

POLICY BRIEFS of Agribusiness Research 2018



Policy Briefs of Agribusiness Research - 2018

Department of Agribusiness Management

Tele : +94 31 229 9246
E-mail : dabm@wyb.ac.lk
Web : www.wyb.ac.lk/abm



Center for Agribusiness Studies (CABS)

Department of Agribusiness Management
Faculty of Agriculture and Plantation Management
Wayamba University of Sri Lanka
Makandura, Gonawila (NWP)

Policy Briefs of Agribusiness Research in Agricultural Research Symposium

28-29 November 2018

Edited By

Prof. Jagath C. Edirisinghe

Editorial Assistance

Ms. B.M.S.K. Basnayake

Ms. H.A.K.I. Perera

Ms. N.A.K.R.D. Chandrasiri

Ms. M.M.N.N. Herath

Ms. K.G.K. Sewwandi

© Center for Agribusiness Studies [CABS]

Responsibility of the content of policy briefs included in this publication remains with respective authors but not the Center for Agribusiness Studies nor the Department of Agribusiness Management.

ISBN: 978-955-7442-22-8

Published by:

Center for Agribusiness Studies [CABS]
Department of Agribusiness Management, Faculty of Agriculture and Plantation
Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP),
Sri Lanka

Cover page design: A.D.K.S.S. Somaratne

Preface

Policy briefs contained in this booklet were developed from the research conducted by the students in the Department of Agribusiness Management of the Faculty of Agriculture and Plantation Management of the Wayamba University of Sri Lanka. The intension of this publication is of two-fold. First and foremost is the dissemination of research findings in a non-technical way to decision makers and to the public. The second is to train the novice researchers in the Department of Agribusiness Management to discuss the needs of policy makers through research that they conduct.

This booklet contains twenty-three policy briefs emanating out of twenty three research projects carried out in a period of six months by final year undergraduates specializing in Agribusiness Management. These research findings were presented in the 17th Agricultural Research Symposium [AGRES] of the Faculty on the 28th of November 2018. The current volume involves policy implications from several studies on usage and popularization of eco-friendly fertilizers such as compost, several researches on environmental valuation aiming at assisting important ecosystem services to be traded in markets; few studies looking at policy implication in paddy cultivation such as input over use and assessing various policies related to paddy supply; studies looking at productivity and profitability and efficiency of tea and rubber sectors; communal perceptions about emerging crops such as oil palm and findings from surveys on organic cultivation and their acceptance in society.

Contents

| Brief No | Title | Page |
|-----------------|--|-------------|
| 01 | Paddy Farmers' Willingness-To-Pay for Eco-Friendly Technologies | 1 |
| 02 | Does Land Consolidation Lead to Increase in Efficiency of Smallholder Rubber Sector?? | 3 |
| 03 | Farmer Perceptions on Eco-Friendly Technologies for Paddy Farming | 5 |
| 04 | Organic Fertilizer Producers in Sri Lanka | 7 |
| 05 | Does the Communal Perception on Oil Palm Match the National and Industry needs? | 9 |
| 06 | Valuing Cultural Amenities and Exploring the Role of Researchers in Setting Priorities for Urban Coastal Ecosystem Conservation: Case of Negombo Lagoon in Sri Lanka | 11 |
| 07 | Analysis of Women Entrepreneurship Development in Sri Lanka: Growth and Obstacles | 13 |
| 08 | Monitoring and Forecasting of Meteorological Droughts in Sri Lanka: Spatio - Temporal Bayesian Modelling Approach | 15 |
| 09 | Mapping High-Potential Areas and Constraints Analysis of Pineapple Cultivation in Sri Lanka Using Maxent Model | 17 |
| 10 | Assessing the Factors Affecting Labor Productivity of Tea Harvesters | 19 |
| 11 | What Factors Influence on Sri Lankan Consumers When Purchasing Organic Foods? | 21 |
| 12 | Assessing the Merits of Government Policies Aiming Increased Paddy Supply in Sri Lanka with Special Reference to Maintenance of Household Food Security | 23 |
| 13 | Agriculture Sector Stock and Return Volatility with Change in Government Regimes: Evidence from Sri Lankan Stock Market | 25 |
| 14 | Farmer Preferences on Quality Attributes of Solid Organic Fertilizer | 27 |
| 15 | Quality of Edible Salt in Sri Lanka Based on Consumer's Perspectives | 29 |
| 16 | Contribution of Rubber Plantations to the Nature | 31 |
| 17 | Farmers' Willingness towards Organic Vegetable Production: A Case Study from Anuradhapura District | 33 |

| Brief No | Title | Page |
|-----------------|---|-------------|
| 18 | Willingness to Pay and Consumer Perceptions for Organic Vegetables: A Case Study in Colombo District | 35 |
| 19 | Is there an Input over Usage in Paddy Cultivation? | 37 |
| 20 | Anthropogenic Impacts & Environmental Degradation: Negombo Estuary | 39 |
| 21 | Production Relationship of Shrimp Cultivation Using Farm Level Data: Case Study in Northwestern Sri Lanka | 41 |
| 22 | Is there a Link between Profit Variability & Weather? A Case from Nuwara Eliya Tea Estates | 43 |
| 23 | An Inquiry into Farmer Perception on “Fortified Compost” | 45 |

KEY MESSAGES

High nutrient solubilizing ability of bio-fertilizer vastly considered when selecting bio-fertilizer as an innovative fertilizer.

Farmers prefer 'Powder form' of bio-fertilizer

Government policy bodies should focus and strengthen up the fertilizer subsidy program while incorporating bio-fertilizer to the subsidy package as a product of supplementary.

Incorporating public and private sectors as a collective effort would be effective for the further development of the product.

Authors:

L.H.N. DE SILVA
U.K. JAYASINGHE-MUDALIGE
R.S. DHARMAKEERTHE
W.S. DANDENIYA

Paddy Farmers' Willingness-To-Pay for Eco-Friendly Technologies

Introduction

At present, rice considered as the crop which utilizes the highest proportion of agrochemicals imported to Sri Lanka, but with low fertilizer use efficiency. Excessive use of chemical fertilizer results in soil and water pollution, food safety issues along with demand on the national budget. To overcome controversial issue, Eco-Friendly Technologies (EFT) become paramount important.

This research study deals with paddy farmers' willingness to pay for Bio-fertilizer which will be delivered as potential outcome of a multi-phase project currently in place with the funds from National Research Council of Sri Lanka.

Approach

To elicit the choices and how much paddy farmers willing to pay towards the bio-fertilizer, Choice Experiment was carried out. It was based on five key areas representing 'Preferred Form', 'Nutrient Solubilizing Rate', 'Purchasing Option', 'Promotional Activities' and 'Environmental Damage'. Example choice card was given in Figure 1.

Farmers registered under this multi-phased project (n = 120) from Anuradhapura and Kurunegala districts were contacted to collect data by means of personal interviews supported by a structured questionnaire during August to September 2018.





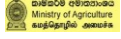



| | Choice 1 | Choice 1 |
|---|--|--|
| Preferred Form | Liquid Form  | Powder Form  |
| Nutrient Solubilizing Rate | Low  | High  |
| Purchasing from | Through RASS  | Through Private Markets  |
| Promotional Activities | Farmer Meetings | Field Demonstration |
| Environmental Damage | Low  | High  |
| Cost of Fertilizer Application (per Acre) | 40% lower than current practice | 25% lower than current practice |
| Preferred Option | <input type="checkbox"/> | <input type="checkbox"/> |

Figure 1. An example of a choice card
(Note: RASS - Regional Agricultural Service Stations)

Results

As shown in Figure 2, the highest willingness to pay was accounted for 'high nutrient solubilizing ability' of bio-fertilizer.

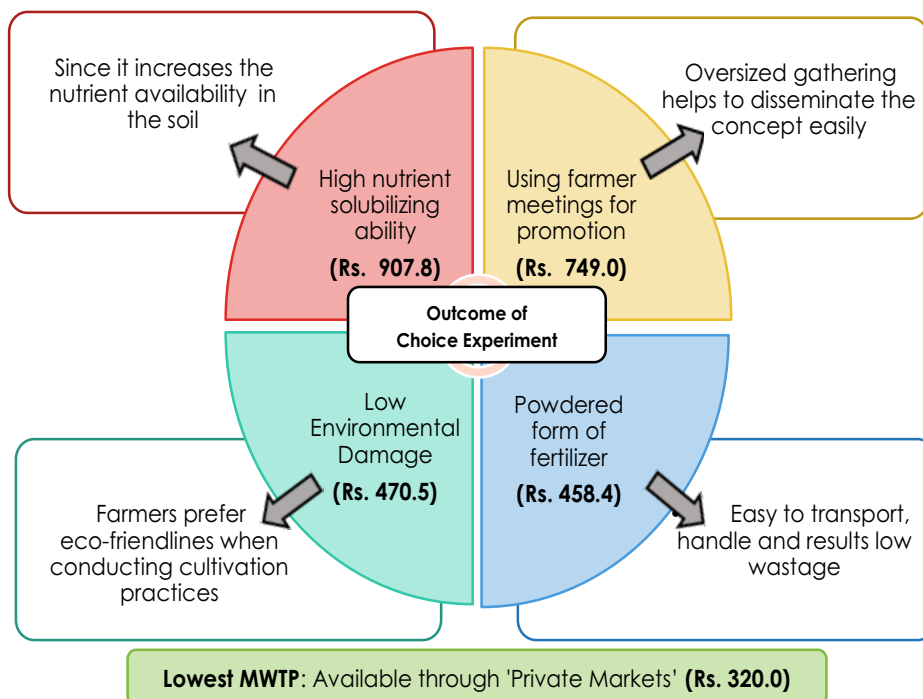


Figure 2. MWTP values by the farmers for the key features of bio-fertilizer

Note: Marginal Willingness-To-Pay values in 'per Acre' were given in parenthesis

Though, farmers willing to pay lowest value for purchasing through private markets, if product quality is above the expected limit, farmers prefer to purchase it either through private or public markets. Consistency in supply and the quality of the product plays a significant role when farmers consider the private market as their choice.

Recommendations

The study highlighted that, at the ground level, farmers were more concern on nutrient solubilizing ability of the fertilizer. In light of these it is important to pay attention to take appropriate actions at the product development stage to enhance solubilizing ability of bio-fertilizer. It is beneficial to implement actions to commercialize bio-fertilizer in powdered form, since farmers preference rely on easy handling.

Setting bio-fertilizer as a product which integrates all the key features preferred by farmer would be worth and incorporating it to the subsidy package as a product of supplementary would be effective.

KEY MESSAGES

Increasing scale would lead to increases in efficiency in production.

Operating several small farms under one management leads to higher profit.

Land consolidation policies would increase efficiency in rubber production.

Does Land Consolidation Lead to Increase in Efficiency of Smallholder Rubber Sector?

Introduction

Rubber sector in Sri Lanka contribute to the GDP by 1.5% and from that 72% contribution comes from smallholder rubber sector. In the present scenario rubber production is decreasing compared to the tapping area of rubber farms due to several reasons. Hence, future of Sri Lanka's rubber industry rests on industry-wide productivity growth from small-farm based rubber production to large-scale manufacturing operations. The absence of regular studies and benchmarking exercises to monitor industry performance is a big problem in effective policy-making and strategic planning. In some regions and countries, the diffusion of new technologies has been rapid, and their impact on farm incomes and productivity is substantial.

Thus, this study help to analyze the level of technical efficiency as well as scale efficiency in the smallholder rubber cultivation taking a sample of farmers from the Kegalle district with the intention to increase production by modifying efficiency levels of smallholder rubber farms.

Approach

Data were cross-sectional in nature and collection was done through a pre-tested questionnaire via face to face interviews. Output oriented model is the appropriate specification since most farmers are interested in expanding their output given their inputs such as (1) Extent of rubber farm measured in a number of acres (2) A number of tapping trees in rubber farm (3) Number of years since tapping commenced (4) Amount of fertilizer applied.

