The Tank Systems in the Dry Zone Sri Lanka: Evolution, Management and Traditional Knowledge

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1. Introduction

The dry-zone water-harvesting and management system in Sri Lanka is one of the oldest historically recorded systems in the world (Gunawardana, 1971). A substantial number of ancient sources mention the management and governance structure of this system suggesting it was initiated in the 4th century BCE and abandoned in the middle of the 13th century CE. In the 19th century CE, it was reclaimed under the British colonial government (Gunawardana, 1971; Murphey, 1957). This research predominantly aims at identifying the temporal development and socio-economic meaning of the water harvesting and management system through a systematic analysis of the written and epigraphic sources. Consequently, a critical analysis was conducted to examine the present-day management system and the preservation of indigenous characteristics for a sustainable utilization of the resource in future.

The key research questions of this research are as follows:

- Do the analyzed sources engender potential for the derivation of information on different aspects related to the spatial, temporal and administrative development of the ancient water harvesting and management system in Sri Lanka?
- What are the main characteristics, and which socioeconomic implications are visible in the evolution of ancient water harvesting and management systems in the Dry Zone of Sri Lanka?
- Which meaning do sustainable indigenous management systems have in present day agriculture in the Dry Zone of Sri Lanka?
- Which traditional knowledge related to the water harvesting systems is still practiced today in a local context?

2. Materials and Methods

This research study was conducted using an interdisciplinary research approach combining different research methods. In general, two major approaches were taken to analyze the socio-economic conditions and implications of past cultures: a) Analysis of epigraphical sources, primary and secondary literature, historical maps and archaeological findings were combined to identify and reconstruct the socio-economic conditions of the ancient Rajarata kingdom during Anuradhapura and Polonnaruwa periods. b) Standardized qualitative interviews and workshops with the main stakeholders involved with the management of the Dry Zone hydraulic landscape were conducted, for the documentation of the present governance structure, land use practices, and existing indigenous knowledge.

Sri Lanka is an island situated in the Southern tip of the Indian peninsula with the total extent its landmass being about 65,610 km^2. Low land Dry Zone Sri Lanka is the main focus for this research study.

3. Results and Discussion

In first case study, 255 text passages containing 837 different records on ancient irrigation were compiled as a database for the period from the 5th century BCE to the 10th century CE to reconstruct the diachronic developmet of the system. The second case study aims to identify the ancient water management and governance structure in the Dry Zone of Sri Lanka through a systematic analysis of ancient sources.

Furthermore, colonial politics and interventions during reclamation have been critically analyzed. Basis for this was the already existing database from which 222 text passages containing 560 different records contained relevant information. 201 of these text passages were captured from lithic inscriptions and 21 text passages originate from the chronicles. The spatial distribution of records in general largely corresponds to the extent of the Dry Zone and northern intermediate zone. The analyzed data are not equally distributed throughout the investigated period and show a distinct peak in the 2nd century CE. In conclusion, the conducted analysis documents the potential of the analyzed source genres for the derivation of information on different aspects related to the spatial, temporal and administrative development of the ancient water management system in Sri Lanka.

The third case study aimed to analyze the current management practices and existing indigenous aspects of the Dry Zone irrigated agricultural system from the viewpoint of farmers who are the main stakeholders of the system. Altogether 49 semi-structured interviews were conducted in seven villages in the Anuradhapura district and a detailed survey was conducted in the village of Manewa with a mixed research approach. The basic elements of the indigenous landscape, agricultural practices and management structures based on Farmer Organizations were mapped and examined in detail. The analysis of results shows that the sustainability of the indigenous agricultural system is vulnerable to rapid changes due to modernization, market changes, education levels, and inconsistent management decisions.

A systematic analysis of written and epigraphic sources was a research desideratum and thus their potential as knowledge base for extracting information on the tank cascades systems was not clear. The first case study clearly shows that these source genres have a high potential for the derivation of information on different aspects related to the spatial, temporal, and administrative development of ancient water harvesting and water management systems in Sri Lanka. Although the inscriptions, classical texts, and chronicles of Sri Lankan historiography were written following a specific agenda, they still provide trustworthy information on the development of the ancient water harvesting system. Spatial and temporal distribution of the records is a key factor for the trustworthiness of the records, emphasized during the total analysis. The analysis of each source genre showed that the spatial-temporal distribution of the records depends on several factors:

- The location of the ancient capitals and their hinterlands
- The core religious areas and the location of major ritual centres
- The areas of research interest from the colonial times to present
- The Colonial and Post-Colonial political landscape
- The availability of resources for lithic inscriptions
- The evolution of the Buddhist monastic institution
- the evolution of the kingdoms and their socio-economic implications
- The evolution of social organization

- Indian influences and World political geography
- The personal interests and influences of individual rulers

In a similar manner, the spatial and temporal distribution of the historical records on water management and governance together with their qualitative information reflect the evolution of the water management and governance systems in the Dry Zone of Sri Lanka.

In contrast, from the beginning of the Sri Lankan hydraulic civilization the vast multitude of small village tanks were developed and managed by local communities with less sophisticated technical skills. Due to the sustainable decentralized management structure, the small tank systems existed intact for more than two millennia, even after the Dry Zone was abandoned during medieval times. Different layers of management strategies were implemented, blending centralized major irrigation schemes with locally controlled small irrigation systems. Buddhist temporalities were used to link the hinterland with the main settlements, not in a secular administrative fashion but in a spiritual and intangible relationship (Coningham et al., 2007). Likewise, the ancient capital Anuradhapura and its hinterland display a unique example of a water management and governance system developed in harmony with a dual patronage between rulers and local people. This conclusion is partly contrary to Karl Wittfogel's hypothesis (Wittfogel, 1959) that state societies in Asia depended on the creation of large-scale irrigation works which required organized, forced labor and centralized bureaucratic management.

