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Sri Lanka: Increasing Agricultural Sustainability and Biofuels through Education

Sri Lanka, formally known as Ceylon, is a tropical island off the southern tip of India near the Equator (“Sri Lanka” [National...1](#)). The total land size is 65,525 square kilometers or 25,299 miles. The capital, Colombo, found in the island’s southwest corner occupies the island’s highest population density (“Sri Lanka” [National...1](#)). The population of Sri Lanka is 20,926,315 (“Sri Lanka” [CIA...1](#)). The country’s major ethnic group is Sinhalese at 74%, while Tamils have the largest minority at 18% (“Sri Lanka” [National...1](#)). Because there are two ethnic groups, the major languages of Sri Lanka are Sinhala, Tamil, and English. The four major religions of Sri Lanka are Buddhism, Hinduism, Christianity, and Islam. Sri Lanka had been under European control for around 450 years, but Ceylon won its independence from the United Kingdom in 1948 and changed its name to Sri Lanka in 1972 (“Sri Lanka” [National...1](#)). Since its change of name, the Tamil Hindus have pressured the Sinhalese Buddhists for a separate state. As a result of this conflict, a civil war broke out in 1983. Thousands of lives were lost including President Premadasa who was assassinated in 1993 by Tamil separatists (“Sri Lanka” [National...1](#)). The war ended in 2002, after an agreement between the government and the Tamil rebels. The war left a very negative impact on the economic growth of Sri Lanka and forced many Tamil citizens to flee Sri Lanka (“Sri Lanka” [National...1](#)). These historical divisions have continued to have an impact on Sri Lankan societies and politics (“Sri Lanka” [Infoplease 2](#)). Another problem affecting citizens is severe income inequality. There is a significant difference in income between Sri Lankans living in rural versus urban areas (“Sri Lanka” [Infoplease 5](#)). One fourth of the country is impoverished. Obstacles to poverty reduction include falling agricultural labor productivity and poor infrastructure outside the western province (“Sri Lanka” [Infoplease 6](#)). Pollution has become an issue due to Sri Lanka’s small size, its location to the Indian Ocean, and prevailing wind patterns. Subsequently, air pollution emissions are possibly caused by trans-boundary impacts (“1 Introduction” [United...1](#)). The key factor to increasing agricultural productivity for biofuels production and improved food security is to educate family farmers using research about agricultural yield, sustainability and providing access to and support for implementing methods from this research.

The typical nuclear family in Sri Lanka includes a husband, wife and unmarried children. Relatives are important because they help to form an important network that supports the nuclear family. If generations live together, each wife maintains her own cooking area and prepares food for her own husband and members of her family (“Sri Lanka” [The...1](#)). Most marriages are monogamous, meaning one woman and one man. Polygamy is not illegal or uncommon especially with wealthy males. In most cases the husband and wife own their property and may split it into equal shares for their descendants. Once married, the husband and wife create a joint property (“Sri Lanka” [The...1](#)). Within a typical household, the woman is in charge of cooking, raising children, housework, weeding, and helping with the harvest. Some women even have a job if the family is very poor. The man’s role is to protect his wife and children, provide with material support, and dominate business and public life (“Sri Lanka” [The...2](#)). When the children are young, the boys and girls play together and receive equal affection from both the mother and father. When they enter their teens they begin to adopt their adult roles and become separated (“Sri Lanka” [The...2](#)). The average household income per month is 25,414 rupee’s, which is equivalent to 230.273 U.S. dollars (“Basic Information” 2).

The Sri Lankan education system originates from the British education system. The first step is primary education which lasts six years. After primary education, students must take a scholarship examination (“The Educational System...”1). If students qualify, they proceed to Junior Secondary Education which lasts five years. Students then take another government examination (G.C.E.) in order to

progress to Senior Secondary education which lasts two years. Finally, students take a competitive university exam, G.C.E. advanced level exam (“The Educational System...1). Those who pass, move on to university level and are given monthly financial support until they graduate from the university. Those who do not qualify to attend the university may attend vocational or technical schools (“The Educational System...1). Some are also employed in companies or government departments as apprentices and trainees. There are also a few who are able to continue school as external students at the Open University of Sri Lanka or at other traditional universities (“The Educational System...1).

