

## INDICATIVE BEHAVIORAL AND RELATED ASPECTS FOR DESIGNING ORGANIC FERTILIZERS - AN EMPIRICAL STUDY

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### ABSTRACT

*Today, we stand at the crossroads between environment and development. For the past few years, the world has been experiencing revolutionary changes to reduce the impact on environment from global warming, climate change, carbon emissions and green house gases. The people around the globe are becoming sensitive towards the environment. The prosperity of the country can be achieved through sustainable agricultural production. Fertilizers are one of the major determinants of the agricultural production as it contributes to food security in the country. Fertilizer industry is highly capital intensive. It requires huge production facilities to be set up. India is yet to master the process and it is importing the process from the other countries. Fertilizers are produced at certain cost. Farmers are not able to bear the cost. The current burden on chemical fertilizers is over Rs.68,000 crores which is the highest subsidy given to any sector. There is a gap between supply and demand of the chemical fertilizers. Fertilizer subsidy is a major burden to the Indian economy. To meet this, why not look at other options. Among the available options are organic fertilizers the least cost option.*

*It has been accepted that, use of Chemical Fertilizers have its long term adverse impact on the fertility of the soil as compared to favourable impact on the fertility of the soil and healthy environment through the use of Organic fertilizers. As a result of this, there is a change in their attitudes to shift the focus from chemical fertilizers to organic fertilizers. This reveals the growing interest among the farmers to know the issues that are affecting the environment through the use of chemical fertilizers. Based on the opinions and information collected from the respondents, this paper attempts to identify and evaluate the criteria w.r.t behavioural and related aspects for designing the organic fertilizers to achieve 'Sustainable Development'.*

**Keywords:** Environment, Fertilizers, Sustainable Development

### INTRODUCTION

Fertilizers are generally defined as “any material, organic or inorganic, natural or synthetic, which supplies one or more chemical elements required for the plant growth”. Organic fertilizers relies on ecosystem management and attempts to reduce or eliminate external agricultural inputs, especially synthetic or chemical fertilizers. Organic fertilizers enhance agro ecosystem health including biodiversity, biological cycles and soil biological activity. Organic approaches share common goals and practices. Through the use of organic

fertilizers, there will be protection of the soil from erosion, nutrient depletion and promotion of biodiversity, which helps in the growing a variety of crops rather than the single crop. To adopt the framework of organic fertilizers, individual farmers have to develop their own organic production systems, determined by the factors such as crop, soil, climate and other geographical constraints. The usage of 'Organic Fertilizers' has to be integrated in all the farming methods and practices so that it will be beneficial for the farmers to ensure healthy crop yield.

## **LITERATURE REVIEW**

### **Promotion of Environmental Protection**

The study by Subir Ghosh(2008) explained the need to ensure the security of hazardous waste facilities, Research and development on risk assessment of new materials, incident analysis methods to predict the occurrence and expansion of hazardous materials accidents, and methods to assess safety.

### **Green Marketing: Some Myths and Realities**

Mansroor Ahmad Beg(2008): An environmentally committed organizations may not only produce goods that have reduced their detrimental impact on the environment, they may also be able to pressure other suppliers to behave in more environmentally fashion.

### **Greening of National Income**

According to Karpagam & Geetha Kumar(2010), the mechanisms of economic growth may impact the environment in many ways, such as pollution and overexploitation of natural resources that results in the degradation and loss of wildlife habitats. Economic growth impacts environmental functions both qualitatively and quantitatively. The greening of national accounts concerns issues related to the environment.

### **Green Purchasing & Greening of Supply Chain Management (GSCM)**

According to Y.K.Saxena and N.K.Uberoi(2004), Green Purchasing involves the buying of products and services with reduced effects on human health and the environment. This approach means integrating environmental factors into procurement policies called as "Affirmative Procurement" or Preferable Purchasing or Environmental Purchasing.