After nearly five centuries of abandonment, the water management and governance systems in the Rajarata kingdom were reutilized under the British colonial regime *(Alwis, 1986; Brohier, 2006; Karunanada, 2006)*. However, the initial intervention was caused by political and economic reasons rather than to reactivate the traditional management mechanisms. British colonial rulers only slightly changed the few main elements of the traditional system such as the compulsory labor system called Rajakariya and the Buddhist temporalities based on service and land tenure *(Alwis, 1986; Mangalaruby, 2015)*. However, in the later stages British colonial rulers tried to adopt the community-based sustainable nature of the traditional governance structure as documented by the introduction of the Vel Vidane system for the small tank cascades.

Throughout the world, for millennia people developed locally adapted agricultural systems. These "indigenous" agricultural systems were highly based on traditional knowledge and were continuously adapted to the changing environmental, social and political conditions; they represent local knowledge, forming a vital combination of social, cultural, ecological and economic services to humankind *(Koohafkan & Altieri, 2011)*. Unlike modern agricultural technologies, indigenous methods often addressed the efficient utilization of resources and helped to preserve cultural diversity and biodiversity with collective involvement. The Sri Lankan small tank cascade systems are an example of such an indigenous agricultural system. They were initiated in the heyday of the ancient kingdoms and since then have undergone several transformation processes. In the 1960s, these processes were triggered by the Green Revolution. Until the Green Revolution the basic elements of the indigenous system and the main ecological and socioeconomic components of the landscape were widely preserved. Current research suggests that these basic elements of the landscape still exist and function to

a certain degree despite the forces of modernization, population pressure, economic changes and educational development.

The management structure and mechanisms were changed from the hereditary headman system to a community-based Farmer Organization system. The transformation into a participatory approach seems a productive and attractive evolution of the system. However, the in-depth analysis of the perception of the main stakeholders of the systems-the farmers-revealed that the inseparable bond they had with the landscape and the entire agricultural system was threatened by the current Farmer Organization system: the spiritual connection was converted into a financial and benefit-oriented system. Within the previous Vel Vidane system, the farmers participated directly in the tank maintenance and the holistic management of the village tank landscape with its irrigation agriculture. In contrast, within the current Farmer Organizations system, the farmers contribute to the maintenance as daily labourers. With the onset of the Farmer Organizations system the farmers became increasingly alienated from the landscape, leading to the deterioration of the indigenous agricultural system.

4. Conclusion

This research contributes to the knowledge base of water resource management by addressing policy dimensions, with a special reference to traditional and indigenous knowledge base. Socio-economic implications on the development of the water harvesting systems were systematically compiled and serve to interpret the evolution of the water harvesting systems in a broader context.

Anuradhapura and its hinterland are considered as the center of the ancient hydraulic civilization in Sri Lanka. During past decades, the management process of its heritage focused on its archaeological and cultural attributes. The cultural values of the surrounding cultural landscapes, with its multiple reciprocal human–environmental interactions and sophisticated water harvesting systems, being rooted in the ancient Anuradhapura period, are not yet the focus of heritage management.

The development of an integrated management approach, to protect this 2,000-year-old cultural landscape, would be a great challenge for future interdisciplinary research and heritage management. From the perspective of landscape archaeology, the major objectives are to enhance the understanding of the development of the ancient water harvesting systems and its effects on the landscape and cultural development, to investigate traditional management aspects and traditional knowledge related to these systems, and to adopt the management strategies of these systems to handle possible socio-economic and environmental evolutions in the future.

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6. Keywords

Water management, Water governance, Landscape Archaeology, Rajarata

7. References

- Alwis, J. (1986). Irrigation legislation and participatory management. *Participatory Management in Sri Lanka's*.
- Brohier, R. L. (2006). *The Story of Water Management in Sri Lanka Down the Ages: Food and the People*. Sooriya Pub.
- Coningham, R., Gunawardhana, P., Manuel, M., Adikari, G., Katugampola, M., Young, R., Schmidt, A., Krishnan, K., Simpson, I., McDonnell, G., & Batt, C. (2007). The state of theocracy: Defining an early medieval hinterland in Sri Lanka. *Antiquity*, *81*(313), 699–719. https://doi.org/10.1017/S0003598X00095673
- Gunawardana, R. (1971). Irrigation and hydraulic society in early medieval Ceylon. *Past and Present*, 3–27.
- Karunanada, U. B. (2006). *Nuwarakalawiya and the north central province under British administration 1833-1900.* Research Centre for Social Sciences, University of Kelaniya, Kelaniya, Sri Lanka.
- Koohafkan, P., & Altieri, M. A. (2011). *Globally important agricultural heritage systems: A legacy for the future*. Food and Agriculture Organization of the United Nations Rome.
- Mangalaruby, S. (2015). THE RECOMMENDATIONOF THE COLEBROOKE–CAMERON COMMISSIONIN1833, MARKED THE BEGINNING OF A NEW ERA IN THE HISTORY OF SRI LANKA-A VIEW. *Asia Pacific Journal of Research*, *1*(XXVI), 14–18.
- Murphey, R. (1957). The Ruin of Ancient Ceylon. *The Journal of Asian Studies*, *16*(2), 181–200. https://doi.org/10.2307/2941377
- Wittfogel, K. A. (1959). *Oriental despotism: A comparative study of total power*. http://philpapers.org/rec/WITODA