Output oriented Technical efficiency

Degree to which a farmer produces the maximum feasible output from a given bundle of inputs



Output oriented Scale efficiency

Gives an idea of whether a firm is operating in an optimal size

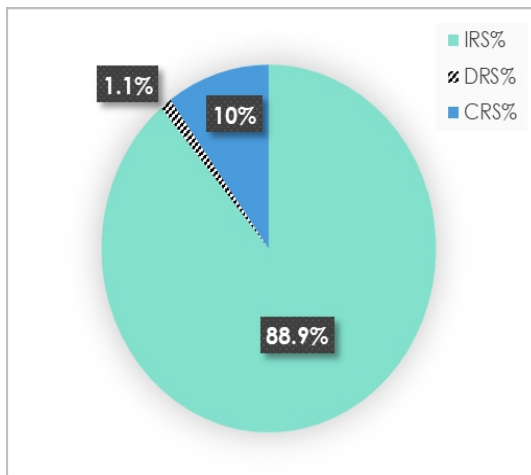
$$SE = TE_{CRS} / TE_{VRS}$$

Authors:

H.A.I.U. HETTIARACHCHI
D.M.D.C. BALASOORIYA
J. C. EDIRISINGHE

Considering economies of scale 88.9%, 10% and 1.1% of farms are operating in increasing returns to scale, constant returns to scale and decreasing returns to scale respectively. Therefore by increasing scale would lead to increases in economies of scale.

There are 8.9% of farms are technically efficient and 10% of farms are operating scale efficiently. While most of the farms are operating with a low level of efficiency; 33.33 % of farms were operating without even achieving half of a scale efficiency.



Percentages of return to scale types in farms

Recommendations

Most of the farmers are operating under increasing returns to scale. That means increasing scale would lead to increases in efficiency. So that

Government may consider land consolidation policies.

Manage as rubber clusters by amalgamating management of small units as one management units.

Introducing societies like "Thurusaviya" would help to amalgamate the farms by gathering farmers into one management.



KEY MESSAGES

- Proper “Incentive-based Regulatory Mechanism” need to be established to make farmers confident enough to use these EFTs.
- It is worth to create a facilitative environment for these EFTs in terms of easy access, quantifies with minimum transaction costs.
- Setting up fertilizer standards related to these EFTs which are over and above what is existing in chemical fertilizer were potential to make a significant transformation from chemical to these EFTs.

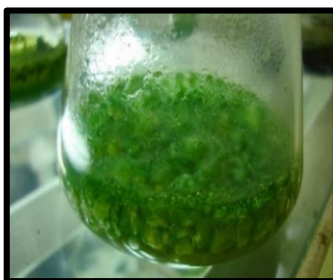
Authors:

C.D.A LAKMALI
U.K. JAYASINGHE-MUDALIGE
R.S. DHARMAKEERTHI
W.S. DANDENIYA

Farmer Perceptions on Eco-Friendly Technologies for Paddy Farming

Introduction

The controversial issue of excessive chemical fertilizer usage in paddy farming led the general public into numerous vulnerabilities, including the adverse health effects. In the light of this, the introduction of ‘Eco-Friendly Technologies’ (EFTs) has become paramount of importance in order to minimize the negative effects of those vulnerabilities without sacrificing the state of food security and ecosystem health. This research study deals with economic importance and socio-economic aspects of two supplementary forms of fertilizer, i.e. ‘bio-fertilizer’ (EFT₁) and ‘slow releasing urea using rice husk biochar’ (EFT₂), which will be delivered as potential outcomes of a multi-phase project currently in place with the funds from National Research Council of Sri Lanka.



Bio-fertilizer



**Slow releasing urea
using rice husk biochar**

It was aimed to assess the attitudes and perceptions of potential direct end-users (i.e. farmers) on development and use of these EFTs in their paddy cultivations against the “Most Popular” and “Best Alternative” technologies currently available and/or in use.

Approach

The key factors that can have an effect on the level of adoption of these EFTs were classified into six major criteria as follows:



Bio-fertilizer (EFT₁) was evaluated against the “Most Popular” technology, i.e. ‘Chemical fertilizer’ and the “Best Alternative” technology, i.e. ‘Organic amendment’. Similarly, Slow releasing urea (EFT₂) was evaluated against ‘Straight fertilizer’ (Most Popular) and ‘Commercially available slow releasing urea’ (Best Alternative) (Figure 1). Those farmers registered under this multi-phased project from Anuradhapura and Kurunegala districts (n = 120) were contacted to collect data by means of personal interviews supported by a structured questionnaire during August to September 2018.

Results

The farmers, overall, were interested to utilize the EFTs to be developed through this research project, and cited that they perceive both private and social benefits, including soil fertility and environmental protection.

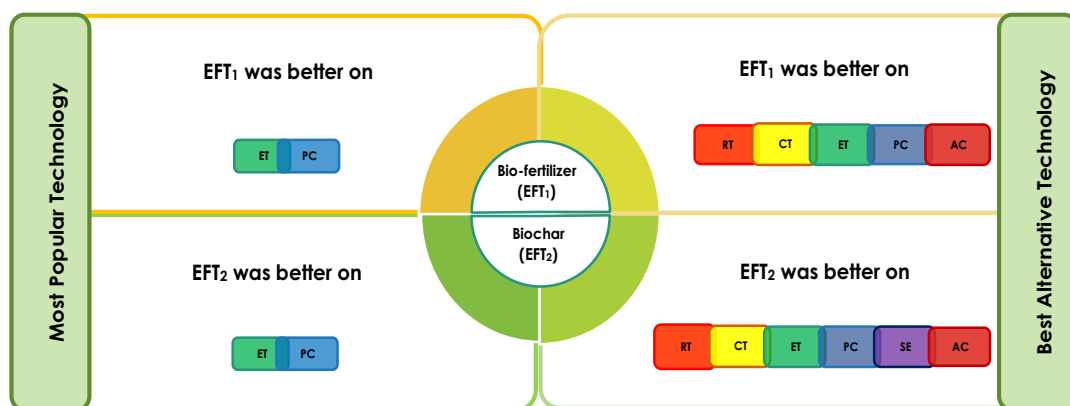


Figure 1. Comparison of EFTs against most popular and best alternative technology

Yet, a deeper analysis into their perceptions highlight that those farmers, as the potential end-users, were “concerned” about the ‘economic’ and ‘financial’ returns associated with transforming to EFTs over and above the chemical fertilizer, especially in terms of the short-term benefits over the costs.

Recommendations

The outcome of analysis emphasized the importance of having a proper institutional set up and co-regulatory mechanism that takes into account of those economic instruments like loans, subsidies and taxes and the individual and collective roles of farmers, private sector and government to facilitate/promote these types of EFTs over and above their counterpart of chemical fertilizers. To initiate such, a standard ‘informational labelling’ process can be brought into the light to enhance farmer confidence on the EFTs.

KEY MESSAGES

- Requirement of recognized local certification system for organic fertilizer with attainable certification cost.
- The necessity of the standards and guidelines for solid organic fertilizer producers.
- Producers should be given proper information on organic fertilizer certification standards.
- The government should develop and implement appropriate quality control measures.

Authors:

M. P. G. D. LAKSHIKA
U.K. JAYASINGHE-MUDALIGE
P. H. AMERASINGHE
H.A.C.K. JAYATHILAKE

Constraints Faced by Solid Organic Fertilizer Producers in Sri Lanka

Introduction

Those involve with organic agriculture face numerous constraints as they deal with others in the value chain and such issues will be in the form of technical, financial, environmental, socio-economics, regulatory and political etc. Yet, there is no direct evidence available on this dilemma; thus, there exists a huge gap in literature, especially in the context of constraints faced by producers involve with production of solid organic fertilizer in Sri Lanka. This research study, with the funding and other facilitative support from the International Water Management Institute (IWMI), was aimed to address this economic problem.

Approach

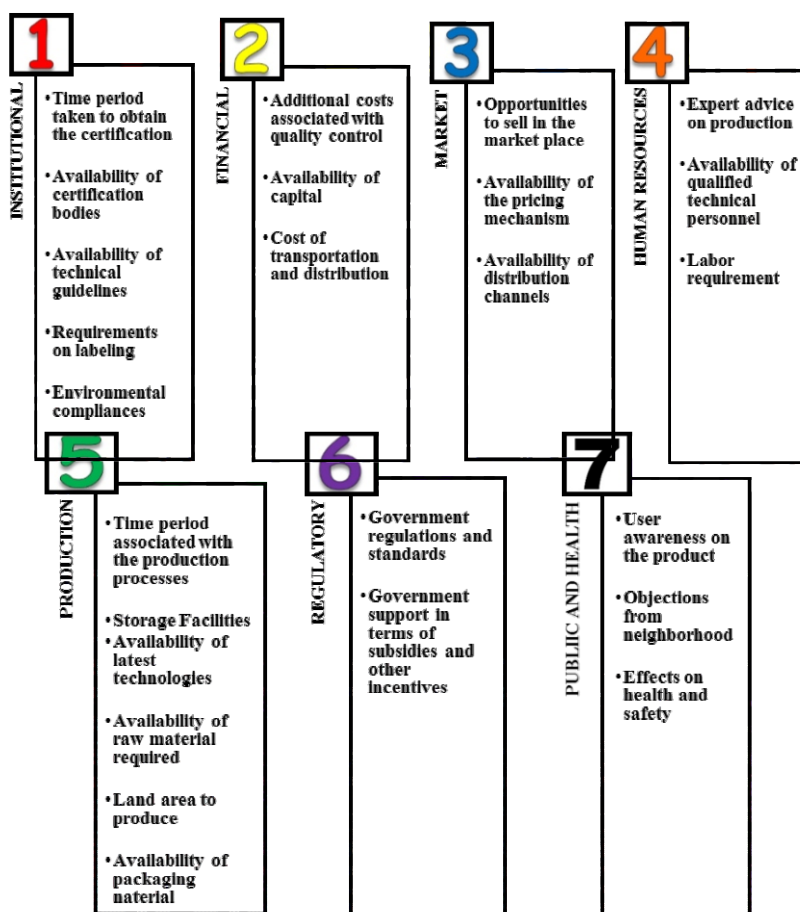
Preliminary information on the constraints associated with the production of solid organic fertilizer was identified through focus group discussions and review of the organic fertilizer processing literature. Those constraints identified were then enlisted as a set of statements and incorporated into a structured questionnaire with a multiple-scales to evaluate each objectively. A survey was conducted with a cross section of 65 organic fertilizer producers who are purely engaged in 'organic farming practices' and belong to 04 registered organic groups in Kandy and Kurunegala districts.



Gathering first-hand information.....

Results

The outcome of study, which uses standard quantitative methods for analysis, reveal that those constraints can be classified into 07 major categories based on their effect on the operation (Figure 1). Amongst the others, those issues arising from "institutional failures" was seen as key constraint. The "Time period taken to obtain the certification" was also remarked as a key constraint followed by "existence of certification bodies".



Constraints faced by producers

Recommendation

The results would help policymakers and other stakeholders in the sector of organic agriculture, in general, and organic fertilizer, in particular, to come up with long-lasting incentive-based regulatory mechanism that satisfy all parties work on these.

KEY MESSAGES

- An alternative crop to fulfill edible oil requirement of the country.
- To running plantation companies without losses.
- Ministry of Plantation needs to map and assess the land extents suitable for oil palm cultivation through researches.
- Suitable lands should be non - forest, uneconomical tea and rubber in wet zone.

Authors:

H.M.C. MADHUBHASHANI
N.R. ABEYNAYAKE
A. NUGAWELA

Does the Communal Perception on Oil Palm Match the National and Industry needs?

Background

The edible oil requirement is escalating with rising global population day by day. Hence oil palm has played a major role in the world's oil and fat supply widely and it came as the best alternative because of its high yielding capacity than any other tropical or temperature oil crop in the world. When comes to Sri Lanka, oil palm cultivation was introduced in late nineteen sixties. Present progressive expansion of oil palm specifically in southern part of Sri Lanka, is creating substantial discussion in the country. The expansion is started with the government policy which came in 2014 to fulfill the edible oil requirement that our country already face. In addition to that oil palm cultivation is an optional crop to plantation companies which were faced continual loss from rubber and tea. Six to seven months before, the expansion of oil palm cultivation temporary banned in Sri Lanka due to some conflicts between large scale oil palm producer companies and local communities. Therefore, this study is attempt to appraise the comity perception on oil palm cultivation in Sri Lanka.

Methodology

Data were collected from two hundred and two respondents from five stakeholder groups, namely workers in the plantations, field officers and managers in plantations, villagers neighboring plantations and general public specifically in Southern part of Sri Lanka where oil palm cultivation already exist for over 50 years. Employees from different categories were selected using simple random

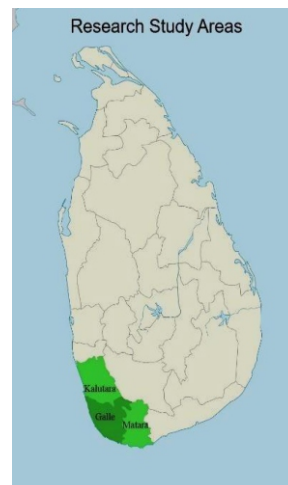


sampling for the study belongs to four plantation companies. Sampling scheme for household survey was carried out according to cluster sampling and data were gathered by conducting face to face interviews through pre designed questionnaires.

