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USING AGRICULTURAL INFORMATION SYSTEM TO ENHANCE THE SUSTAINABILITY AND FORCASTABILITY IN THE ELLANGA TRADITIONAL CASCADE TANK-VILLAGE SYSTEM IN SRI LANKA

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Research Highlights

This paper attempts to suggest that an Information Technology assisted networking program can be introduced to systematize and rationalize the *Ellanga Agricultural Model* alas *Cascade Tank-Village System* that is presently identified and developed as an alternative and sustainable agricultural system in Sri Lanka in place of mass agriculture. Sri Lanka carries the history of 2500 years of hydro-agricultural river vally civilization and her method of cascade tank agriculture is considered as a sustainable and an eco-friendly intergrated method (Ministry of Agriculture & FAO 2017). The main two seasons of agriculture in the dry zone (*Yala* and *Maha*) are mainly sustained through a cascading system (2017: 19) in which the excess water from annual rainfall is stored in a tank for future use. Further, the tank water is protected from evaporation, absorption, wastage, and salinity through various natural means which are highly eco-friendly. In this context, this study investigate the possibility of introducing an Infromation Techology based networking and forecasting method to enhance the sustainability, effectivenss and efficiency of this system. Since this system is already rationalized through traditional means it is easy to introduce a calculation based computated method to sustain the integrity and storage capacities in the tank and predict the climatic changes and rainfall patterns plus other agricultural networkings such as marketing and land use. Since the over-population of

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these villages has forced the younger generation to leave the system, a GIS based IT model can be introduced with the help of mathematical and statistical calculations to help the adminstrative authorities to manage settlement faciltieis and to expand the land use mechanisms for the next few decades. A proper GIS analysis will also help the Forest Authorities and Divisional Secretariats to understand the amount of land that should be allocated to wildlife and elephant corridors without disturbing the ancient farming expansions in the villages. A GIS method can also be used to minimize the natural hazards in this area such as flooding.

Key words: Cascade water tank system, Ellanga IT Network System, traditional knowledge, enhancing efficiency

Graphical Abstract (optional)

