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A Geographical Analysis of Positioning and Functionality of the Tank Cascade Systems of the North Central Province Sri Lanka

by

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Declaration

The work described in this thesis was carried out by me under the supervision of Marcus M. Karunanayake, Emeritus Professor of Geography University of Sri Jayewardenepura and Professor Lennart Strömquist, Department of Social and Economic Geography, University of Uppsala, Sweden and a report on this has not been submitted in whole or in part to any university or any other institution for another Degree/ Diploma.

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Date 15/01/2009

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Certification

We certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation.

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Acronyms

AWA	-Actual Water Available area
DSWY	-Dry Season Water yield
DST	-Down Stream Tank
IWMI	-International Water Management Institute
LHG	-Low Humid Gley Soil
NCP	-North Central Province
RBE	-Reddish Brown Earth soil
TCS	-Tank Cascade Systems
TTC	-Total Tank Capacity
UST	-Upper Stream Tanks
WSA	-Water Spread Area
WSWY	-Wet season Water Yield
CWY	-Cascade Water Yield
SVI	-Spectral Vegetation Indices
WSA	-Water Spread Area
TWSA	-Total Water Spread Areas
AWAA	-Actual Water Available Area
TWI	-Tank Water Intake

Glossary of terms

Dryness of catchments.	The dry status of the tank catchments shown by the dried-up vegetation
Cascade water yield.	The water amount gained by the catchment of the cascade after the balance from rainfall input and evaporation loss
Tank density.	The number of tanks per unit of area or the ratio of tanks to the area of cascade
Dried-up tank beds.	Tank beds without water and with dried –up vegetation
Dried –up vegetation.	The vegetation characterized by permanently or temporally wilted, dead or with removed leaves
Water spread area.	The tank's denudation area
Actual water available area.	The tank's water area exists at the moment of investigation
Water sufficiency.	The availability water in any quantity in the driest month
Effective cascade.	Cascades which have a surplus water after filling all the tanks with the cascade water yield or showing any water quantity of water in the majority of tanks
Efficiency of cascade.	The availability of water exists in the majority of tanks in the cascade

CONTENTS

List of Tables

List of Figures and Plates

Plates

Appendices

A Geographical Analysis of Positioning and Functionality of the Tank Cascade Systems of the North Central Province Sri Lanka

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ABSTRACT

Key words: *Cascades, Water efficiency, Catchment dryness, Water yield, Water surplus, Tank water intake*

The cascade tank systems which have been structurally organized within river and stream basins are unique and widely spread phenomena of the Dry Zone landscape of Sri Lanka, where irrigation and water resources management have roots in the early history.

Most studies on tanks and tank cascade systems in Sri Lanka have dealt with the irrigation, water management and environmental aspects, based on individual locations. Morphologically their formation, shape and size and their relation to the water availability from a spatial perspective have not been adequately studied.

Thus, the present study attempts to comparatively analyze the 'water efficiency of tank cascade systems' using remote sensing, and topographical maps interpretation together with field verifications. To achieve this objective the study observes the distribution and positioning of the tank cascades with emphasise on the physical setup to enable an analysis of water efficiency.

Placing greater emphasis on the spatial aspects of cascades, the study also attempts to differentiate the cascades on the basis of size, shape and destination points of water flow. This classification thus provides an appropriate framework to discuss the location and positioning of the cascades to designate the most efficiencant cascades in the sense of water availability

With the help of the Landsat image interpretation, the study attempts to view the environmental status, in particular the 'dryness' of the tank catchments in order to identify the water and moisture availability of cascades with different shapes to determine which type of cascade is more 'efficient' in maintaining a wet environmental condition.

Quantitatively, the 'cascade water yields' calculated by rainfall and evaporation, and the total tank water capacities are used to determine the most effective cascade types in the sense of water 'deficit' or 'surplus'.

In terms of 'systems theory' the present study also attempts to view how the tank cascades are presently functioning as 'real systems' with an inter-tank water flow system. In addition, from a social perspective, the people's perception or awareness of the cascading water flow system is used to further confirm the system functionality.

In sum, with the use of visual information together with quantitative data, the present study provides a basic guidance to identify the most important cascade types on which attention should be focused in the planning of small tank development in the Dry Zone of Sri Lanka.