002) also emphasise justifiably, that agriculture should and will retain its importance within the Namibian economy, because other development options are limited. Many experts involved in development and economic politics of Namibia agree that, apart from the meat exporting commercial farming sector, Namibia will never get in the position to be a large-scale producer of farming products or to export significant amounts of agricultural, especially food, products. Indeed, modern Namibia is highly dependent on food imports, mainly coming from South Africa and other countries in the region. Most probably Namibia will never reach the level of self-supply concerning food, due to it's environmental limitations. Nevertheless it is a fact, that small scale farming still is an important source of livelihoods at present, especially in north-central Namibia. The observation that agricultural activities today are advancing into areas with decreasing rainfall (see chapter 4.1) also show the prolonged importance of agriculture in sustaining the livelihoods of many Namibians.

Yet, the start of agricultural activities in previously uncultivated regions of developing countries, is often a difficult venture, especially in areas that are characterised by aridity and drought. It is not unusual for such developments to fail. The reasons for such failures can be e.g. bad soil quality resulting in nutrient exhaustion, or soil salinisation, in case badly managed irrigation methods are applied. Very often can also climatic conditions be the reason, in case they do not support the successful cultivation of certain crops or crops in general on the long-term scale. The outcome of such development mistakes are large, open fallow areas with unproductive, exhausted or salinised soils. The natural vegetation is destroyed and the areas get severely affected by erosion. What also remains is an impoverished population without perspectives and income alternatives.

Agro-ecological crop simulation models are a tool to reduce the risk of such mistakes. They can help to better understand and assess the climatic and soil conditions that are characteristic for a specific area. They can also contribute to find crop varieties that can successfully be cultivated under the special conditions at a certain area.

This thesis has introduced one such model and shown that the application of the technique in the Namibian context is possible with relatively little effort and relatively high accuracy, as far as the available input-data and the practical execution of the method are concerned.

The findings and results that were made during the whole procedure, can provide valuable information regarding the future of agriculture in central and western Omusati: The soils in the region have a generally low nutrient content. This fact is not very positive, but typical for most semi-arid and arid regions. However, GANNSEN (1963) mentions that results of nutrient analyses concerning Namibian soils should not be compared with results and fertiliser recommendations concerning e.g. soils from central Europe. Namibian soils, even those with very low nutrient levels, are able to produce satisfying yields. The nutrient deficit is usually balanced by the loose structure and favourable aeration of Namibian soils, so roots can reach deep into the ground, where they can tap additional sources of nutrients. Precondition for successful crop cultivation are of course sufficient rainfall and non-saline soils with neutral to slightly alkaline reaction (GANNSEN, 1963, p.100).

As far as crop cultivation in central and western Omusati is concerned, the of the modelling results show clearly that it is not so much the rainfall amounts, but the temporal rainfall distribution that determines the cultivation success. In addition, it is the drainage and water-holding characteristics of the soils that can reduce the risk of bad harvests during some seasons with erratic rainfall. As it is impossible to influence the temporal rainfall distribution, any future agricultural activities should therefore concentrate on the soils of the *Mopane-Combretum savanna on sandy soils*, the *Western sand plains*, the *Mixed savanna on loamy to sandy soils* and the *Mopane shrubs & low trees on loamy sands* area. These soils have better soil-water qualities and are, except for the soils in the area of the *Mixed savanna on loamy to sandy soils*, generally less saline than those in the area of the *Western mopane-pan mosaic* and the *Cuvelai palms & fruit-trees on loamy sands* vegetation unit. An additional reason to choose the area of the *Western sand plains* for agricultural activities would be the apparently higher K_2O-concentrations of the soils there.

Beyond the concentration of farming activities to areas with favourable soil qualities, special farming techniques, e.g. the *Matuta*[1]-system, *Agroforestry* and wind-breaking hedges to reduce evaporation can additionally promote the soil-water situation.

Yet, it seems debatable to the author, if any further development of rain-fed agriculture would make sense in central and western Omusati. A decision on this point depends on how the risk of a marginal harvest or total crop failures in statistically four out of ten years is appraised by official planners/ decision makers and by the affected local population.

It is true that the calculated risks of bad harvests only apply for Tepary bean cultivation, but as Tepary is known as an extremely resistant and drought tolerant crop, it is questionable whether the risk is less, if other crop varieties are cultivated.

[1] The *Matuta*-system is a cultivation technique, which is widely applied in western and also in eastern Africa. The method is to plant the crops on top of little dams of soil that have a positive effect on soil-moisture.

In any case, farmers who intend to start agricultural activities in the previously non-cultivated areas of central and western Omusati should get information about the special characteristics of the area and about ways to reduce the risk of crop failures.