

Sustainable Development in the North Central Province of Sri Lanka through Ecological Agriculture

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Abstract: *Population growth, increasing pressure on land, land degradation: these are problems that directly affect the livelihoods of many farmers in developing countries. Crop failures, food shortages and malnutrition are a constant threat. Therefore, increasing productivity through sustainable agricultural practices should be a top priority. These farming practices are ideally suited for poor and smallholder farmers, as they require minimal or no external inputs, use locally and naturally available materials to produce high-quality crop yields, and encourage a whole systemic approach to farming that is more diverse and resistant to stress. The level of incomes and the pattern of income distribution determine to a significant extent the access to enough food at the household level. Poverty is a foremost determinant of food insecurity that leads to undernourishment. Further the availability of sufficient food and the means to acquire enough food at the household and individual level does not ensure proper utilization of food and good health. Ecological farming technique can ensure uninterrupted supply of enough food for all the people, while minimizing the detrimental environmental impacts of destructive agriculture. Ecological agriculture appears to be the most promising, realistic and economically feasible alternative for the existing destructive agriculture in the North Central Province of Sri Lanka.*

Keywords: eco friendly agriculture, green revolution- type agriculture, kidney failure, sustainable agriculture.

1. Introduction

In developed countries such as the United States and Japan, less than 5% of the economically active population is involved in agriculture. This percentage rises to 50 to 70% for many Asian countries and 70 to 90% for many countries in Africa. There is an inverse correlation between the size of the agricultural workforce and the level of development. Mexico, for example, with 9% of its gross domestic product represented by agricultural production, counts 31% of its labor force in agriculture; in Nigeria, with 36% of output in agriculture, 66% of the labor force is engaged in agriculture [1].

Majority people unable to meet their minimum daily caloric intake, the issue of food security is imperative to overcoming rural poverty. The way in which we produce food plays an extremely important role in solving the hunger epidemic and reaching the first Millennium Development Goal (MDG) of eradicating extreme hunger and poverty [2]. The dominant model of agricultural development practiced by many countries today is based on chemical-intensive agro-industrial complexes growing monocultures for export. This model of corporate-controlled agro-industry has failed to produce positive results economically, environmentally or socially. As one of the main contributors of greenhouse gas emissions, the agro-industrial model is exacerbating global climate change, degrading arable land, deteriorating public health, decreasing food quality and disrupting traditional rural livelihoods. Although this model was deemed to produce higher yields and increase productivity, it has failed to increase food security around the world [2]. There are many reasons for this heartbreaking situation the world over that the United Nation (UN)'s Food and Agriculture

Organization (FAO) Director-General Jacques Diouf, described as a "tragic achievement in these modern days".

Among the reasons for this situation are the unequal distributions of people to land and water resources in the world and the unequal distribution of incomes and poverty within countries. Expenditure on wars, rather than on the war on hunger is a fundamental cause that does not enable the poor to be given the necessary income support to obtain their minimum requirements of food. Some recent proximate reasons that have aggravated the situation are climate change, droughts, floods and forest fires causing soaring food prices. The financial crisis and economic recession has not helped either [3].

The greatest tragedy of malnutrition is that it prevents children from reaching their full potential for growth and development. Malnutrition during childhood has serious and long lasting consequences. There are 14 per cent of children under five who suffer from acute malnutrition (wasting) when their weight is compared to the weight of a normal child of the same height. Nearly 58 per cent of infants between 6 and 11 months and 38 per cent children between 12 - and 23 months are anemic. The government is conscious of this problem and has set in motion programs to tackle it.

Dynamism in the rural and agricultural sectors is essential to narrow the rural-urban income gap and reduce rural poverty that is closely related to food security. The World Development Report 2008 argued that an emphasis on agricultural investment, reforms and policies in agriculture are essential [4]. It disclosed that agricultural and rural sectors in developing countries have suffered from neglect and underinvestment over

the past 20 years. Only a mere 4 per cent of official development assistance was for agriculture.