Sri Lankan families make use of home grown spices and vegetables such as black pepper, cardamon, cinnamon, cloves, nutmeg, turmeric, chilies, garlic, onions, peppers and tomatoes. Curries may be eaten as the main dish which includes meat, fish, and vegetables (“Sri Lanka Information” 1). The curry is often eaten with flat bread known as roti. Coconut milk is also used in curries and rice. Rice is a very popular dish in Sri Lanka and is sometimes prepared as a sweet dish. Typical desserts use tropical fruits like mango, papaya, passion fruit, and pineapple. Tea is the national drink and arrack is the local alcoholic drink (“Sri Lanka Information” 1-2).

Data from 2002 reveals that 1,920,324 hectares of land was used for agriculture, in other words 30% of the total land area of Sri Lanka (“Agricultural Sector in...” 2). The average farm size is less than one hectare. Rice paddies account for 600,000 ha, coconuts 395,000 ha, tea 211,000 ha, and rubber 115,000 ha. Rice paddies are the most important peasant crop (“Agricultural Sector in...”2).

The economy of Sri Lanka is based on industry, exports, and agriculture. Industry includes rubber processing, tea, coconuts, and other agricultural commodities such as clothing and cement. Exports include textiles/apparel, tea diamonds, coconut products, and petroleum products (“Sri Lanka” National...1). Agriculture is the most important division of Sri Lanka’s economy. Agriculture accounted for 38% of the total labor force in 1999 (“Sri Lanka Agriculture” 1). Rice is the main crop and farming rice is the most important economic activity for the majority of people living in rural areas. In 1999 farmers grew approximately 2.9 million metric tons (“Sri Lanka Agriculture” 1). Farmers have been able to increase production due to increases in area farmed and improved productivity due to modernization of agriculture. They have also fixed the irrigation networks and invested in construction and maintenance of the irrigation infrastructure. From 1960-2000 rice production increased six times. Productivity also rose due to high-yielding seeds, tractors, and chemical fertilizers (“Sri Lanka Agriculture” 1). Farmers have started to grow yams, pulses, grains, vegetables and fruits in family gardens to sell. Farmers are also growing sugar cane and potatoes but only produce 15% of what is consumed domestically (“Sri Lanka Agriculture” 1). Rubber is the second major commercial crop generating 56%. Rubber is used in domestic manufacturing and the rest is exported. China is the major buyer of rubber while the U.S. bought \$33 million in 1999 (“Sri Lanka Agriculture” 1-2). Sri Lanka’s plantation crops include tea, rubber, and coconuts. Sri Lanka is famous for its high quality black tea and is the largest supplier in the world. The United Kingdom, Russia, and the Middle East are the major export markets of the tea (“Sri Lanka Agriculture” 1). Sri Lanka also has a sizeable amount of fishing resources because of its exclusive economic zone. The country has 500,000 kilometers of coastline and 1,700 kilometers of inland water reservoirs for fish farming (“Sri Lanka Agriculture” 2). This economic activity has not been exploited enough. Most marine fishing takes place in coastal areas but poor production rates, due to the lack of technical knowledge and equipment, hinders its growth (“Sri Lanka Agriculture” 2).