Questionnaire was designed with Likert scale questions to rank five main views; suitability of oil palm cultivation for Sri Lanka, loss of biodiversity, water scarcity in neighboring areas, reduction of employment opportunities and health problems related to estate worker category. Significant perceptions were obtained through Wilcoxon signed rank test and association of demographic factors and views of each stakeholder group were separately analyzed by independent Chi- squared test.

Results

Study revealed that neighboring community and general public community confirmed oil palm cultivation is not suitable for Sri Lanka mainly due to biodiversity loss and water scarcity. Although majority of neighbors were agreed with water scarcity due to oil palm cultivation, seventy percent of their answers are not base on own experience. The rest of the respondents mentioned that they experienced the depletion of water level in their wells even during very low drought conditions. Most of general public had not clear idea about all five major views mention in the questionnaire.



All the managers and field officers were afforded oil palm cultivation is good for Sri Lanka to running plantation companies without losses and they mentioned it was the righteous answer to high labor requirement in their estates. Although forty percentage of managers afforded undecided opinion in loss of biodiversity due to oil palm cultivation and they were mentioned more researches need to identify it scientifically. Majority of estate workers stated that employment reduction occur mainly in female workers due to rubber and tea replacement by oil palm cultivation. And also most of estate workers disagree with health problems with them when engaging activities in oil palm estates. Then rest of the estate workers who agreed with statement mentioned about some pains in heart and shoulders during harvest period and tumors on the skin due to poisonous thorns of oil palm cultivation. Therefore safety wears should needed to estate workers regularly to prevent from thorns.

Recommendations

Government ensure that companies adhere to relevant legal, environmental, and management standards. Plantation companies also should follow RSPO certification to obtain sustainable oil palm cultivation in Sri Lanka. The replacement of oil palm created employment reduction in mainly female worker community, therefore new job opportunities should be provided to them. Some awareness programs should be provided to general public to enhance their knowledge about this cultivation.

KEY MESSAGES

- Allocating funds for researches on ecosystem services is limited, resulting in a diminished interest to further research on ecosystem services.
- This has masked the reveal of important ecosystem services and has created lack of awareness.
- People tend to have less value on the ecosystem services, which leads to diminished productivity and sustainability.
- Increase of funds for research would intensify the participation of researchers, which will give out monetary values for the ecosystem

Authors:

D. G. PRASANGIKA
U.K. JAYASINGHE- MUDALIGE
T.P.S.R.GURUGE

Valuing Cultural Amenities and Exploring the Role of Researchers in Setting Priorities for Urban Coastal Ecosystem Conservation: Case of Negombo Lagoon in Sri Lanka

Introduction

Biodiversity is closely connected with ecosystem services and supports the sustainable human wellbeing. Ecosystem services help to sustain and fulfil human life, and are categorized into four groups as "Provisioning", "Supporting", "Regulating" and "Cultural" services. When studying the ecosystem services as a whole, these services are taken as bundle of services, where each attribute mentioned above has an individual value.

Cultural services of the ecosystem, which include "non-material benefits" that people obtain from the environment, include recreation, aesthetics, science and education benefits that have received an inadequate attention in the research field.



Rapid growth of human population has increased the demand for urban space and housing properties, which have caused the conversion of urban wetlands to urban use. As a result, coastal ecosystems located close to the urban areas face reclamation for housing and settlements. Due to this condition, urban coastal ecosystems have faced a severe deterioration of ecosystem services. The objective of this research was to determine a monetary value for the cultural ecosystem services of Negombo lagoon, by the stated preference given by the researchers of Sri Lankan State Universities. This paper explores the stated preferences of researchers on ecosystems systems which were derived through a Choice Experiment and those research work carried out in and adjacent to the Negombo lagoon was selected as the case.

The data for estimations were obtained during the period of July to October 2018 from a cross section of academic staff members (n=45) attached to the State Universities in Sri Lanka with a track record of research on ecosystem services. The sample of choice card used is shown in Figure 1.

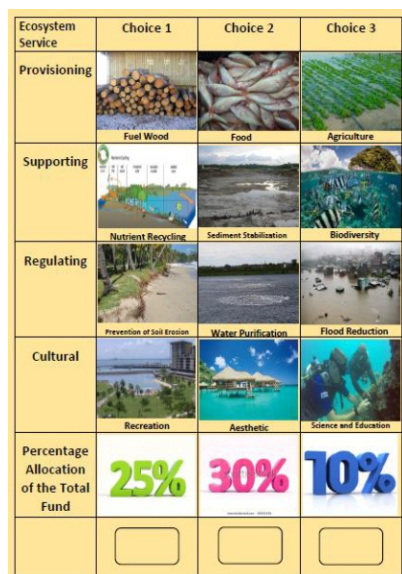


Figure 1 – Sample of Choice Card Used

The highest value of Marginal Willingness-To-Pay was estimated for the “Provisioning Services”, i.e. Rs. 1.11 Million followed by “Regulating Services and “Supporting Services”. Conversely, the “Ecosystem Services” were calculated to have a value of 1.64 Million, which is a Willingness-To-Accept value.

Even though ecosystem valuation is an important aspect in the conservation scenario, it is a very costly process. As a result, the number of stakeholders involved in this process is less, and therefore, they must be compensated in order to encourage the valuing process. The Willingness-To-Accept value implies that since the cultural ecosystem services and their degradation have no directly visible impact on the human beings in the short term, researches on them have less priority.

The outcome of analysis suggests that those experienced researchers must be stimulated and empowered with increased fund allocations to increase the researches on “Cultural Ecosystem Services”. Such action would help enhance environmental protection, in general, and ecosystem services, in particular, as those have both direct and much larger indirect benefits to the society and to the future generations.

Results

It was found that out of the total allocation of Rs. 112.5 Million allocated on research on ecosystem services, Rs. 6.4 Million (6%) were on “Cultural Ecosystem Services”. Table 1 reports the allocation of funds within this category.

Table 1 : Allocation of Funds for the Cultural Ecosystem Services

| Cultural Ecosystem Service | Fund (Rs) | Percentage of Total Fund | Percentage of Cultural Ecosystem Services |
|----------------------------|--------------|--------------------------|---|
| Recreation | 3,971,188.00 | 3.5% | 62.0% |
| Science and Education | 2,291,005.00 | 2.0% | 36.0% |
| Aesthetic Values | 165,000.00 | 0.2% | 3.0% |

KEY MESSAGES

- There is a positive growth of women engaged in MSMEs in Sri Lanka.
- Attempts should be taken to establish proper training institutes for enhancing level of work-knowledge, skills, enhancing capabilities of women entrepreneurs.
- Establishing various policies to offer easy finance schemes for economically strengthening the position of women.

Authors:

M.A.I. D SUMANASEKARA
N.R. ABEYNAYAKE
A.M.T.P. ATHAUDA

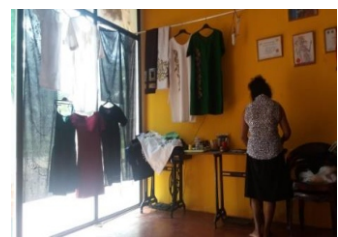
Analysis of Women Entrepreneurship Development in Sri Lanka: Growth and Obstacles

Introduction

Entrepreneurship development is an important issue related to economic development in a country. Sri Lanka is a lower middle income country and to rise up to upper middle income country, development of women entrepreneurship is very important. In Sri Lanka women entrepreneurs have been identified as an untapped source of economic growth and development sector. Micro small and medium enterprise sector (MSME) contribute for the economic growth, to reduce unemployment and to alleviate poverty. The participation of women entrepreneurs in the micro, small and medium enterprises is lower in many countries and it is same in Sri Lanka too. Therefore, the objectives of this study were to recognize the growth of women entrepreneurship in Sri Lanka and, to identify the constraints specific to women entrepreneurs and suggestions to overcome those constraints.

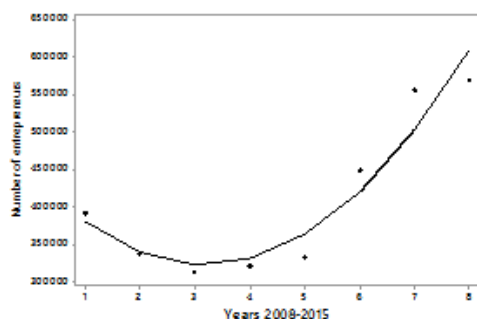
Approach

The secondary data on women entrepreneurs in Sri Lanka (The total number of entrepreneurs) were collected from the Annual Survey of industry reports (2007-2015) from the Department of Census and Statistics. Sample survey was carried out in Kurunegala district with a sample of 60 women entrepreneurs engaged in SMEs using a semi-structured questionnaire. Cluster sampling was done.



Secondary and primary data were analyzed descriptively and inferentially. Chi-square and cross tabulation was done to see the association between socio-economic factors of women entrepreneurs and factors related to their business. Wilcoxon sign rank test was done to determine the significance of the constraints reported by the respondents.

Results



There is a positive growth of women engaged in MSMEs in Sri Lanka (from year 2008-2015). However there are several constraints faced by women entrepreneurs resulted low performance in the field of enterprise.

The survey data revealed several significant constraints such as financial problems, lack of education, family ties, absence of Proper support from own family members, high price of raw materials, inadequate infrastructure

facilities, market problems, problems in transportation, high cost of production, social attitude and socio- economic constraints.

Results of independent Chi-square test shows the significant association between education level with business sector and income level, income level with business type and business sector, Business type and satisfaction with the business. Further survey data revealed that, majority (87 %) of the women entrepreneurs were engaged in Micro enterprises (number of employees 1-4) Out of the total respondents, 35 % enterprise sector was Trade. Most of the respondents had an education level up to A/L (51 %). Out of total, 90 % of respondents had not previous business experiences. Majority of the respondents (42 %) income level was Rs. 100,000-500,000 per year.

Recommendations

- Establishing proper training institutes for enhancing level of work-knowledge and skills of women entrepreneurs.
- Establishing various policies to offer easy finance schemes for economically strengthen women.
- Generation of awareness and consciousness on the policy of self-development of women entrepreneurs.
- Attempts by various NGO's and government organizations to spread information about policies, plans and strategies on the development of women in the field of industry, trade and commerce.
- Forming a cooperative association of women entrepreneurs to mobilize resources and pooling capital funds, in order to help the women in the field of industry. Offering seed capital, upliftment schemes, women entrepreneurs fund etc. to encourage them economically.

KEY MESSAGES

- Gaussian Process model is a better choice to capture spatial and temporal variations in droughts using SPI.
- Forecasts (mean and variance of SPI) from GP model can be mapped to understand spatial distribution of the drought incidences. In 2017, risk of drought in the north east monsoon is apparent in Northern, Eastern and Southern coasts.

Authors:

P.K.P. WEERASINGHE
S.B. KARUNARATNE
W. WIJESURIYA
H.M.L.K. HERATH

Monitoring and Forecasting of Meteorological Droughts in Sri Lanka: Spatio - Temporal Bayesian Modelling Approach

Introduction

The droughts in Sri Lanka that have been occurred in different time periods and regions may be a huge threat to the agricultural sector, making negative impacts for farming, irrigation and water conversations. Although Spatio-temporal modelling of drought is generally carried out in terms of Standardized Precipitation Index (SPI) by following a number of statistical methods such as kriging, Inverse Distance Weighted (IDW) method, and Triangulate Irregular Networks (TIN), which are not included the covariates, they do not properly implement the spatial and temporal patterns for drought.

Gaussian process (GP) model, as a Markov Chain Monte Carlo (MCMC) based Bayesian modeling method is tested and used to model and forecast the droughts by taking account of climatic covariates and uncertainties in the analysis and spatial and temporal predictions.

Approach

GP model was applied for the study which is a collection of random variables indexed by time or space, is known as a stochastic process.