In Sri Lanka, agricultural growth has been only 1.2 per cent per year and lagged behind those of other sectors. Production of several crops declined over a period of time and even when there was growth these have been modest. The yield levels attained in almost all crops is much less than the potential. This applies as much to plantation crops as to small holder agriculture as well.

Agricultural growth could contribute to reduction of poverty, hunger and malnutrition. Poverty and food insecurity are largely problems in the rural and estate areas in Sri Lanka. The development of Sri Lanka's agriculture requires many thrusts. There has to be much more investment in research and rural infrastructure development. The agricultural extension services that are hardly serving its purpose should be reformed and reconstituted to address the need of sustainable ecologically sound agricultural system [2].

Undoubtedly, we need alternative agricultural production systems that assure ecosystem functioning, biodiversity, sustainability of the natural resources such as soil and water, social justice and food security. Strategies are needed to revitalization of small-scale farms, and to point the way towards the reshaping of the national agricultural policy and food security in a way that are economically viable to farmers and consumers. There are hundreds of movements in Sri Lanka that pursue changes towards eco-friendly and socially just agricultural systems. Many highlight the establishment of food security through promoting ecological agriculture. Some groups promote different marketing strategies, whilst others land management and empowerment of rural communities. Although most of these organizations work towards a same goal – i.e. ecological agriculture ensuring food security, there are intractable differences not only in objectives but also in ideological perceptions of the root causes of the unsustainability of the structure and strategies on how to change the failing structure towards the ultimate goal – i.e. food security. Identification of mapping of civil society organizations which are working on establishing food security by promoting ecologically sound technologies (e.g. sustainable home gardening, food forestry, modern organic farming) will be important to deploy organized new knowledge in the farming sector. Also, the different types of ecological agricultural techniques that the different organizations are dealing with should also be carefully identified and studied. The effort will be of great advantage to plan the researches and large-scale development programs related to ecological agriculture under contrasting climatic, soil and sociological conditions. The farmers, land managers, scientists, policy makers, donors etc. appear to be in confusion with ecological agricultural techniques with different names.

All these objectives should be achieved through a food production system that ensures food security; sovereignty; protection of the environment and natural resources (soil, water, biodiversity etc.); economic stability of the rural population and social stability – one of the best systems to use for the purpose is the ecological agriculture [5].

2. Present Status of Ecological Agricultural Practices in the North Central Province (NCP) of Sri Lanka

According to the classification of agro-ecological zones of Sri Lanka, North Central Province (NCP) of Sri Lanka falls under Low Country Dry Zone and which is the largest province in the country covered 16% of total country's land area. North central province consist two districts called Polonnaruwa and Anuradhapura. Anuradhapura is the largest district in Sri Lanka and its area is 7,128km².

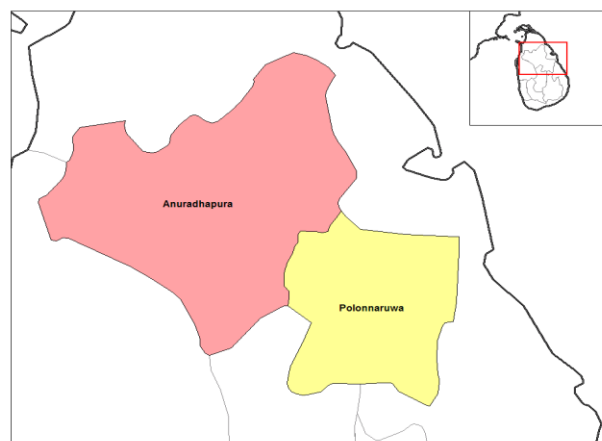


Figure 1: The map shows the area belonging to the NCP

Source:[6]

North Central Province (NCP) has been recognized as the bread basket of the country because it contributes with the largest portion of the grain production in the country – mainly rice. It falls under low country dry climatic zone.

