Green technologies and business practices: a study on rural microenterprises in PURA scheme villages of Thanjavur District, Tamil Nadu, India

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Abstract: This paper present the study that was carried out in the PURA scheme villages of Thanjavur District, India. The investigation was to determine the impact of education on green technologies and business practice among the villagers, who deals with micro-enterprises. The data were collected from PURA villages that consist of seven clusters. Each cluster has been allocated an activity that yield production from natural resources. A random sampling method was used in collecting the data among clusters of the villagers. Chi-square test and T-test was used in determining the role of green technologies on the villagers' performance towards green technology management and practices. The research study was carried out before and after the implementation of green technologies-based farming. The result revealed that the villagers have changed their method of farming after the education of green technologies and business practices.

Keywords: rural development; green technologies; biogas; solar energy; organic farming pest management; environmental pollutant; chemical fertilisers; renewable energy; India.

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1 Introduction

1.1 History of green revolution

The term Green Revolution refers to the renovation of agricultural practices beginning in Mexico in the 1940s. Because of its success in producing more agricultural products there, Green Revolution technologies spread worldwide in the 1950s and 1960s, significantly increasing the production without jeopardising the amount of calories produced per acre of agriculture. Dr. Norman E. Borlaug has received the Congressional Gold Medal in 2007 and a 1970 Nobel Laureate, was honoured for his work in the 'Green Revolution', saving millions of lives from famine in India, Mexico, and the Middle East, mentioned that green revolution is a technology based and scientific approach, where it can reduce the chemical reaction. Chandel and Perrault (1999) mentioned that green revolution technologies elevate the villagers from poverty.

1.2 Providing urban Amenities to rural area (PURA) scheme

Providing urban amenities to rural area (PURA) is a scheme inaugurated by Former President of India, Dr. A.P.J. Abdul Kalam in the year 2003. This scheme was to highlight the villages on the changes of environment that been occurring due to fast growing economic growth. Many villages were not aware of these environmental defects that are harmful to the society. Farmers can decide whether they want to maximise income at a higher level of risk, or pursue a more conservative yield target with less risk [Swanson, (1997), p.85]. The environmental impact is the consequential of excessive use chemical fertilisers and pesticides. Majority of the villagers believes in yesteryears technologies that has use up the clean energy around them and that has deposited unwanted pollutants, which in turn wear down the quality of soil, purity of water, purity of air, source of energy and mismanagement the waste. According to Norman, new energy technologies will play a decisive role in fulfilling the present needs as well as those of future generations. However, this may also break the tight link between economic growth on one hand and increasing energy demand and damaging environmental effects on the other [Larsen and Petersen, (2002), p.19]. Tamil Nadu has adopted the load sharing among the states by scheduling the power supply. The farmers are the largest occupant of Tamil Nadu, education on the green technologies and its reimbursement is essential. One of the prerequisites of technology adoption is that a farmer should be aware of the benefits the new technology may bring to them. Thus, farmer should understand the potential benefits of environmental changes in their routine farming practices. They should be able to assimilate new techniques and adopt new practices which reduce the unwanted elements the environment. The nature of technological change in agriculture has three folds classification:

1 infrastructure

2 information

3 incentives [Singh and Kohli, (2008), p.302].

2 Green technology education

The farmers were been trained periodically on the green technology based on farming and business practices. Periyar Technology Business Incubator situated at Vallam, Thanjavur conduct the training for villagers from the clusters. The training covers on the following:

- Solar photovoltaic technology (SPT)

  Converting sunlight energy into electricity by using semi conductor modules is one of the photovoltaic technologies. It is use generally to meet up the lighting requirements; which can also be used for pumping water, refrigeration, communication, and charging batteries. Solar photovoltaic has application as green agricultural energy source for pumping water, street lighting in villages, and lighting in rural houses. Framers were educated on the solar energy usage and on its technical specification. Portable solar lamps produce by Periyar Technology Business Incubator was put in use to substantiate the differences in energy saving.

- Biogas (BG)

- The product of anaerobic digestion of organic matters by methanogenic bacteria. BG qualifies on the merits that this technology utilises organic agricultural waste and converts it to fuel and fertiliser. Direct impacts of BG are fuel-wood, agriculture residue, livestock manure, and kerosene savings. Increases in soil fertility and crop production have also been observed. Renewable energy has received ever-increasing attention in recent years. The farmers were educated on the conversation of waste product into bio-energy. These sources produce significantly lower levels of environmental pollutants than conventional sources of energy; in particular, they generally emit negligible greenhouse gases or are neutral over their life-cycle in greenhouse gas terms [Li et al., (2006), p.352]. Efficient waste management is one of preconditions for sustainable development of any country [Schneider and Bogdan, (2010), p.105]. According to Froome (2009) the renewable energy is economical and abundant in supply.

- Organic and biodynamic farming systems (OBFS)

  When productivity in terms of inputs applied and outputs obtained and social costs of conventional farming are considered, organic alternative has been found to be significantly economical. Vermi-compose are the end product from decay progress of dung and plant. This natural fertiliser is free from chemical and brings good yields of crops. Farmers were educated on the technique and process of the natural manure, which is readily available in their farm. Thus, promoting self-sustainability and cost saving. Beside that, farmers could refrain from using chemical for their farming process. Organic farming in today's terminology is known as a method of farming system which primarily aims at cultivation of land and rising of crops in such a manner so as to keep the soil alive in good health by using organic wastes (crop, animal and farm waste, aquatic wastes and other biological materials). To solve waste problems, every upstream and downstream player in the waste and recycling chain has to be environmentally responsible and accountable [Qian et al., (2011), p.122]. Along with these beneficial microbes (bio-fertilisers), the essential nutrients

were release to crops for increase in production and eco-friendly pollution free environment. According to Banerjee (2010, p.2) and Shambu Prasad (2004, p.51), the organic farming/agriculture is a unique production management system, which promotes and enhances agro-eco system of health including bio diversity, biological cycles and soil biological activity.