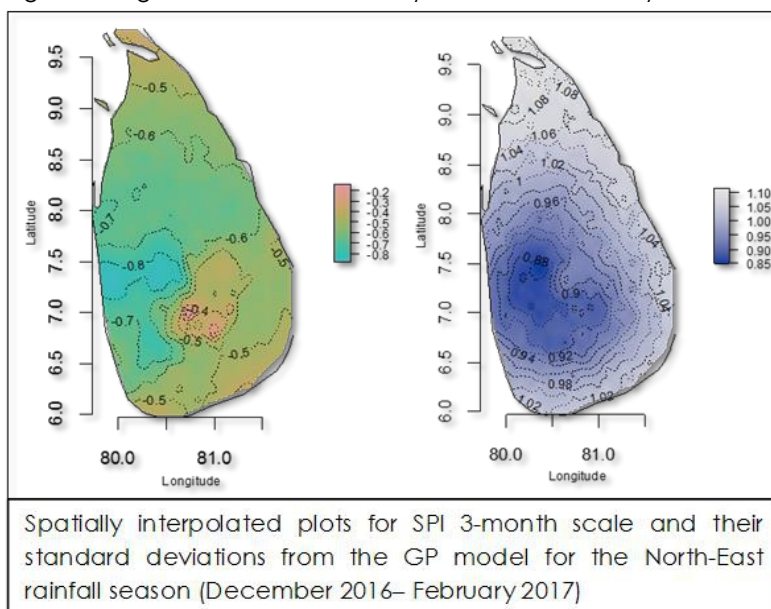
The precipitation measures which were observed at 25 weather stations are applied to calculate the SPI in different time scales: 1 scale, 3 scale, 6 scale, and 12-month scale from year 1983 to 2017 to reflect the dependent variable in GP model fitting. As model covariates: longitude, latitude, elevation, maximum temperature, minimum temperature, sea surface temperature, and dipole index mode were included for model fitting.

Spatial predictions for year 2017 were carried out at 10 km spatial resolution with monthly time steps. Maximum and minimum temperature data for 28 monitoring stations were interpolated by using universal kriging considering elevation as an environmental covariate. Then a data-cube was created with covariates for each grid that use as in input for spatial-temporal predictions by using "spTimer" package available in R software.

Results

According to the fitted GP model, the parameter estimates for 1-month scale, 3-month scale, 6-month scale, and 12-month scale of SPI show that except for dipole mode index, all regression coefficients are statistically significant since the 95 % confidence intervals. As spatio-temporal forecasting for droughts across Sri Lanka for year 2017 on monthly basis, the forecast mean SPI and associated

uncertainty in terms of prediction standard deviations represent by the following figure for the period December 2016 to February 2017 (Season with North East monsoonal influence). According to the surface plot given by the figure, the Precipitation conditions with respect to SPI 3 – month scale for the



North East season, seems getting near normal compared to the previous three months. As far as the prediction standard deviations are concerned it can be noticed that the risk of drought incidences in the Northern, Eastern and Southern parts of the island is high.

Recommendations

GP model is a better method to forecast droughts in spatially and temporally in terms of SPI. Drought forecasting and early warning activities establish an effective drought management tool in the future climate. A more accurate drought early warning system as well as appropriate relief programs and agricultural insurance schemes should be developed for assuring sustainable agriculture in the country. Understanding of the spatial and temporal patterns of drought severities needs to progress further to increase the use of forecasts.

KEY MESSAGES

- With the government involvement pineapple cultivation can be expanded to the identified High-potential areas.
- Authorities should set up guaranteed price and introduce subsidy schemes to uplift pineapple cultivation.
- Increasing the availability of organic fertilizers in the market encourage growers towards to organic.

Authors:

A.V. WIJEGUNAWARDANA
N.R. ABEYNAYAKE
H.K. KADUPITIYA

Mapping High-Potential Areas and Constraints Analysis of Pineapple Cultivation in Sri Lanka Using Maxent Model

Introduction

Pineapple is one of the major commercial fruit crop cultivated in Sri Lanka which has huge potential for export market as it produce the finest pineapples in the world. But the local production contributes only less than 1% of total world production and not in a position to meet the growing demand due to the lack of quantities and exportable quality. Yield and quality of fruits highly depend on the agro-ecological and climatic factors. Therefore, testing of ecological adaptability is a vital factor in the expansion of pineapples in Sri Lanka. Only two districts of the country (Gampaha and Kurunegala) are widely growing pineapple but it can be expanded to other districts as well. Maximum entropy modeling (MaxEnt) is extensively tested high performing quantitative modeling technique which has great potential for identifying best ecological requirement of species based on "presence only data" together with environmental variables. Therefore this technique was used to identify and map the high-potential areas for pineapple cultivation in Sri Lanka. Further, constraints which involves with the cultivation expansion need to identify to develop the sector through stronger agricultural policies.

Approach

This study involved the 215 pineapple GPS location coordinates and raster environmental layers for monthly rainfall, monthly mean temperature, Digital Elevation Model (DEM), slope, slope aspect, Normalized Difference Vegetation Index (NDVI) covering whole Sri Lanka. All the environment covariates were derived using digital map data acquired from free web sources. Google Earth Pro and Arc GIS software were used for pineapple location data processing, initial spatial data processing and final mapping. Spatial analysis and modelling were done using MaxEnt software. The resulting model was validated by using area under the receiver operator characteristic curve analysis and jack-knife test. In addition, a questionnaire survey was conducted to explore prevailing conditions and constraints for pineapple cultivation with a sample of 60 farmers in four divisional secretariat divisions of Gampaha and Kurunegala districts.

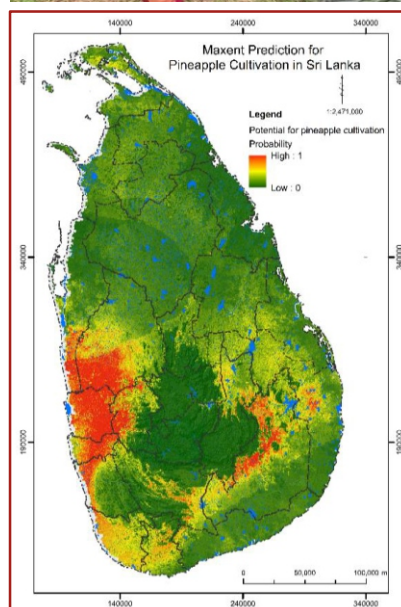
Wilcoxon sign rank test was done to determine the significance of the constraints reported by the farmers.

Results

Probability of pineapple cultivation potential was mapped at 250 m ground resolution with high predictive power (AUC value of 0.913). Mean temperatures in drier months and total rainfall during wet month's shows relatively high correlation for pineapple cultivation and model resulted such areas eg: Ampara, Monaragala, Puttalam, Kegalle, Colombo, Kaluthara, and Galle also as high-potential areas in addition to Gampaha and Kurunegala.

Out of twenty four constraints analyzed in the study, high cost of inputs, high price of mulching materials, lack of guaranteed price, low bargaining power, high cost and shortage of labors, high investment, lack of government subsidy scheme, threat mealy bug and weed problem identified as highly significant constraints for marketing and production of the pineapple cultivation.

Majority of the farmers 93 % use only chemical fertilizer but it is interested to note that most of the farmers 57 % willing to convert their cultivations into organic if organic fertilizers are available in the market. However, 35 % farmers are requesting monetary subsidy while 25 % request for land facilities to enhance the cultivation.



Recommendations

- Probability map developed by MaxEnt can be used to take information-based decisions and input data for diverse studies.
- Methodology of this research can be used to find out most suitable areas for other crops.
- With the increasing demand for chemical free pineapples it is important to conducting awareness programs on organic farming practices among interested farmer.

KEY MESSAGES

- Improving total profitability by increasing the labor efficiency is a way to maintain tea productions for the long term sustainability and it brings a paramount status to the tea sector.
- Major concern in the industry is low labor productivity and mechanism to increase labor productivity will eventually upturn labor income and reduce migration.

Authors:

A.M.I.H. ATAPATTU
U.K. JAYASINGHE
W.G.R. RAJADURAI

Assessing the Factors Affecting Labor Productivity of Tea Harvesters

Introduction

Sri Lankan tea is considered as the world's premium tea in line for quality maintenance through a labor intensive practice of selective plucking. Labor productivity is the amount of goods and services that an employee produces in a specific period of time. Tea sector is a distinctive sector for productivity research by means of labor productivity is readily measurable as work attendance and weight of the green tea leaves plucked by each worker are prudently recorded daily in order to calculate individual wage packets.

The main objective of this research study was to identify the relative importance of factors affecting the labor productivity on tea harvesting, as a result to identify which factors affect most for the highest, average and lowest productivity levels.

Approach

Primary and secondary data were used, original data were collected from 350 tea pluckers employed in the estates in Nuwara Eliya district by detailed face to face interviews. Secondary data of the individual pluckers were obtained from records kept by the estate management. Five key Productivity intervention areas (Indices) were built using Principal Component Analysis (PCA) and Quantile Regression was used to assess the differing impacts of these five indices on labor-productivity.



Results

Household and health, worker skills development were positive across all productivity levels and its impact was greater on higher productivity level. Individuals health level was important in lower productivity levels, but not in highest. The unimportance of Individuals Health in 50% and 75% productivity levels indicated lack of health has become a reason for low labor productivity which indicates when laborers' health level increased, of those who perform in low level, their productivity would further increase.

Availability in finance also important in lower productivity levels not in the highest which proves when the monthly income level increases, it will increase the productivity of low productive laborers. It results that having extra income sources and the fact that not having any monthly loan settlement amount does not affect the productive laborers at 50% and 75% productivity levels.

Working environment and the conditions were only important for highest productivity levels. Which means the tea pluckers who do not perform well do not much consider about the safety, hygiene, facilities provided to them or the rules and regulations of the estate. Highly productive laborers' productivity (75%) could be increased in further amount through increasing working conditions, working environment and their relationship with the supervisors.

Recommendations

Tea pluckers with 25% productivity can be upturn by concerning on household and housing conditions, worker skill development opportunities, and individuals' health level maintenance. Those with 50% productivity can be further increase by concerning on household, housing conditions and worker skill development prospects. By uplifting household and housing conditions, worker skill development opportunities and working environment and conditions, 75 % productive pluckers' efficiency can be further intensified. Administrative unit of the estate should focus on offering an additional payment for the highly productive pluckers, providing training opportunities and encouraging to participate in training programs, influencing them to obtain medical aids from the estate and to maintain a good health condition.



KEY MESSAGES

- Consumers trust on organic productions is low. Thus, it is essential to establish a responsible authority to monitor organic cultivation by farmers closely as a policy.
- Information on the organic labelling is low. Credible labelling system should be implemented through the government authority.
- Knowledge on organic food production and usage should be enhanced.

Authors:

W.V.H.L.ATHTHANAYAKA
A.G.K.WIJESINGHE

What Factors Influence on Sri Lankan Consumers When Purchasing Organic Food?

Introduction

Organic food market has recently increased considerably and it is widely regarded as one of the biggest growth markets in the food industry. Organic foods market is yet undeveloped and relatively new in Sri Lanka. Organic foods are generally believed as safer to consume, nutritious, and environmentally sound production.

Understanding the consumer decision process to buy organic foods is important to implement better policies for the development of the organic foods market as well as promote the organic foods among the general public in Sri Lanka. In order to provide information to help shape these policies, this study was conducted to see how the information revealed on organic food labels and perceived organic knowledge influence attitudes and trust toward organic food purchase and also how subjective norm drives toward organic food purchase intentions.

Approach

A structured questionnaire survey was used to gather primary data by means of face-to-face interview from a sample of 300 respondents covering randomly selected five divisional secretariats in Colombo district. All the respondents were selected based on systematic sampling by interviewing each 5th customer arrived to the randomly selected six super markets representing 2 Arpico, 2 Keels Supers and 2 Cargills food cities from each selected divisional secretariat. Twenty four items were used to assess the six constructs in the questionnaire; Revealed information, Perceived knowledge, Subjective norm, Attitude, Trust and Purchase intention of organic foods.



All items in the questionnaire were assessed using a seven-point Likert-type scale, ranging from 1 to 7, where 1 was denoted "strongly disagree", and 7 was denoted "strongly agree". Structural Equation Modeling (SEM) was used to examine the proposed model by using Analysis of Moment Structure (AMOS). Confirmatory Factor Analysis (CFA) was carried out to determine whether all observed variables (Indicator variables) appropriately reflect their underlying constructs (Latent variables) and whether the measurement model has

acceptable fit to the data. After that Path Analysis was used to examine the predicted causal relationship among the latent constructs.

