

**ASSESSING THE ENVIRONMENTAL IMPACT OF CHEMICAL
FERTILIZERS AND EXPLORING VIABLE ORGANIC
FERTILIZER ALTERNATIVES FOR VEGETABLE
CULTIVATION IN NUWARA ELIYA DS DIVISION,
NUWARA ELIYA DISTRICT**



**By
H.M.N.C.Herath**



FTC278

Main Library, Eastern University, Sri Lanka

**Department of Biosystems Technology
Faculty of Technology
Eastern University, Sri Lanka
Chenkalady**

2026

ABSTRACT

Agriculture in Sri Lanka's Central Highlands, particularly in the Nuwara Eliya Divisional Secretariat Division, plays a vital role in vegetable production but is increasingly threatened by environmental degradation due to excessive chemical fertilizer use. This study investigates the environmental impacts of chemical fertilizers and evaluates the feasibility of organic alternatives as sustainable inputs, drawing on agroecological sustainability and innovation adoption frameworks. A quantitative survey of 100 randomly selected vegetable farmers was conducted using structured questionnaires, and data were analysed with descriptive statistics and multiple regression models in SPSS. The results indicated that chemical fertilizers dominate use Urea (100%), MOP (97%), and TSP (64%) while organic fertilizer adoption remains minimal due to labour intensity, limited availability, insufficient knowledge, and yield concerns. Despite this, most farmers recognize environmental consequences such as water pollution (81%), biodiversity loss (77%), and soil degradation (43%). Regression analyses reveal significant relationships between fertilizer practices and environmental outcomes: the organic fertilizer impact model ($p = 0.003$) explained 31.8% of variance, with farmers' awareness and attitudes ($p = 0.002$) and cultivation of potatoes ($p = 0.007$) and tomatoes ($p = 0.001$) as key predictors; the chemical fertilizer impact model ($p = 0.023$) accounted for 27.7% of variance, with fertilizer type ($p = 0.009$) and application frequency ($p = 0.020$) significantly influencing outcomes. The organic fertilizer adoption model was highly significant ($p = 0.001$), explaining 41.2% of variance, showing that frequent organic fertilizer use increases adoption intention ($p = 0.005$) while reliance on chemical inputs reduces it ($p = 0.008$). Although farmers are increasingly aware of the environmental risks of chemical fertilizers, adoption of organic alternatives is constrained by labour, availability, technical knowledge, and institutional support. The findings emphasize the need for strengthened extension services, improved supply chains, targeted subsidies, and policy interventions promoting integrated nutrient management to enhance sustainable and environmentally responsible vegetable production in the highlands.

Keywords: Chemical Fertilizers; Environmental Sustainability; Farmer Awareness; Nuwara Eliya; Organic Fertilizers; Vegetable Cultivation

TABLE OF CONTENTS

DECLARATION	iii
DEDICATION	iv
ACKNOWLEDGEMENT	v
ABSTRACT	vi
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ABBREVIATIONS	xiii
CHAPTER 1	1
INTRODUCTION	1
1.1 Background	1
1.2 Problem statement	1
1.3 Research Gap.....	2
1.4 Purpose of the Study.....	3
1.5 Objectives of the Study	3
1.5.1 Overall Objective:	3
1.5.2 Specific Objectives:	3
1.6 Research Questions	4
1.7 Significance of the Study	4
1.8 Organization of the Study.....	5
CHAPTER 2	6
LITERATURE REVIEW.....	6
2.1 Introduction	6
2.2 Theoretical Framework	7
2.2.1 Agroecological Sustainability	7
2.2.2 Innovation Diffusion and Adoption Theory.....	7
2.3 Type of Fertilizer Used (Chemical Vs Organic)	8
2.4 Quantity and Frequency of Fertilizer Application.....	8
2.5 Farmers' Awareness and Attitudes Towards Fertilizers	9
2.6 Availability and Access to Organic Fertilizers.....	9

2.7	Environmental and Agronomic Outcomes	9
2.7.1	Soil Degradation.....	9
2.7.2	Water Pollution	10
2.7.3	Biodiversity Loss	10
2.8	Adoption of Organic Fertilizer	10
2.9	Crop Productivity and Sustainability	11
2.10	Synthesis and Conceptual Relationship.....	11
2.11	Gaps in the Literature and Justification for the Study.....	12
2.12	Hypothesis Development	12
2.12.1	Effect of Fertiliser Type (Chemical Vs Organic) on Environmental Impact in Vegetable Cultivation.....	13
2.12.2	Effect of the Quantity and Frequency of Fertilizer Application on Environmental Degradation (Soil, Water, and Biodiversity Loss).....	13
2.12.3	Effect of Farmers' Awareness and Attitudes Toward Fertilizers on the Adoption of Organic Fertilizers.....	14
2.12.4	Effect of Availability and Accessibility of Organic Fertilizers on Adoption Among Vegetable Farmers.....	14
CHAPTER 3		16
METHODOLOGY.....		16
3.1	Introduction	16
3.2	Research Design	16
3.3	Study Area	16
3.4	Population and Sampling.....	17
3.5	Data and Data Collection Method	18
3.6	Data Analysis	20
3.7	Validity.....	20
3.8	Ethical Considerations.....	20
CHAPTER 4		21
RESULTS AND DISCUSSION		21

4.1	Introduction	21
4.2	Socio-Economic Characteristics of Respondents.....	21
4.2.1	Gender.....	21
4.2.2	Age.....	22
4.2.3	Education Level	22
4.2.4	Types of Vegetables.....	23
4.2.5	Years of Farming Experience	24
4.2.6	Size of Cultivated Land	25
4.3	Types of Fertilizer Used	26
4.3.1	Types of Chemical Fertilizer Used by Farmers	26
4.3.2	Types of Organic Fertilizer Used by Farmers	27
4.4	Frequency of Fertilizer Application	28
4.4.1	Frequency of Chemical Fertilizer Application	28
4.4.2	Frequency of Organic Fertilizer Application.....	29
4.5	Environmental Consequences of Chemical Fertilizer Use.....	30
4.5.1	Soil Degradation	30
4.5.2	Water Pollution.....	31
4.5.3	Biodiversity Loss	32
4.6	Barriers in Adopting Organic Fertilizers.....	33
4.7	Opportunities in Adopting Organic Fertilizers.....	34
4.8	Environmental Impact	35
4.8.1	Environmental Impact of Organic Fertilizer Use	35
4.9	Environmental Impact of Chemical Fertilizer Use.....	39
4.10	Adoption of Organic Fertilizers	44
CHAPTER 5		49
CONCLUSION AND RECOMMENDATIONS.....		49
5.1	Introduction	49
5.2	Major Findings and Discussion.....	49

5.3	Conclusion.....	50
5.4	Recommendations	51
5.5	Suggestions for Future Research and Outlook	52
5.6	Limitations of the Study	53
	REFERENCES.....	54
	ANNEXURES	62
	ANNEXURE 01.....	62
	ANNEXURE 02: FIELD DATA COLLECTION PHOTOGRAPHS	68