Educating farmers about agricultural yield and sustainability will help to increase agricultural productivity and farm income. If farmers are not educated about new methods and new techniques, the people of Sri Lanka will not be able to produce enough food or earn an adequate income. There has already been a trend to implement programs in Sri Lanka to teach citizens how they could have a better life and these programs have proven to be successful. Malaria, a disease carried by mosquitoes, has been a common and threatening illness in Sri Lanka for many years. Mosquito and disease control efforts have

not been successful in the past because of farmer's dependency on chemical spraying, the lack of intersectorial cooperation, and the lack of environmentally sound mosquito control activities with community participation (Yasuoka et al. 1). From October 1, 2002 to March 31, 2004 a 20-week education program was piloted to teach members of the community about mosquito control. The program took place in two intervention and two comparison villages. The program mainly focused on rice farmers (Yasuoka et al. 1). The participants were given a survey before and after the program to see how much they learned. Through the program participants learned how to incorporate environmentally sound methods for mosquito control that required no expense. Exercises in the field such as identifying mosquito breeding sites in villages, studying mosquito life cycle by raising mosquito larvae at home, identifying mosquito genera at both larval and adult stages, observing mosquito predators in rice ecosystems, ecosystem analysis in and around paddy fields, a role play regarding mosquito-borne disease transmission, and practicing mosquito control methods both at residence and in the field (Yasuoka et al. 3). In the follow up survey the citizens' knowledge of mosquito ecology and mosquito-borne disease epidemiology were tested. Actions for mosquito control and mosquito-borne disease prevention were measured to detect changes caused by the educational intervention. The survey also asked if changes in agricultural practices were made (Yasuoka et al. 3). Trained surveyors also observed water storage containers and coconut shells discarded as garbage at residences and from participants' yards to see if they were protected from mosquito breeding. The presence or absence of mosquito larvae was recorded. These analyses showed the participants the effectiveness of keeping their homes free of mosquito breeding (Yasuoka et al. 3-4). After comparing the data before and after the program, the participants' knowledge of mosquito ecology, disease epidemiology and actions taken for mosquito control and disease prevention increased in all of the intervention communities (Yasuoka et al. 5). Some farmers even changed their farming techniques such as land leveling, cleaning of the irrigation canals, and draining the rice paddies (Yasuoka et al. 6). This study proves that with educational programs we can help the farmers of Sri Lanka to enrich their agricultural yield and land sustainability.

Many Sri Lankan farmers, in more recent years, have begun to use pesticides to increase agricultural production and productivity. Although pesticides have worked, many damaging effects on the environment have occurred, such as reduced agricultural sustainability, agricultural production, damaging fauna, flora and human illness (Wilson and Tisdell 1). Pesticides have killed many predators of pests causing pests to live more freely and damage more agricultural crops. Land has become abandoned because pesticides no longer protect the crops because the crops have become immune to the pesticide treatment (Wilson and Tisdell 3). The pesticides have also had a negative effect on other production processes such as fisheries. The pesticides have entered water through water run offs. These pesticides are highly toxic to fish. The pesticides contaminate drinking water and food crops like vegetables and fruits which could cause possible health risks to the people of Sri Lanka who eat and drink the contaminated food (Wilson and Tisdell 6-7). Every year tens of thousands of farmers are exposed to pesticides and deaths are not unusual. Research reports that 14,500 people were hospitalized and 1,500 people died from pesticide poisoning during the years 1986-1996 (Wilson and Tisdell 8). Protective gear worn by farmers is poorly preserved and insufficient making them very prone to pesticide contact. There are fewer medical facilities in countries like Sri Lanka, especially in rural areas, so many farmers are never diagnosed with pesticide exposure (Wilson and Tisdell 9). Many farmers use pesticides due to cost reasons. They use pesticides if the discounted net present value of stream of returns from doing so is positive (Wilson and Tisdell 11). Market systems encourage farmers to adopt biophysically unsustainable techniques like pesticides that will lower current costs and boost yields in the short run, but lower yields and raise costs of production in the longer term (Wilson and Tisdell 11). Many farmers have loans for the purchase of pesticides which makes it more difficult to switch to other strategies. Studies have shown that farmers in Sri Lanka are willing to pay a higher price for safer pesticide or Integrated Pest Management strategies and biological control of pests and disease but these services have been hard to get in these types of areas (Wilson and Tisdell 12). There is also a very high initial cost of switching to a more sustainable agricultural system and all farmers would need to switch to new methods at about the same time for

economic losses to be avoided. Farmers may also not have enough knowledge about managing crop disease which is important in the use of pesticides (Wilson and Tisdell 12-13). Educating farmers about the irreparable effects of pesticides would help to preserve the environment and farmers would experience successful agricultural yield for future generations.