Results

Consumer attitude (mean= 5.88) was measured by using six statements which asked about the chemical residues, safeness, healthiness, taste, quality and premium price of the organic foods. The results indicate that consumer attitude is the major factor that significantly influence on the consumer organic foods purchase intention. Healthiness of the organic foods highly reflect consumer attitude towards organic foods (by 94.9%). As organic foods relatively new to Sri Lanka, the consumers have low trust (mean = 3.93) in organic food producers, organic farmers, venders, organic labels and certifiers. There is no significant impact of the others factors of revealed information, perceived knowledge, subjective norm and Trust towards organic foods purchase. This indicates that Sri Lankan consumers tend to buy organic foods only based on their attitudes towards organic foods.

Recommendation

Government intervention to monitor the processes in organic food productions, organic farming, organic labeling and certification is essential to build trust among consumers on organic productions. Organic labeling should be done through the intervention of government to make it credible and trustful. Knowledge on benefit of organic food usage and organic production should be enhanced by providing credible information through diversified channels to reach all consumers.

KEY MESSAGES

- Sri Lankan government have implemented many policies to ensure the nation's food security via increasing the local paddy production.
- This study shows that providing a guaranteed price for paddy has a greater influence on local paddy production rather than providing a fertilizer subsidy
- To increase the local paddy production the government should allocate much resources to provide a guaranteed price for the paddy yield.

Authors:

H.A.M.B. DISSANAYAKA
U.K. JAYASINGHE-MUDALIGE
J.C. EDIRISINGHE
K. HERATH
M. UDAGAMA

Assessing the Merits of Government Policies Aiming Increased Paddy Supply in Sri Lanka with Special Reference to Maintenance of Household Food Security

Introduction

Household food security can be simply defined as "having year-round access to sufficient amounts and varieties of safe foods for the members of the household to lead active and healthy lives". For countries like Sri Lanka where the staple food is rice, it is important to have sufficient amount of rice to ensure the food security of the nation. When the Sri Lankan context is considered it can be observed that many different policies have been adopted by almost all the past governments to increase the domestic paddy production. But some of the policies were not able to yield expected



results and had to be stopped due to the excessive cost to the government. This history clearly shows the importance of assessing the merits of a policy prior to implementing it. In this study two

important policies related to the paddy cultivation namely fertilizer subsidy and the guaranteed price were selected for the assessment.

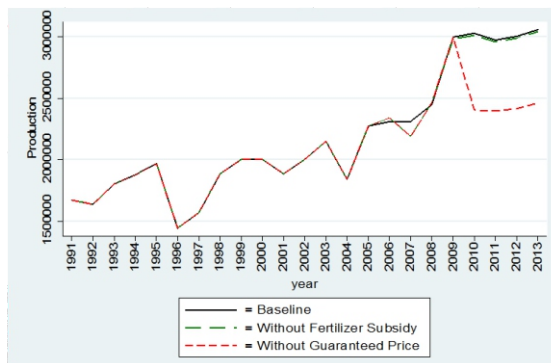
Approach

Secondary data were used for the analysis and they were obtained from published statistics of Food and Agricultural Organization (FAO), National Fertilizer Secretariat, Ministry of Agriculture, Department of Census and Statistics and the Annual Reports of the Central Bank of Sri Lanka. A pre-constructed Partial Equilibrium Model was used to estimate the data from 1990 to 2010.

Constructed Partial Equilibrium Model was used to estimate the data from 1990 to 2010. Two alternative scenarios were created to run the model assuming that (1) the fertilizer subsidy was removed while the guaranteed price is in place (2) the guaranteed price was removed while the price support is in place. Forecasting suit of strata (ver. 14) was used to estimate the structural model and obtain the graphical output.

Results

According to the resulted graph below, it is evident if the government had removed the fertilizer subsidy in 2009, the rice production would have slightly reduced in comparison to the situation which both policies are implemented. But the situation is not such that when the price support is removed as it shows a significant fall in the paddy production.



Above result proves that the government policies have a direct impact on the long-run supply of paddy. In microeconomics, the price of a commodity is decided by the supply and demand. So the long-run supply of paddy influence the market price of it, and the market price can be identified as a factor that affect the household food security. Even though it is difficult to establish a direct relationship, the trade policies adopted by the government related to the agricultural sector has a considerable impact on household food security.

Recommendations

Local farmers require the government's support to carry on the paddy production process successfully, but the government should be carefully analyze the policies and select the most effective ones for the implementation.

Increasing the long-run production decreases the long-run real prices of a commodity. By increasing the production, market price of rice can be reduced to assure the food security of the nation. Farmers, the paddy sector and finally the consumers would be much benefitted if the government can allocate much resources to stabilize the paddy price rather than providing fertilizer subsidies

KEY MESSAGES

- As in many other developing countries in Sri Lankan context also political regimes are changing frequently.
- It is important to understand how government regime affect for the agriculture sector.
- Share prices are the most important information and indicator used by investors to invest or not in a particular share.
- When considering scenario 1 and 2. Both nominal and real prices shows declining trend over scenario 2.

Authors:

M.M.R. RATHNASEKARA
D.A.M. PERERA
H.M.L.K. HERATH

Agriculture Sector Stock and Return Volatility with Change in Government Regimes: Evidence from Sri Lankan Stock Market

Introduction

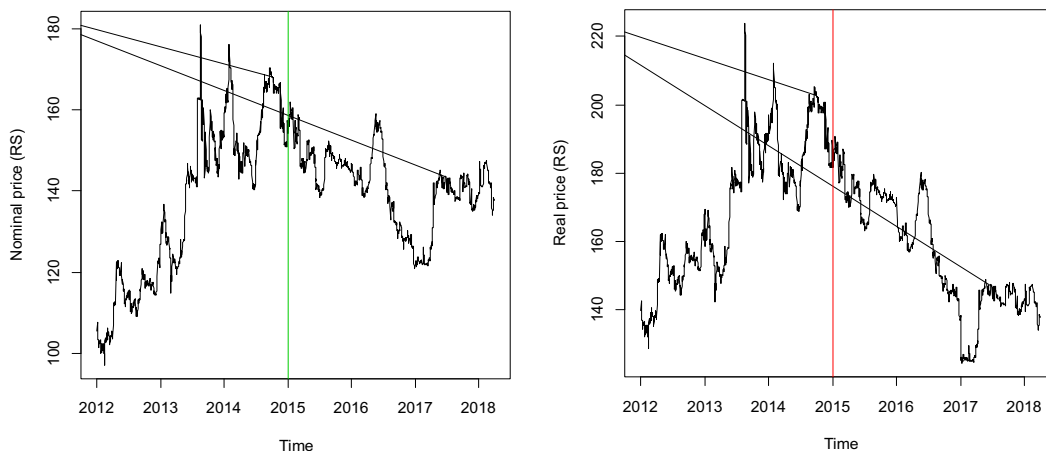
Agriculture sector plays a major role in Sri Lankan economy as in many developing countries. Political changes are occurring frequently impacting the stock price volatility and returns volatility. After a regime shift the stock market can either negatively or positively be affected. There is no clear idea how stock market changes with changing regimes. But if we have good idea how stock market change with regimes it is very important for decision making by the various stakeholders of the stock market. Thus this study aims at identifying the behaviour of stock market after a political regime shift taking the agriculture sector as an example.

Methods

For this study, daily stock prices and returns were taken for three years under each scenario; 2012-2014 for scenario one and 2015-2018 for scenario two, matching equal time lengths from each scenario. Data were collected from 10 randomly chosen agriculture sector companies in Sri Lanka while stratifying them into large-scale, medium scale and small-scale firms. Both nominal and real stock prices/ returns were analysed using numerical and graphical summary measures. For the volatility analysis both symmetric and asymmetric models in the ARCH/GARCH family were used.

Results

Figures in below depicts the dynamic behaviour of nominal prices and real prices respective across two different scenarios. However, the agriculture sector stock prices show a declining trend over the second scenario. The steepness of the declining trend is more on real prices. When considering returns they shows volatility clustering. According to the summary statistics for both nominal and real prices maximum, minimum, mean and median values of scenario one is greater than scenario two.



Time series plots of average nominal and real prices of agriculture sector

For volatility studies considering ARCH (1), GARCH (1, 1), EGARCH (1, 1) and GJR (1, 1) adequately fit to the data. GARCH (1,1) model fits best for both nominal and real stock prices of scenario 1. For the scenario two GJR (1,1) is the best fit model for nominal price returns while EGARCH (1,1) model best fit on real price returns. According to the news impact curve it can be inferred that both positive and negative news on stock market, agriculture sector impact in equal manner during the scenario 1. However, in the scenario 2 agriculture sector stock market quickly responds to good news while it responds slowly for negative news. Anyhow the in scenario 2 stock prices show quickly responds to the good news that period has declining prices. Sometimes it will affect there is no any positive news in that period.

Recommendations

Stock price returns have declined after the regime shift taken place in 2015 for which the reasons should be closely monitored. Comparison of the behaviours in stock returns in both scenarios can be used in formulating policies to stabilize the agriculture sector stock market.

KEY MESSAGES

- Setting standards for solid organic fertilizer products and taking actions to implement a National level certification criteria to certify them is necessary.
- Conveying that certification through a public accessible method such as displaying a logo or seal on the product will be effective.
- Thus attention and contribution of government authorities towards implementing and employing policies on standard Information Labelling and introducing specific standards for it is required.

Authors:

S.D. WITHANAGE
U.K. JAYASINGHE-MUDALIGE
P.H. AMERASINGHE
H.A.C.K. JAYATHILAKE

Farmer Preferences on Quality Attributes of Solid Organic Fertilizer

Introduction

Global trend towards organic farming and organic food consumption is increasing day-by-day. For a product to be labelled as "organic", it has to be certified through an accepted standard procedure and an institution, for example by a third party organization. However, to date there is no such standards for national policies are set comprehensively, which acts as a key constraint for all in the value chain, including the producers and users. This research, supported by International Water Management Institute, is aimed to set such standards, and in this analysis, we specifically look into those key attributes of quality that are demanded by those key actors in the value chain.

Approach

Those key attributes of quality pertaining to solid organic fertilizer were classified into three categories, namely: (1) Search; (2) Experience, and (3) Credence (see, Figure 1). Farmers involved with organic agriculture practices (i.e. farmer groups established under Department of Export Agriculture and known as "Kabanika Govi Gammuna") were contacted to reveal their preferences on various attributes listed under each category during September 2018.



Interviewing farmers.....

Each farmer was interviewed in-person with the support of a structured questionnaire that possesses questions to run a Choice Model to elicit their preferences.

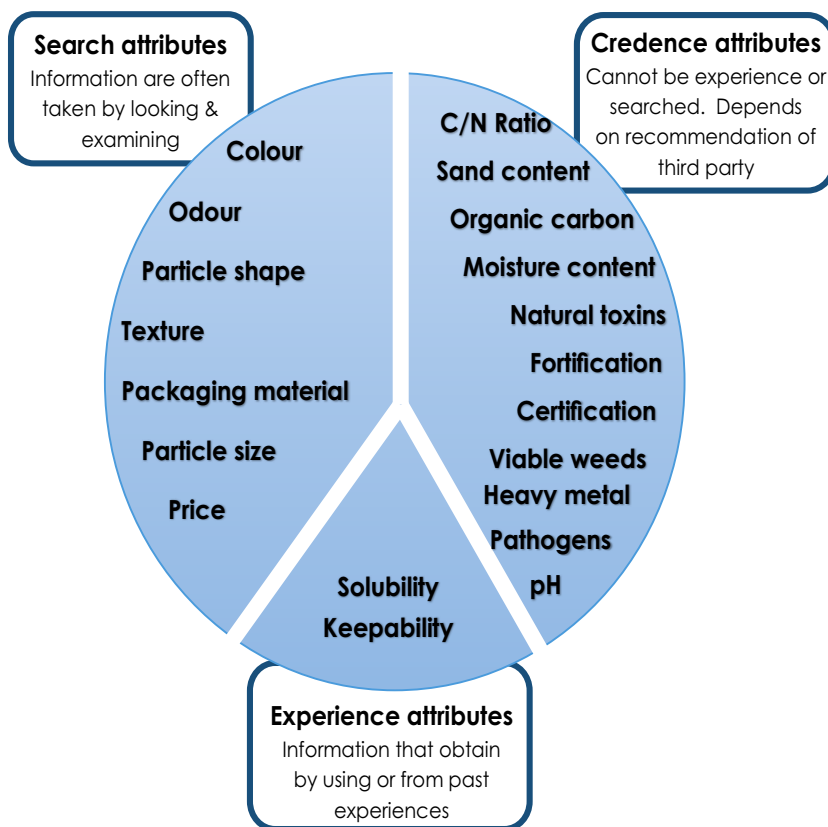


Figure 1. Quality Attributes

Results

The outcome of analysis, overall, suggest that farmers are highly concern on those attributes listed under the Credence category.

| Quality Classification | Mean Attribute Score |
|------------------------|----------------------|
| Credence attributes | 3.6 |
| Search Attributes | 2.8 |
| Experience attributes | 2.8 |

Recommendation

Results highlight the importance of transformation of those seemingly unobservable Credence attributes into either Search or Experience so that the organic fertilizers are "visible" in terms of their quality attributes, and in turn, the farmers can easily recognize and decide on the use of such through, for example informational labelling and packaging mechanism.