Table 1. Agro-ecological regions of Low Country Dry Zone

Agro-ecological Region	Expected annual rainfall - mm	Major land use
DL1a	> 1,100	MHG, Paddy, Forest plantations, Scrub, Sugarcane, Natural forests,
DL1b	> 900	Rain fed Upland Crops, Paddy, Scrub, MHG, Forest plantations
DL1c	> 900	RUC, Paddy, Scrub, Natural forests, Forest Plantations, Sugarcane
DL1d	> 900	RUC, Paddy
DL1e	> 900	RUC, Paddy, Scrub
DL1f	> 800	RUC, Paddy, Scrub, Natural forests
DL2a	> 1,300	RUC, Paddy, Natural forests, Sugarcane, Scrub
DL2b	> 1,100	Paddy, RUC
DL3	> 800	Cashew, Coconut, Condiments, Scrub, Natural forests
DL4	> 750	Scrub, Paddy, RUC
DL5	> 650	Scrub, Natural forests, RUC, Paddy

MHG: Mixed Home Gardens, RUC: Rain fed Upland Crops
Source: [7]

It appears that lowland rice farming dominates the NCP. Farmers also prioritize rice over all the other food crops and as a result, relatively low crop diversity is prevalent in the NCP. A large majority of the farmers in the NCP has been practicing intensive rice farming since late 1960s.

This article links the high prevalence of chronic kidney disease in the NCP with the presence of heavy metals in the water, caused by fertilizer and pesticide use. Over the past two decades, dozens of studies have been conducted on the large number of kidney patients in Sri Lanka's agro-rich NCP. As many as 400,000 people in the NCP may be suffering from kidney disease. In the past two decades, as many as 22,000 people may have died as a result. The affected area covers approximately 17,000 square km, with a population of about 2.5 million, in which more than 95 percent live in rural areas. From the main hospital in the NCP, Anuradhapura Hospital, in 2010, there was a 227 percent increase in live discharge patients with end-stage chronic kidney disease, whereas the death rate increased by 354 percent during the last few years. Sources closely associated with WHO research said the organization has in fact made a recommendation to the Sri Lankan government to regulate and standardize fertilizer and pesticide imports.

Dry zone in Sri Lanka faces a wide range of environmental management challenges that are tied to its economic development. Foremost among these are the interlinked problems of land and water degradation. Unsustainable agricultural and forestry practices are causing biodiversity loss, severe soil erosion on sloping lands and reduced productivity of irrigated lands. Agricultural chemicals and agro-processing byproducts are polluting soil, air and water. Agricultural run-off containing pesticides and fertilizers affects water quality in other areas.

3 Some Observations During Our Ecological Agricultural Study in the NCP

- Majority of the rural population in the NCP depends on agriculture as their main source of income.
- Rice appears to be the most popular crop among the farmers
- Other crops cultivated include maize (*Zea mays*), finger millet (*Eleusine coracana*), soybean (*Glycine max*), brinjal (*Solanum melongena*), hot pepper (*Capsicum frutescens*), banana (*Musa spp.*), okra (*Hibiscus esculentis*), pumpkin (*Cucurbita maxima*), etc. which are usually considered to be drought tolerant species.
- Chemical based mono - cropping appeared to be the dominating farming system.
- Average farmer seemed to have little faith on ecological agriculture as an income generating industry.
- However, almost all the farmers and their families are well informed about the dangerous consequences of chemical based green revolution type farming.
- In general, rural population accepts the fact that their health status has been deteriorated dramatically and Kidney failures have gone up to an epidemic level.

Farm animals including cattle have also been affected with strange disorders including poor vision and frequent abortions.

Damage on crops from elephants and macaques the water distribution and finding a reasonable market for their farm products appeared to be some crucial problems that farmers face for.

Having considered the complex situation in the NCP it will be extremely important to transform the present status of farming to an environmentally sound sustainable system – i.e. ecological agriculture.