- Identifying integrated pest management (IPM)

  The knowledge intensive approach on dichotomous to conventional chemical intensive approach served best in pest control. IPM was introduced on Farmers' Day programmes where farmers are envisaged experts with their expertise emanating from routine hits and trials, interactions among farmers. Trainings have empowered farmers and hat has maintained environmental balance. The farmers were been invited for focus group discussion on the issues of crops management and sharing their expertise among farmers. This programme was organised by Centre for Rural Development-PMU.

- Business practices

  Famers were updated on the business practices that would reduce the environmental pollutant. Zero usage of plastic-related product especially the packaging materials. Coconut fibre-based rope were been used instead of nylon-based rope in securing the harvested crop. The farmers were educated on chemical-based cleaning solvent and its outcome. The farmers were advised on the adverse reaction when chemically produced pesticide used on the vegetables, fruits and crops and its adverse reaction was explain to the farmers.

3 Methodology

3.1 Sample size

A simple random sampling was taken among seven clusters of village in Thanjavur district that come under the PURA schemes. Total 27 micro-enterprise owners were identified for this research work.

3.2 Period of study

The research study was carried out from the month of January 2011 to June 2011.

3.3 Data collection

The data was collected through questionnaire. The data was collected before and after the education of green technologies. The primary data was collected through questionnaires. Secondary date was collected from Centre for Rural Development, Periyar Technology Business Incubator, Periyar Renewable Energy Training Centre, Center for University Industry Interaction, Village President Office, Village Panchayat Office and Village Administrative Office. About 30 rural micro enterprise owners were been scheduled for interview but only 27 of them responded to our request. Out of the 27 micro-enterprises owners, 13 were males and 14 were females (see Table 1).

Table 1 Breakdown of the sampling

Categories	*Number*	*(%)*
Men	13	48
Women	14	52
Total	27	100

Table 2 Relationship of micro-enterprises and green technology education

Gender group	*Category of respondents*		*Total*	χ^2 *value*
	Benefited	*Not benefited*		
Male	6	7	13 (48)	4.727
Female	12	2	14 (52)	
Total	18	9	27	

Note: Figures in the parenthesis are the percentage.

3.4 Research tools

3.4.1 Chi-square test

The Chi-square test was used to determine the goodness-of-fit test of the sample been collected is fit for the research work.

3.4.2 T-test

The t-test assesses whether the means of two groups are statistically different from each other. In this research, t-test was used on the selected groups before and after training of green technologies.

3.5 Hypotheses statement

H_0 There is no relationship between the micro-enterprises and green technology education in the PURA villages.

H_1 There is a relationship between the micro-enterprises and green technology education in the PURA villages.

4 Data analysis

The farmers who are the owners of the micro-enterprises deals with crops like paddy, wheat and maize. The farmers have live-stocks like goats, cows and buffaloes. As for women micro-enterpriser, they concentrate on peanuts, cashew nuts and honey harvesting.

Table 3 revealed that the relationship between the rural micro enterprises and green technology education in the clusters were high. This implied that there is a significant relationship between rural micro enterprises and green technology education. The calculated value of χ^2 (4.727) is more than the table value of χ^2 (3.841) at $p \leq 0.05$ level,

df = 1. The *null hypothesis* (H_0) showed there is significant difference between rural micro enterprises and green technology education in the clusters, thus, rejected while the *alternative hypothesis* (H_1) was accepted. Since, the Chi-test revealed the significant; further investigation has been carried out to determine the impact of the education.

Table 3 The differences in farmers (rural micro-enterprises) performance

	n = 27				
	Before training		*After training*		*t-value*
	$\bar{x}$	σ	$\bar{x}$	σ	
(T1) Solar photovoltaic technology	1.42	0.5	2.43	0.507	–6.934
(T2) Usage of biogas	1.65	0.49	3.61	0.58	–10.028
(T3) Organic and biodynamic farming systems	1.42	0.5	3.35	0.487	–11.144
(T4) Identifying integrated pest management	1.58	0.5	3.48	0.67	–9.432
(T5) Business practice	1.50	0.51	3.39	0.72	–11.124

Our obtained, or calculated t-value is –6.934 (T1), –10.028(T2), –11.144(T3), –9432 (T4) and –11.124 (T5). Our degree of freedom equals the total group size (27) minus 2, or 25. Entering a t-table with 25 degrees of freedom, we see that for alpha = 0.05 the tabled value is 2.060. Our calculated value is larger than the tabled value at alpha = 0.05, so we reject the null hypothesis and accept the alternative hypothesis. This deduces that there is strong relationship between the rural micro-enterprises owners and the green technology education.

5 Conclusions

There has been clear evidence that the Green Revolution technologies have had a significant impact on rural sector and minimising the risk of chemical reaction that damages the natural organic substances. Our research study has revealed that the education on green technologies and its benefits to the rural enterprises owners was strongly significant. However, the rural enterprises owners have to update continuously on the green technologies so that they can keep themselves equivalence with the information. Though the research on education of the green technologies was in need but researchers felt that whether it produces the necessary economic growth comparing both methods of cultivation will be discussed on next research study. The secretariat of UNCTAD (2010) mentioned that green technologies and renewable energy is a solution for rural development.

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