KEY MESSAGES

- There is a gap between producer defined quality and consumer expected quality in Sri Lanka and thus the definition of quality should be revised mainly based on customers' expectations.
- Per capita salt consumption is high among the community which has significantly deviation from the WHO standards. Especially it is high in households where there are no incidences of diseases related to salt consumption.

Authors:

K.D.B.N. TARSHA
A.H.M.N. CHAMARA
N.W.B.A.L. UDAYANGA
L.E.M.C.S. SUMANARATNE
H.M.L.K. HERATH

Quality of Edible Salt in Sri Lanka Based on Consumer's Perspectives

Background

As Sri Lanka is a country which having a large periphery of ocean, tropical climate and high wind velocity, it is blessed with the solar evaporation method for salt manufacturing process. Salt is considered to be among the daily consumptive commodities with low concerns of quality in Sri Lanka. In present situation only the producer has defined the quality of salt. But consumers of salt are not well aware about the quality standards that should exist in the product. And from the side of customers the quality of salt is not well defined. Therefore there could be a quality issue with edible salt in the market.

Consequently this study was carried out to define the salt quality on the basis of consumer and to identify consumption pattern of the salt by the community.

Approach

Primary data was collected using a pre tested questionnaire from two districts, Anuradhapura and Colombo. Colombo is



the main commercial city in the country located close to the sea, while Anuradhapura is located rather middle of the country. The sample size was limited to 200 depending the time and financial constraints. Questionnaire mainly focused on 5 major areas, as; (1) Demographic factors of the consumer (2) Purchasing condition of salt (3) Perception in quality parameters (4) knowledge on quality and (5) Opinion about salt production in Sri Lanka. Moreover, salts samples were collected from the salt brands available in the area. Data were analyzed using descriptive summary, one sample t test, Chi square test and a logit model.

Results

As shown in the Table 1, the per capita consumption of salt in Colombo and Anuradhapura districts are respectively 7.82g/day/person and 9.37g/day/person. The result showed that the consumption statistically greater than the WHO standards (5g/day/person)

Table 1. Household level monthly consumption of salt in two districts

| Description | Anuradhapura | Colombo |
|---|--------------|---------|
| Per Capita household consumption Table salt (g) | 362 | 370.5 |
| Per Capita household consumption crystal salt (g) | 482 | 333.25 |
| Per Capita household consumption total salt (g) | 844 | 703.75 |
| Daily Consumption of a person (g) | 9.37 | 7.82 |

It was found that there is a positive relationship between consumption of salt and the diseases related to consumption of salt (DRS). In households with high incidences of DRS, the salt consumption found to be low. However, salt consumption was found to be high in households where there were low or no incidences of DRS. This may be a potential threat towards increasing the incidences of diseases related to high salt consumption. In the comparison of the quality standards of salts in the market it was found that iodine content and the moisture content has deviate largely from their standards. Although some salt brands conformed to the standards fully, they were not popular among the customers. More than 85% of the market share was belong to two identified commercial salt brands. This study further revealed that customers do not much concern about the standards introduced by the producers while there were a separate set of concerns that they consider as quality relevant.

It was evident that most of the respondents identified that the physical attributes are important and reflect the quality of salt. More than 80 % of the consumers suggested color as a very important parameter that reflect the quality of salt, while about 65 % of the consumers recognized particle size as another important quality parameter. Only chemical parameter that was identified as important for quality of salt was the iodine content (85 %). However, certification, brand name, proper labeling and proper packaging also emerged as important quality parameters that influence the purchase decision of salt.

Recommendations

Authors wish to recommend to redefine the term quality with respect to salt considering the customer's expectations together with more research opportunities. The authorities should be aware about the overconsumption of the salt by the community and actions should be taken to aware the public about its repercussions.

KEY MESSAGES

- Major ecosystem services are prevention of soil erosion, protecting of water resources, CO₂ absorbance and existence of canopy cover.
- Based on the Kyoto protocol, Sri Lanka can promote rubber as silviculture for Carbon trading.
- The total lower bound value of rubber extent in Kegalle district is Rs. 26,075,009 per hectare per day.
- To preserve rubber extent a payment mechanism for ecosystem service must be developed.

Authors:

H.S.R. PERERA
J.C. EDIRISINGHE

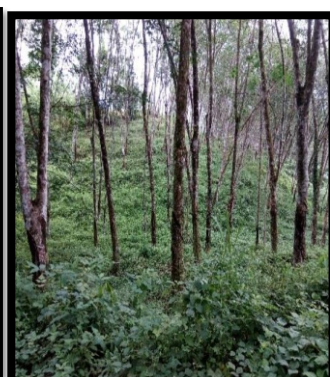
Contribution of Rubber Plantations to the Nature

Introduction

Rubber ecosystem influence the human well-being, which is assumed to possess diverse constituents, including direct benefits namely latex, timber and also indirect benefits namely biodiversity, air purification, watershed protection, nutrient recycling and climate regulation. The contributions of these benefits are not entirely captured in business market in terms comparable with economic services. Hence income generation from rubber is becoming less profitable than other plantation crops. With this situation most of the traditional rubber growing areas are being abandoned or diversified in to other crops. The study was carried out to obtain monetary value for this indirect Ecosystem Services (ESS).

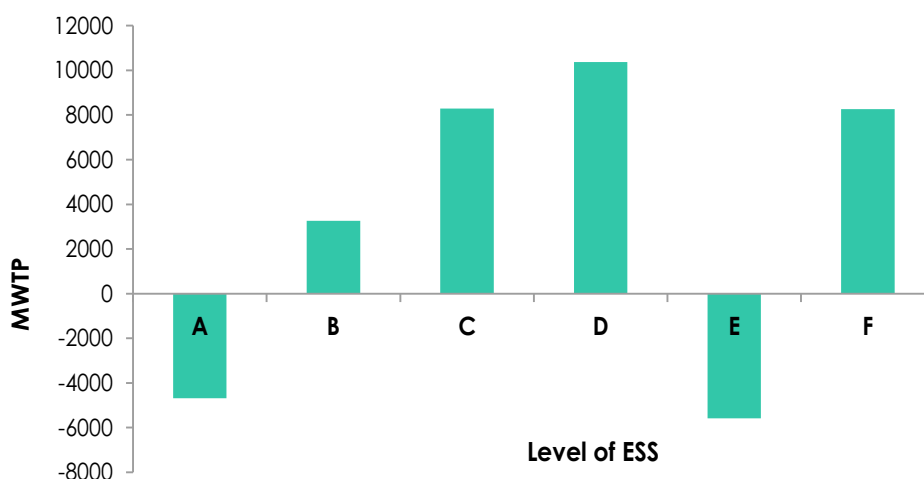
Approach

Smallholder sector was purposefully selected as they are contributing significantly for national rubber production. Primary data were collected through a survey using a structured questionnaire from a sample of 135 respondents in Kegalle district which were selected using multiple stage sampling method. Choice Experiment (CE) was used to measure the Marginal Willingness To Pay (MWTP) for ecosystem services and contingent Valuation Method (CVM) was used to estimate the Willingness To Pay to conserve rubber plantations.



Results

Choice experiment shows higher number of animal species, fully covered canopy, prevention of soil erosion, water springs, efficient nutrient recycling and CO₂ absorbance are considered as important attributes when making a choice. Respondents are willing to pay for all attributes, except nutrient recycling and the higher number of animal species. The highest value (Rs. 10,375 per hectare per month) was recorded for the protection of water resources. MWTP value for the prevention of soil erosion (Rs. 8,285 per hectare per month) was higher than the value of the absorbance of CO₂ (Rs. 8,260 per hectare per month). Demand for the full covered canopy (Rs. 3,260 per hectare per month) is also considerably high since they place great importance for the climate condition in terms of cooling ability.



Marginal willingness to pay values for ecosystem services

A = 70 Animal species, B = Fully covered canopy, C = Prevent soil erosion, D = 75 % Water spring, E = 50 % nutrient recycling efficiency, F = 75 % absorbance of CO₂

The mean WTP for whole rubber plantation was estimated as Rs. 733 per hectare per day, while considering the both use and nonuse value from 135 respondents. The majority of farmers in the sample fall in the income category of Rs. 10,000 – 30,000. Because the value was calculated based on their forgone income, this may be a lower bound of the actual value they placed on the plantations. Accordingly total value of rubber in the Kegalle district amounts to Rs. 26,075,009 for the extent of 35,573 hectare.

Recommendations

Because the value of ecosystem services provided by rubber plantations are high, protecting them is vital. For this, a payment for ecosystem services needs to be developed and factored in to price of rubber so that it would be competitive with other competing crops.

KEY MESSAGES

- Farmers are willing to shift towards organic vegetable production, if the organic concept is accepted by the consumers & if they can produce organic vegetables up to the standards.
- A 143.5% increment in farm gate price is expected by farmers to shift towards organic production.
- The government has to consider the knowledge and attitudes of farmers on organic farming.
- A National Policy on organic agriculture is required to promote sustainable agriculture.

Authors:

R.M. RUSHNEE
N.W.B.A.L. UDAYANGA
A.H.M.N. CHAMARA
H.M.L.K. HERATH

Farmers Willingness towards Organic Vegetable Production: A Case Study from Anuradhapura District

Introduction

Intensive agricultural systems are becoming a threat to both ecosystem and human health, with undeniable impacts on different sectors, especially on agriculture, due to the excessive applications of agrochemicals and poor agronomic practices. As a fine alternative to all these issues, organic agriculture is becoming a popular concept in recent years. Even though, organic farming is becoming an emerging trend within Sri Lanka, a limited number of farmers have adopted organic farming practices. Beliefs and perceptions of farmers and their requirements play a vital role in motivating the farmers towards organic farming. Present study was conducted to identify the willingness of farmers to accept organic farming for vegetable production in the district of Anuradhapura, which remains as one of the major contributing districts for tropical vegetable production in our country.

Approach

The study was designed as a choice experiment focusing on five major attributes of organic farming namely; acceptability, assurance, availability of inputs, production quality and market price. A pre-validated set of choice cards and a well-structured questionnaire on different aspects related to organic farming were used to capture knowledge, attitudes and the willingness of 134 farmers residing in four divisional secretariat divisions. Willingness to accept organic farming by farmers was estimated by fitting a conditional logit model for the data collected through the choice experiment.

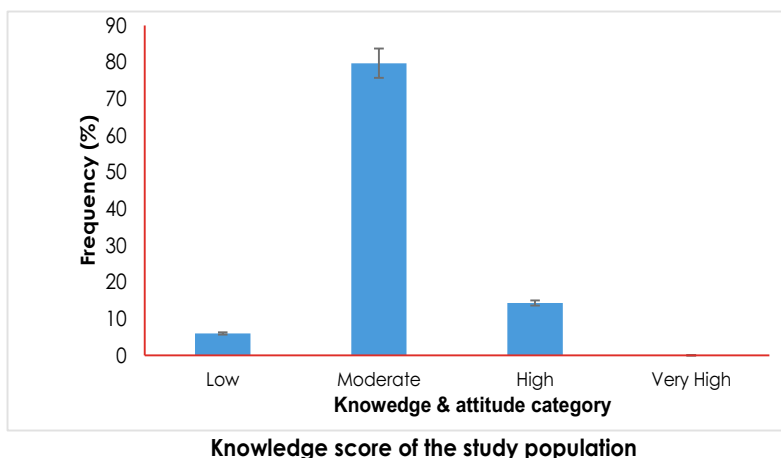


Choosing choice cards by a farmer

Results

All the respondents were males. The age group of 32 -38 was the predominant followed by > 52 years group accounting for 39.8 percent and 31.6 percent of farmers, respectively. Majority were cultivating in their own lands (66.2 %), while 74.5 percent of the farmers were depending on farming as the major income source. In case of educational levels, O/L (44.4 %) and A/L (36.1 %) included majority of the farming community, while no one belonged to the illiterate or primary education category. With 46.6 percent of farmers, the income category of 21, 000 – 30, 000 LKR remained as the most dominant category, followed by 31, 000 – 40, 000 LKR and 11, 000 – 20, 000 LKR categories (27.1 % and 22.6 %, respectively).