Figure 2: Problem of aquatic weeds are some proofs for the mishandling of agro chemicals in the NCP



Figure 3: Scattered empty bottles of pesticides in the NCP



Figure 3: Paddy fields with traditional paddy varieties in the NCP



Figure 6: “Swayanjatha” cultivation in the NCP



Figure 4: Some traditional paddy varieties found in the NCP



Figure 5: “Swayanjatha” the most precious and historical paddy variety in Sri Lanka

Table 2: Popularity of local ecological techniques in the NCP

Local ecological techniques	Farmers' Percentage
Local paddy varieties	90-100%
Other local seed varieties	
Traditional compost	
Cattle manure	
Green manure	
Organic liquids	
Spiritual methods	
<i>Jeewamurtham</i> (Rich natural microbial culture)	70-80%
Biochar	40-50%
Bat guano	10-20%
Paddy husk ash	
Poultry manure	0-10%
Paddy husk charcoal	
Natural pesticides	

4. Suggestions for the Promotion of Ecological Agriculture in the NCP

1. Awareness program

An effective awareness programs highlighting the importance of moving away from destructive chemical based green revolution type farming and the timely importance of ecological agriculture to solve the majority of the problems which are directly or indirectly linked with current farming practices is essential. The program should cover the much wider range of communities including children, elderly people, religious leaders, influenced rural leaders, politicians etc. in addition o the farmers. The participation of the government and non-governmental organizations and law imposing bodies should be participated.

2. Agricultural trainings

Training the techniques of ecological agriculture targeting extension workers (government and non-governmental) farmer,

farm leaders school children and teachers will have to be organized.

3. Training should not be limited to class room teaching and presentations but it should go with outside class room activities with practical use and applications.

Non-governmental organizations which deal with agriculture should be strengthened with well trained staff and volunteers who are equipped with sufficient knowledge and skills of ecological agriculture.

4. Research and development of ecological agriculture.

Getting the participation of farmers will be crucial to research on different ecological agricultural techniques. A team of skilled scientist with special interest on ecological agriculture should give their continuous contribution for the research and development of ecological agriculture in NCP.

5. Development of infrastructure

Facilities to continue ecological agriculture in the region should be established. For an example:

Rural seed banks for the farmers to exchange Planting materials collecting centers for farm products Arrangement of the market Information centre etc.

6. Soil and water management

Farmers should be empowered to take decision on water management in their areas. Appropriate soil management techniques should be implemented for whole area taking a proper agricultural land use planning in to a consideration.

7. Adaptation to climate and weather conditions

Crop calendars should be introduced to the farmers to match seasonal changes in the weather to avoid weather disastrous on crops. Appropriate crop selection should also be introduced to shoot the climatic requirement in the NCP. It was observed that some farmers (not less than 1000) in the province practice ecological agriculture with enough confidants. There are NGOs helping farmers to stay with ecological agriculture. However, it appears that these NGOs and the farmers need more training on new effective agricultural techniques – e.g. NPK enriched compost making, use of rich culture of natural microbe biochar soil conditioning, botanical pesticides, biological control of pest and diseases, bioremediation of soil and production of high quality farm food. Post harvest handling including processing of raw crop yields and value addition for farm products could also be identified as some of the gaps to be filled in.

5. Conclusions

Sri Lanka is heavily reliant on agriculture for overall growth but public spending for farming is only a small proportion of total government spending. This is a fundamental reason for the soaring food prices we are experiencing and the large number of people in the country being hungry. Much better investment in agriculture and rural infrastructure is a timely need to ensure food security and sovereignty in the country. Higher levels of investment are needed in science, agricultural research, infrastructure, and human capital. There should be better policies and institutions that are major drivers of agricultural productivity growth.

Undoubtedly the Green Revolution–type farming – i.e. agro-chemical based, still dominates the north central provinces. However, More than 1000 farmers who have developed their faith on ecological agriculture were identified. Practice of chemical farming and their residues appeared to have caused an immense damaged to the environment and the natural resources (mainly soil and water) in the province. Soil degradation has reached in many areas to a level of deserts so that farmers are forced to use more and more agro-chemicals to achieve satisfactory yields. The resultant increase of cost of production in the farms has created a situation where farmers rapidly move away from farming. So, the dependency-modernization theory of agriculture appeared to have brought the food insecurity from bad to worse in NCP

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