

Evaluation of Agroecological Diversity in Pathadumbara DS

Division, Kandy, Sri Lanka

April 2022

Hettiarachchige Chamara Jayanath HETTIARACHCHI

Evaluation of Agroecological Diversity in Pathadumbara DS

Division, Kandy, Sri Lanka

**A Dissertation Submitted to
the Graduate School of Life and Environmental Sciences,
the University of Tsukuba
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy in Science
(Doctoral Program in Geoenvironmental Sciences)**

Hettiarachchige Chamara Jayanath HETTIARACHCHI

Abstract

Agroecology, can be defined as a farming method, which “centers on food production that makes the best use of nature’s goods and services while not damaging these resources”. It is also being defined as the “science of applying ecological concepts and principles to manage interactions between plants, animals, humans and the environment for food security and nutrition”. Agroecology is one of the key important aspect in agriculture based economies and hence, the study on agroecological diversity plays important role in development of a country that is having agriculture based economy. Further assessments on agroecological diversity will assist in, improving soil and plant quality through available biomass and biodiversity, than negatively impacting nature and natural processes with chemical inputs. In addition, it will improve crop production and helps to maintain ecological balance while assuring profitable farming.

Sri Lanka is an island nation having limited land resources with a tropical climate and agricultural based economy. However, current farming practices are facing many challenges including less crop production from farming lands due to unexpected environmental conditions and due to plant pests and diseases. In this background, exploring the spatial distribution of agroecological diversity become a necessity which will assist to identify most preferable land use pattern for an area. The study area of this research, the Pathadumbara Divisional Secretariat Division (DSD), which is situated in the central highlands of Sri Lanka. The altitude of this DSD ranges from 300m - 1400m above sea level with subtropical highland climate. No systematic data is available on current changes and future recommendations for agroecological diversity in the area. The objective of this study is to fulfill these gaps using GIS and remote sensing techniques.

Data collection of the study was carried out under three categories. First category covered with unstructured questionnaire survey, where and around 300 sample data points were collected. It includes demographic, economical and farmland information. Additionally it covered the wildlife conflict information of the farmlands. Further biological diversity surveys were carried out covering 60 points where bird and plant diversity was recorded. Drone images of two sample areas were captured for more precise image classification. Seven major factors were identified, which has greater influence of existence of agroecological diversity. AHP (Analytical Hierarchy Process) was used as a methodology for calculating the influence of each factor on agroecological diversity of the area. Using Multi Criteria Decision Analysis (MCDA) process each factor was mapped in to overlaid map, which produce the existing agroecological diversity map of the study area.

The resultant map will be able to identify the potential areas for enhancement of agroecological diversity, which in turn will increase the ecological balance of the area and reduce the impact of human wild life conflict within the farmlands. Through this analysis, the most suitable land use pattern for the area is identified and this will assist in future land use planning for human settlements, crop and livestock, adaptation for the climate change resilience, enhancing the eco system for sustainable future. This study can also be used as a reference for future land use studies in different disciplines.

Keywords: Agroecology, agriculture land suitability, GIS, Sri Lanka, MCDA, AHP