Acceptability of organically produced vegetables by consumers and capability of producing vegetables up to the standards were recognized as significant factors ($p < 0.05$) that affect the willingness of farmers towards organic farming, while remaining attributes had no significant influence. When the knowledge and attitude level of the farmers are considered, 79.01 percent of the farmers were characterized by a "Moderate" level of knowledge and attitude score followed by "High" score (14.29 %). It was noted that none of the farmers were having a "Very High" score for knowledge and attitudes (Figure 2). It was evident that the knowledge of farmers on creditability and assurance, availability of inputs and market price were notably limited. This limited knowledge and attitudes of the respondents may be held responsible for the non-significant contribution of above factors on the willingness of the farmers on organic farming.



Recommendations

The farmers are willing to shift towards organic vegetable production, if they receive a farm gate price that is approximately 140 % more than the farm gate price of inorganic vegetables in the market. The assurance and availability of inputs could be developed further, since those are not significantly concerned by the farmers in making the decision to switch towards organic production of vegetables. The government and relevant entities has to support the farmers through appropriate policies and guidelines to trigger the organic farming concept among the farmers.

KEY MESSAGES

- Organic vegetable market is not in large scale, but a growing market in Sri Lanka.
- Price, Certification and nutrition content are the major factors that consumers concern when buying organic vegetables and consumers' willingness to pay depends on the health concern and the label of products.
- Consumers willing to pay a higher premium price for organic products (143% more than inorganic products).

Authors:

M.A.K. CHAMEERA
M.D.S.G. PIYATHILAKA
H.M.L.K. HERATH

Willingness to Pay and Consumer Perceptions for Organic Vegetables: A Case Study in Colombo District

Background

Organic vegetable consumption has become a social trend in the world. The consumption of organic vegetables can be shown as a better solution to prevent health hazards due to consumption of inorganic vegetable products. Nowadays in Sri Lanka, organic vegetables are becoming popular due to their health and safety benefits which is also a worldwide trend. Therefore, there is a growing demand for organic vegetables in the local market. In Sri Lanka, organic cultivating practices with proper guidelines were started in the year 1979. By the year 2016, the extent of organic cultivation has covered over 96,300 ha of agricultural lands in Sri Lanka, which accounted nearly 3.5 % of the total agricultural land in the country.

However, in Sri Lanka, the market for organic products is not very much developed and no market statistics are available. It is described by the lack of proper retail venues, lack of continuous supply, the absence of certification, low-quality products etc. Therefore, the study focused to assess consumers' Willingness to Pay (WTP) for organic vegetables and an understanding of consumers' awareness, attitude, and perceptions towards organic vegetables.

Methods

Consumers (both organic and inorganic) in the urban areas of Colombo district were interviewed during the months of August to October using interview schedules. A choice experiment was conducted to understand the willingness to pay (WTP) of the consumers to organic vegetable products.

Interview, the respondents were given the choice cards (Block 1 or 2 which comprised of- 4 questions each) with two options to select one option which were analysed employing a conditional logit model. The five attributes assessed in the experiment are respectively, certification, environmental concern, health concern, label, and price.



The questionnaire which unveil the demographic data and perception towards organic products from respondents also were collected and analysed statistically.

Results

According to the results, three out of five attributes (health concern, label, and price) were statistically significant indicating that they are critical on WTP. According to the results, consumers are willing to pay around 143 % more price for the organic vegetables than the commercial vegetables in Colombo region where the largest market for the organic food products is prevailing.

Most consumers mentioned that the lack of availability and lack of reliable places to purchase organic vegetables in Colombo region as one of the main constraints in order to reach the organic vegetables in the local market context. Surprisingly, this study indicated that there is no significant consideration is given for organic labelling may be due to lack of trust or lack of information access while this study should be extended further to find out other attributes which have a significant impact on organic vegetable consumption.

Recommendation

The organic vegetable market is yet operating in small scale in Colombo area and consumers are willing to pay a higher price premium for the organically grown vegetables over non-organic vegetables which should be considered during decision and policy making.

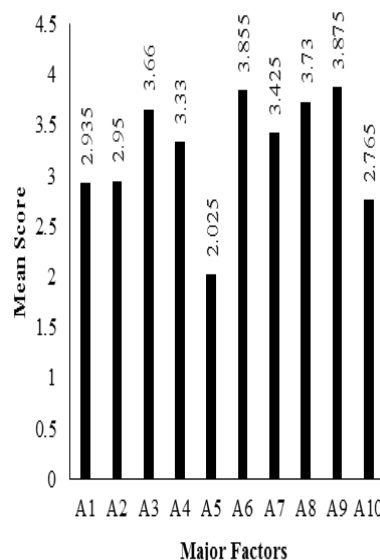


Figure 1 - Important major factors when buying organic vegetable as ranked by respondents

Note: A1 - Brand name, A2 - Packaging, A3 - Price, A4 - Outer Appearance, A5 - Advertisement, A6 - Certification, A7 - Shop, A8 - Taste, A9 - Nutrition content, A10 - Durability (Ranging from 1 for not at all important to 5 for extremely important)

KEY MESSAGES

- Highest input over usage is in Batticaloa and lowest in Mannar.
- Field extension activities should be developed to educate farmers to reduce input over usage.
- Revise current policy on environmental detrimental inputs in order to reduce input over usage by encouraging farmers to use them in optimum amounts.

Authors:

M.D.K.S.P. DASANAYAKA
J.C. EDIRISINGHE

Is there an Input over Usage in Paddy Cultivation?

Introduction

Around 2.7 million tons of rice is produced in the country annually which is enough to fulfill 95 per cent of the domestic rice requirement. Demand for rice is projected to increase 1.1 per cent per year. To meet this demand, rice production has to grow at a rate of 2.9 per cent per year. In order to achieve this production target, increasing crop intensity and national average yield are the options available. Many claim that Sri Lankan rice farming over uses inputs. Input over usage causes an increase in the cost of production and environmental detrimental inputs among them cause threats to the ecosystem. Due to agricultural intensification, some species of wild plants and animals have declined and some have become extinct and the functioning of ecosystems has changed regionally and nationally. Water pollution by nitrates and phosphates has been identified as a major environmental concern. Trace elements may be introduced into agricultural soils by cultivation practices such as fertilization, irrigation, pesticide application and organic waste disposal.



Approach

Input oriented technical inefficiency is the rate at which inputs are overused compared to the minimum amount of input needed for the production of a given level of output. Using data collected from Cost of Cultivation (COC) reports issued by the Department of Agriculture from the 2000/2001 season to the 2016/2017 maha season, input oriented technical inefficiency of paddy cultivation in Ampara, Anuradhapura, Batticaloa, Gampaha, Hambantota, Trincomalee, Kandy, Kurunegala, Kaluthara, Mathale, Mathara, Mannar and Polonnaruwa districts were estimated using Stochastic Frontier Analysis.

Results

The highest average yield was reported from Ampara district while lowest average yield was reported from Gampaha district. Maximum average fertilizer usage, machinery and weedicide expenses were reported from Ampara. Highest average cultivated extent and seed paddy usage could be seen in Batticaloa district. In Gampaha district, lowest average cultivated extent, seed paddy usage, fertilizer usage and machinery expenses could be seen. Maximum average labor usage could be seen in Polonnaruwa district while minimum was reported from Mannar. Our results suggest that there's an input over usage in paddy cultivation in Sri Lanka. This inefficient input usage have not increased or decreased over time. However, current agriculture policy of the country has failed to address this input over usage over this time period. Estimated inefficiency values are shown in the table below.

Input over usage varies from 6 % to 72 %. In Mannar input usage should minimize by 6% to achieve full efficiency while in Batticaloa input over usage should minimize by 72% to achieve full efficiency. Mean input over usage of 13 districts was 37 %. So, input usage in paddy cultivation in these areas can be minimized to achieve full efficiency.

Recommendation

Farmers should inform about harmful effects of input over usage to environment and how it affect for increasing cost of production. Current agricultural policy of the country should revise to reduce input over usage.

Summary statistics related to variables used for the analysis

| Variables | | | | | | | | |
|--------------|----------------------|----------------|-------------------------------|-------------------|------------------------------|------------------------------|----------------------------------|----------------------------------|
| District | Input over usage (%) | Yield (Tonnes) | Cultivated Extent (square km) | Labor (man days) | Seed Paddy Quantity (Tonnes) | Fertilizer Quantity (Tonnes) | Real Machinery Cost (Rs million) | Real weedicide Cost (Rs million) |
| Ampara | 31 % | 313000 | 0.151 | 3076368 | 10000 | 17300 | 1560 | 344 |
| Anuradhapura | 32 % | 251000 | 0.125 | 3516129 | 6127 | 14400 | 1280 | 251 |
| Batticalao | 72 % | 179000 | 0.154 | 1388030 | 10300 | 12800 | 1170 | 234 |
| Gampaha | 52 % | 25300 | 0.018 | 471376.7 | 784 | 1373.533 | 198 | 31.4 |
| Hambanthota | 17 % | 125000 | 0.052 | 1172716 | 3945 | 6243.752 | 653 | 111 |
| Kaluthara | 64 % | 32800 | 0.028 | 853031.9 | 1221 | 1866.824 | 218 | 44.6 |
| Kandy | 34 % | 33400 | 0.027 | 1217656 | 1118 | 1950.931 | 205 | 31.2 |
| Kurunegala | 46 % | 126000 | 0.072 | 2104046 | 3136 | 7457.626 | 707 | 109 |
| Mannar | 6 % | 51700 | 0.022 | 364996.3 | 952 | 2486.74 | 283 | 42 |
| Matale | 25 % | 56300 | 0.037 | 1642308 | 1546 | 3962.128 | 357 | 28.6 |
| Mathara | 45 % | 47200 | 0.035 | 1112827 | 1454 | 2477.095 | 220 | 61.5 |
| Polonnaruwa | 27 % | 286000 | 0.133 | 3615978 | 5916 | 16000 | 1460 | 270 |
| Trincomalee | 30 % | 116000 | 0.059 | 1124344 | 2871 | 5882.88 | 708 | 124 |

KEY MESSAGES

- People in adjacent area are willing to Pay.
 - To conserve mangrove area
 - To avoid large scale
 - constructions to avoid large scale dumping
- Respondents – a key stakeholder of this ecosystem- living around the ecosystem should be made part of the implementation strategy of any management plan to conserve.

Authors:

S.D. HANSIKA
J.C. EDIRISINGHE
M.D.S.T DE CROOS

Anthropogenic Impacts & Environmental Degradation: Negombo Estuary

Introduction

Negombo estuary and Muthurajawela marsh both together are considered as western coastal ecosystem with the extent of 6232 ha, just north to the Colombo Sri Lanka (Emerton and Kekulandala, 2003). It connects with the sea by single narrow opening & distributed over 3164 ha. Muthurajawela marsh covers 3068 ha to southwards from the lagoon. Dadugam oya, Old Dutch canal, Ja-ela connect with the Negombo estuary.

The main problem that concern in this research is destruction of environment quality in Negombo estuary and Muthurajawela marsh. Destruction of mangroves, dumping, and discharge of effluent & illegal constructions are main factors that influence the environment quality reduction. Objective of study was to estimate the impact of anthropogenic activities on environment quality in monetary terms. The outcome that expected from the study is to generate information for development decisions, wetland management projects and green accounting regarding on Negombo estuary and Muthurajawela marsh.

Approach

Ecosystem services and anthropogenic impact on estuarine ecosystem do not have monetary value attached & therefore not traded in the market. Thus, a stated preference method of non-market valuation was used in this study. Choice experimentation technique was most applicable for this study.

Conditional logistic regression was employed by using software STATA version 14 to assess the value of the anthropogenic activity.

Results

Adjacent households of Negombo estuary are willing to pay to avoid, waste and effluent discharge, and illegal constructions in the area while they are willing to pay to conserve the size of mangrove area. The considerable value was expected for the existence of large scale dumping points by respondents.