Biofuels are already the primary source of energy and account for almost 66% of the annual energy consumed in Sri Lanka (Wickramasinghe 1). Wood is the primary resource used for the production of biofuels. According to the World Health Organization, half of the world's population relies on firewood to cook. Sri Lanka consumes ten million tons of wood annually; this is worth almost 440 million U.S. dollars (Wickramasinghe 1). The two reasons that determine the use of alternative sources of energy in Sri Lanka are price and availability. Fuelwood is the least expensive source of energy for industries and households ("FRA 2000 Forest..." 1). Biomass fuel is important to contribute as an energy cooking source, hence food security. This is an area where the implications on nutrition and health can be contextualized. (Wickramasinghe 1). Households consume around 81% of the biomass energy in Sri Lanka; 98% of rural households; 80% of urban residents; and 99% of plantation residents use biomass for cooking (Wickramasinghe 1). Even though biofuels have been successful, they have had a negative impact on women causing them stress, difficulty, and physical discomfort (Wickramasinghe 1). Women's jobs in biofuel production include gatherers, carriers, and users. Many women have had health problems due to their exposure, exhaustion and subjection to the biofuel cycle which consists of three steps: production, the flow system, and the indoor sphere where combustion takes place (Wickramasinghe 1). There was a study of 720 households where researchers recorded signs of health deterioration. In the end 60% of households reported health problems. During the production phase, women developed skin irritations, allergic reactions, injuries, pest attacks, backaches, and fungal infections. During the carrying phase, women handled heavy loading which contributed to repetitive strain injuries, headaches, chest pains, trauma, and fatigue. In the final phase of combustion, women developed coughing, bronchitis, conjunctivitis, poisoning, upper respiratory irritation/inflammation, headaches, and pneumonia (Wickramasinghe 1-2).

Using wood as the primary biofuel resource will soon deplete this resource in Sri Lanka; therefore, new resources for biofuel production must be researched and developed. For example, rice is a primary crop in Sri Lanka, and farmers have been able to grow large harvests of it. Rice would be another resource for biofuel production in Sri Lanka. Citizens must be educated about the damaging effects of biofuel production on women since women are major contributors to the workforce. Efforts to develop healthier and safer ways for biofuel production must be developed. Biofuels is a great way for the citizens of Sri Lanka to make and save their money. If citizens are able to make their own fuel, they won't have to pay the high costs of regular fuel. Farmers could also make more money by growing and selling the biofuels to surrounding countries.

I think organizations such as the United Nations, World Bank, and other private or civic organizations could help Sri Lanka and other developing countries by piloting programs that educate subsistence farmers about ways to increase yield and sustainability while also developing biofuel alternatives. For example, researchers from these organizations could investigate, develop, and teach farmers about using other natural resources or crops instead of using wood as the primary biofuel. For examples, biofuels made out of rice, because rice is such a prosperous crop in this area, might be a distinct possibility for future use. Sri Lanka's economic growth in agriculture has improved and continues to improve because farmers have been introduced to new farming procedures and growing practices. Help from these well known and well-supported organizations, can assist Sri Lanka to become economically prosperous. Sri Lanka has many resources available to make it a more successful nation. Farmers and workers need to learn more specifically how they can increase and maintain an economic return on their investment from the land that they farm. Farmers need to be taught more ways to make the land more prosperous and sustainable. Land sustainability will decline over time if a current practice of pesticide use