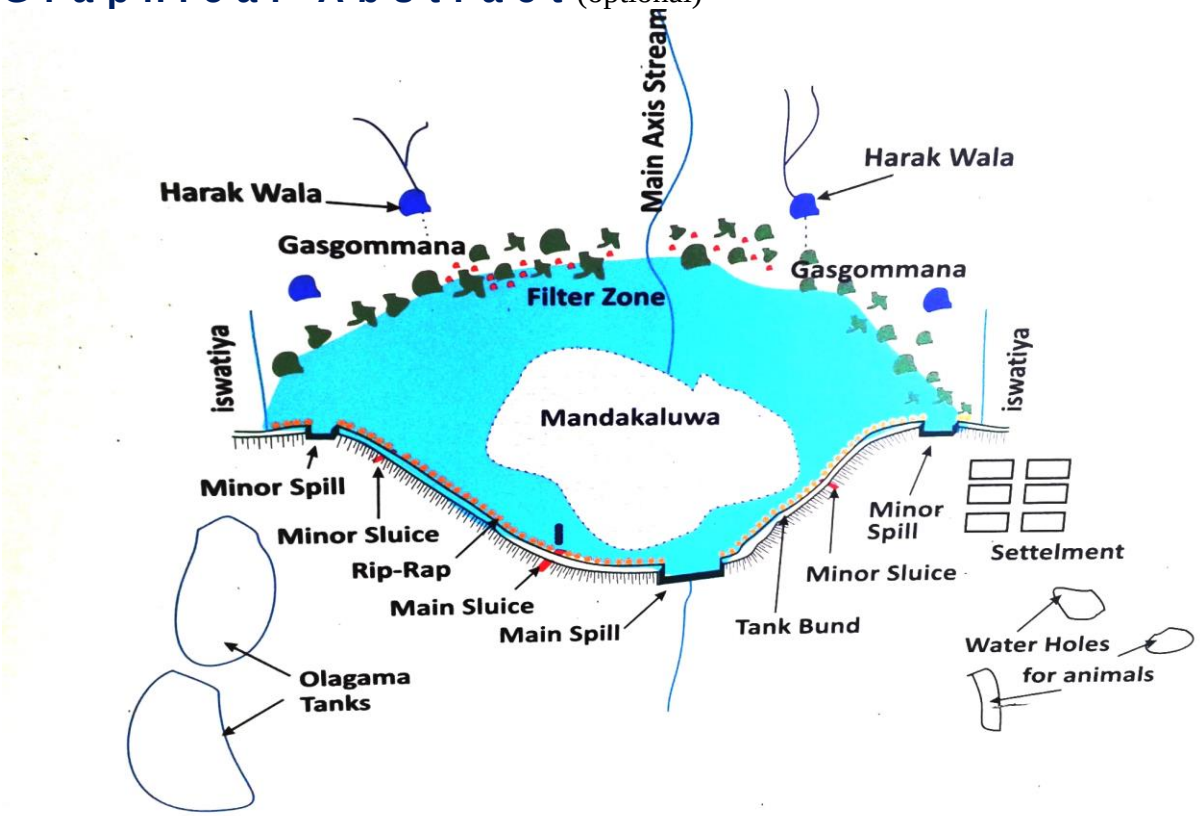

Figure 01: Intergrated network features of the Cascade Tank System (Source CRIWMP 2018)

Research Objectives

To introduce an IT and GIS based calculation and forcasting model for the Ellanga Cascade Tank Village System in Sri Lanka

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To enhance the effectiveness, forecasting ability and land use mechanism to further sustain this world heritage agrarian system.

To introduce to the world the integrity of rationalism and eco-friendly sustainability in the cascade-tank agricuture system in Sri Lanka.

Methodology

Several site visitations were made by the researchers to the village Rambawewa in Nawagaththegama Divisional Secretariat Division in Puttalam District in Sri Lanka. The researchers observed the cascade network system in the above village and made series of interviews with the farmers, village headwoman, Secretary of the Planning Division in the Divisional Secretariat as well as with one NGO called *Wew Gam Pubuduwa* operating under CRWMP (Climate Resilient Intergrated Water Management Project) funded by UNDP. Snowball technique was used to collect date and to meet more resource persons and farmers. GIS and certain statistical/mathematic packages are used to introduce the calculation techniques and to measure the geographical features of this research entity.

Results

Rambawewa village suffers from various socio-agricultural issues at the moment. Lack of rainfall for five seasons, invasions from wild elephants, scarcity of drinking water, scarcity of farming land, over-population, lack of marketing method are some of those issues. According Mr. P.M. Tikiribanda (70), one of the farmer who was interviewed, the families have no space for further expansion and his offsprings have moved to other distant areas for agricultural and other social needs. The elephant corridor that has been introduced by the forest department also further restricts the cultivatable paddy lands. He also added that he could not cultivate during the last four seasons since there was no rian. According to his view, the ancient methods have now disappeared and the new generation does not know much about the (or does not believe in) preservation techniques or water management techniques used by the previous generation. Therefore, IT based mathematical and statistical model can help to rationalize the system, to enhance its effciency level and to find solutions for some of its burning issues. For example, water capacity of the tank which is the most important component in the whole system can be measured and put into an mathematic equation as follows;

To Find Total Volume of the Tank (Table given Manual process)

Contours Interval (m)	Depth between contours (m)	Contour Area (m^2)	Average of contours (m^2)	Volume of each contours (m^3)
950		7.12		
952	2	8.45	7.79	15.57
954	2	9.63	9.04	18.08
956	2	12.93	11.28	22.56
958	2	17.47	15.20	30.4

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960	2	21.9	19.69	39.37
962	2	25.18	23.54	47.08
			Total Volume	173.06

Irrigation Headworks for Small Catchments Irrigation Department Colombo (Source A.J.P. Ponrajah)

Suggestion Equation

Inputs	General Equation	System Output
n-No of contour intervals (m) X-depth between two contours (m) A_i-Area of i^{th} contour (m^2) (using Plani Meter)	$TVT = \sum_{i=1}^{n} (A_i + A_{i+1}) X$ TVT-Total Volume of the Tank	173.06m^3

Findings

In this context, there must be a new rationalization, awareness and scientific way of re-organizing this ancient system so that the new generation will realize the value of it. Hence this study looks for the possibility of introducing a mathematical-statistical based IT model for better forecasting and sustainability of this village system. The sustainability of this system will in turn affect the global ecological crisis and to preserve this world heritage agrarian system. There is a greater space to introduce an IT based calculation and forecasting model for the sustainability of this agrarian system. This can be further developed to introduce an Ellanga android app or a computer based interface or Ellanga software or information desk to address the rising needs of the farmers (which can be used by the farmers, agriculture officers, irrigation department or divisional secretariat etc.). Further, a properly calculated tank water management method can also reduce the sudden flooding in this area.

Acknowledgement

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