

An Impact Assessment of Agro-Ecology on Climate Change Mitigation and Economic Sustainability: A Case of Mopani District

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Abstract

The United Nations Framework Convention on Climate Change (UNFCCC), Food and Agriculture Organization (FAO) and other global structures advocate for agro-ecology in response to climate change. However most of the expected outcomes concerning agro-ecological were not empirically tested for universal application. Economic sustainability is directly related to yield capacity, which is theorized to increase by 3-10% in a space of ten years as a result of agro-ecological implementation. Agro-ecology is theorised to increase over ago-ecological farms and decrease over conventional farms. Increased crop health means increased carbon sequestration and thus less CO₂ in the atmosphere. This is in line with the view that global warming is anthropogenically enhanced through Greenhouse Gasses (GHG) emissions. Agro-ecology mainly affects crop health, soil carbon content and yield on the cultivated land. This study aimed to empirically assess the practicality and validity of these assumptions. The study utilized mainly Geographical information systems (GIS) and Remote Sensing (RS) techniques to assess the effectiveness of agro-ecology as a strategy for climate change mitigation and economic sustainability. The assessment involved a longitudinal study (2013 – 2015) assessing the changes that occur after a farm retrofits from conventional agriculture to agro-ecology. The assumptions guided the objectives of the study. For each objective, an agro-ecological farm was compared with a conventional farm in the same climatic conditional occupying the same general location. Crop health was assessed using satellite images analysed through Normalized Difference Vegetation Index (NDVI) using ArcGIS. Crop health is an indicator of soil carbon content, therefore soil carbon patterns were inferred from crop health patterns based on this relationship. A regression was performed to assess the relationship between surface temperatures and crop health. Yield capacity was calculated based on the production records acquired from the farmers. The results of the study showed increasing surface temperature trends over 80% of the conventional farms and a decrease over 80% of the organic farms. Crop health, Soil carbon and yield capacity revealed an increase over agro-ecological farms and a decrease over conventional farms.

Key words: *Agro-Ecosystem, Agro-ecology, Dialectical, Sustainability, Clean Development Mechanism (CDM), Conventional farm, Agro-ecological farm.*