continues. The pesticides do not only damage the land but also the farmers and families who are working the land. The research studies conducted and written about in this paper prove that using a hands-on, practical approach to educating the subsistence farmer can be most successful. Farmers also need to learn about alternative crops that could be grown and yield prosperous economic returns, such as sugar cane, yams, and other fruits and vegetables. Additionally, facts must be communicated about the biofuel production process and how that process has created physical problems for the women of Sri Lanka. The consequence of not finding alternative biofuels is simple. Sri Lanka's natural resource, wood, will expire along with its vital human resource, women, who contribute so much to the biofuel production process. Finally, I've grown up in the Midwest region of the United States where we are particularly wealthy in agricultural yield and sustainability. Many of the farmers in Iowa have been educated about the problems, issues and trends in farming. Iowa farmers have learned to produce greater economic yields while not destroying the land that creates that yield. I think it is every country's or every nation's responsibility to educate others in developing countries so they, too, can feed their families, live above the poverty level and eventually prosper. Efforts must be taken to move politicians, policy makers, business, educators and others toward building a coalition of support to improve economic conditions for subsistence farmers in Sri Lanka and other countries.

Bibliography

- “1 Introduction.” United Nations Environment Programme Regional Resource Centre for Asia and the Pacific. Aug. 14, 2007.
<http://www.rrcap.unep.org/issues/air/maledec/baseline/ActnPlan/SriLanka/INTRO.htm>.
- “Agricultural Sector in Sri Lanka.” Regional Data Exchange System. 2002. <http://www.fao.org/apcas.org/srilanka/index.htm>.
- “Basic Information.” Household Income and Expenditure Survey-2006/07 Department of Census and Statistics Sri Lanka. June 2007.
www.statistics.gov.lk/HIES/HIES2006_7/PreliminaryBuletin.pdf.
- “The Educational System of Sri Lanka.” Sept 9, 2007.
<http://www.mysrilanka.com/travel/lanka/education>.
- “FRA 2000 Forest Resources of Sri Lanka Country Report.” FAO Corporate Document Repository. 2001.
<http://www.fao.org/docrep/007/ad678e/AD678E06.htm>.
- “Sri Lanka.” CIA The World Factbook. Sept. 20, 2007. <https://www.cia.gov/library/publicatins/the-world-factbook/geos/ce.html>.
- “Sri Lanka.” Infoplease. May 2007. 2000-2006 Pearson Education.
<http://print.infoplease.com/country/profiles/sri-lanka.html>.
- “Sri Lanka.” National Geographic Atlas of the World. Eighth Edition 2004. National Geographic Society 1996-2007. http://www3.nationalgeographic.com/places/countries/country_srilanka.html.
- “Sri Lanka Agriculture.” National Economies Encyclopedia. 2007. Advameg Inc.
<http://www.nationsencyclopedia.com/economies/Asia-and-the-Pacific/Sri-Lanka-AGRICULTURE.html>.
- “Sri Lanka Information.” World InfoZone. 1997-2007. World InfoZone Ltd.
<http://worldinfozone.com/country.php?country=SriLanka>.
- Wickramasinghe, Anoja. “Gendered Sights and Health Issues in the Paradigm of Biofuel in Sri Lanka.” Energia News. Dec. 2001. Vol. 4 nr 4: 12-14.
- Wilson, Clevo, Tisdell, Clem. “Why farmers continue to use pesticides despite environmental, health and sustainability costs.” Ecological Economics 39. 2001:449-462.
- Yasuoka, Junko, Mangione, Thomas W., Spielman, Andrew, Levvis, Richard. “Impact of Education on Knowledge, Agricultural Practices, And Community Actions For Mosquito Control And Mosquito-Borne Disease, Prevention In Rice Ecosystems In Sri Lanka.” The American Society of Tropical Medicine and Hygiene. 74(6), 2006:1034-1042.