Outcome of choice experiment

| Attribute | Levels | Coefficients | P value | MWTP (Rs./month) |
|----------------------------|--------|-----------------------|---------|------------------|
| Scenic Beauty | 40% | * | * | * |
| | 50% | -1.665 | 0.178 | -6759.45 |
| | 60% | -0.117 | 0.867 | -475.66 |
| Mangrove Area | 10ha | * | * | * |
| | 14ha | 1.039 | 0.180 | 4219.22 |
| | 20ha | 2.097 | 0.044 | 8515.96 |
| Number of Species | 230 | * | * | * |
| | 250 | -0.425 | 0.690 | -1724.42 |
| | 270 | -0.897 | 0.466 | -3643.89 |
| Illegal Constructs | 50 | 2.709 | 0.045 | 10997.5 |
| | 100 | 1.514 | 0.089 | 6145.11 |
| | 150 | * | * | * |
| Large Scale Dumping Points | 4 | * | * | * |
| | 6 | 0.015 | 0.845 | 619.56 |
| | 8 | -3.437 | 0.001 | -13958.44 |
| Waste & Effluent Discharge | 25% | 2.292 | 0.001 | 9306.04 |
| | 50% | -0.867 | 0.604 | -3521.37 |
| | 75% | * | * | * |
| Monthly Income | | 2.46×10^{-4} | <0.000 | |

Recommendations

Any management plan to conserve this important ecosystem may be highly successful if respondents – a key stakeholder of this ecosystem- living around the ecosystem are made part of the implementation strategy of such a plan. There should be strict and active rules on new constructions and development projects adjacent to the ecosystem. Environment assessment should be done before any projects regarding the ecosystem. The findings of this study can be used for that. Green Accounting concept should be implemented regarding such ecosystems.



KEY MESSAGES

- Aquaculture is of great importance worldwide, serving as an alternative source to traditional food production systems.
- Countless farming methods have been developed over the years to maximize production.
- No potential efficiency gains by increasing farm sizes because the production increases at the same rate.

Authors:

W.K.G. PERERA
J.C. EDIRISINGHE
M.D.S.T DE CROOS

Production Relationship of Shrimp Cultivation Using Farm Level Data: Case Study in Northwestern Sri Lanka

Introduction

Shrimp farming offers considerable potential for diversification and income security in Sri Lanka's rural areas. Production has declined significantly in recent years due to civil wars, unsustainable practices and devastating epidemics. In terms of production volume and technology, the Sri Lankan aquaculture sector is still in an infant stage compared to other Asian countries. Efficient use of resources, be it manpower, fertilizers, water or even light and land, has long been the goal of aquaculture. Countless farming methods have been developed over the years to maximize production.

This research attempted to study production relationships in shrimp cultivation in the Northwestern Sri Lanka, where majority of the production takes place.



Approach

The study areas were selected from the Chilaw to Puttalam, mainly in North western region in Sri Lanka where the majority shrimp farming activities are concentrated.

Primary data were collected using a pretested questionnaire.

Data collection took place in September 2018. The sample size was determined based on a thorough analysis of the population involved in this sector. The size of the sample taken was 81. Analyzing the production relationship in shrimp cultivation, a Cobb-Douglas production function fitted. The statistical estimation of the production function was carried out by using STATA Statistical software (version 14).

Results

Total labor cost represents the labor input value for shrimp culture. Independent variables like feed cost and the total area are significant at the 95 % significance level. Other dependent variable electricity, is significant at the 90 % significance level.

Coefficient of the variables represent elasticity values since the Cobb-Douglas function is in log-log form. When the total labor input increased by 10 percent, the output will be increases by 0.13 percent. Similarly, a 10 percent increase in electricity would yield a 0.47 percent increase in the shrimp production. Likewise, the production will be increased by 0.73 percent, when feed cost is increased by 10 percent.

Since the other variable factors of production have been defined per acre, the coefficient for total area, is, obviously, the sum of the factor elasticities in the Cobb-Douglas production function. In other words, the deviation of this coefficient from unity can be tested to yield a measure of the returns to scale. Results shows that the shrimp cultivation in the study area show constant returns to scale.

Table 1. Estimates of farm production function

| Variable | Coefficient | Std. Err. | P Value |
|-------------------|-------------|-----------|---------|
| Total labour cost | 0.013 | 0.113 | 0.903 |
| Electricity | 0.047 | 0.027 | 0.089* |
| Feed cost | 0.073 | 0.023 | 0.003** |
| Total area | 0.923 | 0.049 | 0.000** |
| Constant | -0.732 | 1.275 | 0.568 |

Note: Significant level * 90% and ** 95%, Adj R-square 0.87, Number of observations 81

Recommendations

Observed data showed on the positive relationship between production and all the inputs considered. The major finding of the study is that shrimp farming in the Northwestern Sri Lanka show constant returns to scale. Thus, doubling the size would double the output. Hence, there is no potential gains in efficiency by increasing farm sizes because the production increases at the same rate. An economic environment that makes it easier for increase the production should be promoted while enhancing the rural non-farm growth.

KEY MESSAGES

- Rainfall and temperature has a profound impact on variability in profits.
- Technological developments in the tea sector has not been able to impact profit variability.
- Adaptation strategies to climate and weather changes are important to minimise losses.

Authors:

A.D.K.S.S. SOMARATHNA
J.C. EDIRISINGHE

Is There a Link between Profit Variability & Weather?

A Case from Nuwara Eliya Tea Estates

Introduction

Climate change and variability add to the account of challenges that agricultural sector in Sri Lanka has to face. Considerable shifts in long term average and variability in rainfall, temperature and intensity of droughts and floods have been experienced worldwide. Tea industry showed a declining growth rate in last four years with the drop of Sri Lanka's position in the world tea market down to the fourth. This happened mainly due to the total production variability caused by the bad weather conditions and the backward technology used.

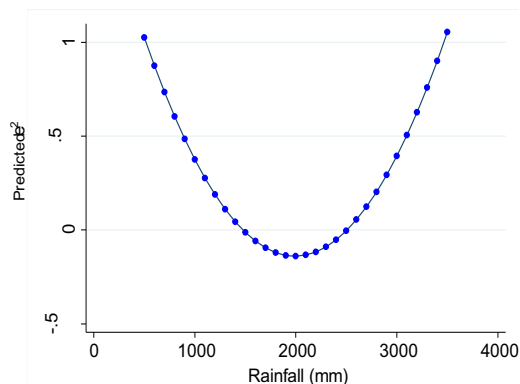
This research is based on studying the variability in profit (risk) among tea estates and to see how weather, climate and technology influence this variability.



Approach

As the first stage, sample selection has done by considering the all tea estates in respective region and agro ecological zone. In the second stage tea estates were selected from each principal tea planting region by adopting stratified random sampling procedure where factors of stratification were cultivated extent of each principal tea growing region and agro ecological zones. The number of tea estates belong to each region was determined probability proportionate to the area under the tea planting region.

The final sample comprised of 35 tea estates and secondary data were gathered from relevant plantations.

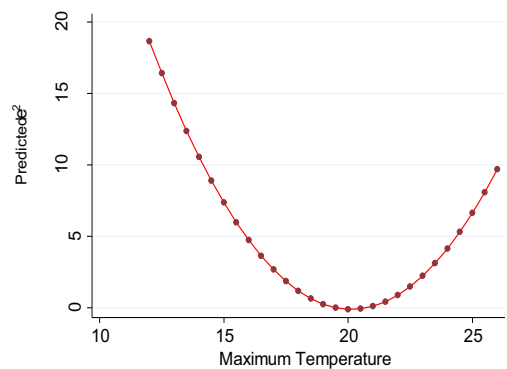


Annual rainfall data were gathered from the IRI (International Research Institute) online database and the maximum and minimum temperature data was obtained from the Department of Meteorology.

Results

According to the results of this study, the insignificant year variable hints that the technology changes have not made a real impact in increasing or decreasing risk in the study period.

However, rainfall increases profit risk diminishes up to minimum point and increase with further increases in rainfall. Any rainfall above the minimum point to see a high variable profits in estates.



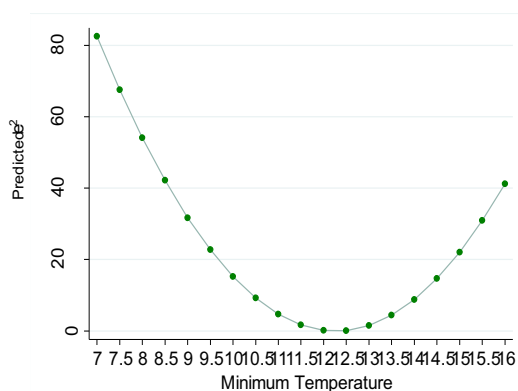
When maximum and minimum temperature (day temperature – maximum and night temperature – minimum) up to optimum level the profit risk becomes minimum. However, the temperature extremely rising up that affects to the plant growth badly, and it resulted in the high variance in profit (risk). After becoming to the minimum point profit risk increased with the temperature increment.

Conclusion

This study found that climatic factors play a major role in the variance of profit in the tea estate sector. The optimum annual total rainfall that minimises risk was 2000mm, while the optimum maximum annual average temperature was 21 °C and the optimum minimum annual average temperature was 12.25 °C.

Recommendation

Because weather factors such as temperature and rainfall shows clear impact on variability of profits, development of tolerant varieties and employing other adaptation strategies recommended to minimise losses.



Profit variability with weather factors

KEY MESSAGES

Soil fertility recession in agricultural lands have become drastic.

Urban waste mismanagement is a massive issue to be addressed.

Fortified compost is a better solution as it improves the soil fertility and decreases the amount of MSW and FS in urban areas.

Authors:

R.G.I.C. WAIDYARATHNE
J.C. EDIRISINGHE
M. OTOO
W.J.S.K. WEERAKKODY

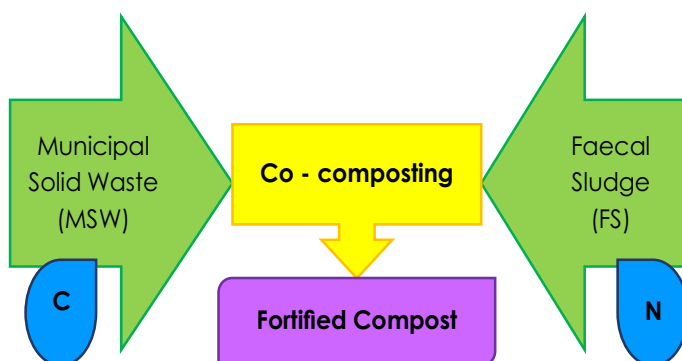
An Inquiry into Farmer Perception on “Fortified Compost”

Introduction

When considering the present scenario in Sri Lankan agriculture there are two main problems that need to be addressed. First is the reduction of soil fertility in agricultural lands due to the continuous usage of chemical fertilizer. The second is the continuous increase in price of chemical fertilizer due to the oil price increment at an increasing rate.

Emerging waste problem in the country also becoming a major issue nowadays. Urban waste mismanagement was the main reason behind this. Currently, to reduce this for a certain level, dumping waste in open areas or landfilling processes are practised, but with very little success.

These problems can be mitigated through fortified compost.



The content of fortified compost

However, before introducing such a product to the market, it is essential that farmer preference for such products be obtained. Therefore, a study was initiated to assess farmer preference on fortified compost.

Specific objectives were to assess preference in terms of Willingness to Pay (WTP) for specific attributes of a fortified compost product and estimate the demand for product 'profiles' that may be able to offer to farmers.

Methodology

The survey was conducted in Nuwara-Eliya district focusing on vegetable farmers. Because that is the cluster identified as easiest to penetrate the market for compost products. Face to face interviews was conducted among 300 randomly selected respondents in the district representing all 5 divisional secretariat divisions. The questionnaire consisted of 4 parts; personal details, farming details, Likert scale statements (to describe farmer perception) and choice cards to rank without blocking (assess the relationships between the choice and the attributes).



Photographs of the survey in Nuwara-Eliya district

Results

In the study, the majority of respondents strongly agreed to purchase fortified compost due to the improvement of soil quality, reduction of waste problem in environmentally friendly manner. Also, 60.67% strongly agreed to purchase the product next season. Farmers were willing to pay additional; Rs. 4.18 if the product is in "dust", Rs. 1.49 if the product distributed to the farm gate and Rs. 5.06 to the "presence of faecal sludge" respectively. Best attributes combination for the product:

Form: Dust

Distribution method: On-farm gate

Availability of faecal sludge: Yes

Price: Rs. 7/=

Recommendations

Encourage private sector engagement with fortified compost production in order to create a better investment climate for co-composting business models.

Enhance government intervention in order to make a link between co-composting plants and potential users.

Introduce laws to reduce chemical fertilizer usage among farmers by emphasizing health impact from the chemical.

Make an environmental act regarding soil conservation in agricultural lands highlighting the benefits of compost products in soil structure enhancement.

Conduct farmer awareness programs about the benefits of fortified compost over other fertilizers