### **Awareness Level on Green Marketing**

The study by Leena Sharma et al(2012) highlighted that business activities cannot avoid exerting an influence on conditions in the natural environment. As a result increasing number of companies are going green, positioning their products, services or brand on the basis of pro-environmental characteristics. Green marketing should not be considering just approach of marketing.

### **A Conceptual Framework on Green Marketing – A Tool For Sustainable Development**

The study by Nandini Deshpande(2011) revealed that there is a growing interest among the consumers all over the world regarding protection of environment. For green marketing to be successful in the long run, the companies should have concern for the environment and also it helps them to be compatible to the needs and wants of consumers who are environment-friendly.

**Green Marketing : Emerging Opportunities and Challenges**

The study by Pavan Mishra & Payal Sharma (2010) highlighted that Green Marketing is a phenomenon which has developed significance in the modern market. This concept has resulted in the innovations in the re-marketing and packaging of existing products. The development of Green Marketing has opened the door of opportunity for companies to co-brand their products into separate line, appealing the eco-friendliness of the products.

**Recycling**

According to Kamal Vasisth (2011), Recycling involves processing used materials into new products to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution and water pollution by reducing the need for “conventional” waste disposal, and lower greenhouse gas emissions as compared to virgin production. Recycling is a key component of modern waste management and is the third component of the “Reduce, Reuse, Recycle” waste hierarchy.

**Sustainable Development: Effectiveness of the Government and RBI Initiated Schemes**

The study by Ruchi Jain (2012) reveals that the Government of India as well as the various state governments, Central bank (RBI) implements a number of schemes for the welfare of the poor. The benefits of these to the poor, their cost-effectiveness is likely to be low. The study also highlights that much waste could be avoided through higher public investment in agriculture-especially in irrigation, roads and electricity- which would translate into higher yields, lower food prices and higher agricultural wage rates.

**Sustainability Management of Agricultural Soil**

According to Azmal Hussain(2007) : It is a well established fact that one of the major factors responsible for obtaining agricultural crop yields to a satisfactory level is the existence of adequate amount of essential nutrients in the soil. For optimal and rational management of agricultural soil, it is essential to have knowledge of the soil's fertility status as well as its physical properties. Air, minerals, water, and organic matter are the four basic components of soils. Soil-dwelling organisms are known to release bound-up- minerals, which are taken up by the growing plants. These organisms keep on recycling nutrients and thus result in the management of organic matter which is essential to maintain the sustainability of the entire soil ecosystem.

**Carbon Offset Pricing**

The study by Robert Dahlstrom(2011) indicated that Carbon Offset Pricing used in situations under which the marketer of a product enables the purchaser to compensate for the greenhouse gas emissions associated with consumption. This pricing places the cost of sustainability directly in the hands of the consumer. Two parameters associated with determining the offset price are the determination of the carbon-related cost of a product and the determination of the cost of the offset investment.

**Agricultural Chemicals as Soil Pollutants**

N K Uberoi(2010): Pesticides and fertilizers are chief chemicals which are used by the agriculturists for spraying on crops and the soil. India has, during the last 50 years increased its annual food production from 50 million tonnes to about 200 million tonnes. Use of

fertilizer is one of the important contributors of increased production. It is estimated that only  $\frac{1}{4}$  of the fertilizer is used by the plants, remaining leaches out beyond the roots of the plants or is lost through volatilisation. One thing about many of these chemicals is their long life. The chemical companies are now developing chemicals that are short-lived and at the same time more effective. The pesticides, whether short-lived or long-lived are harmful to human and wild life.

### **Going Organic**

Anju Agnihotri Chaba(2012) : The recent success story reveals that in Punjab's Roopnagar district, farmers with small holdings are shunning costly chemical fertilizers and pesticides to grow wheat, paddy, maize and vegetables, using organic methods. The farmers are getting much higher price for their produce and saving a lot for not using costly chemical fertilizers. Due to the small land holdings and high rate of chemical fertilizers, farmers are forced to go organic. To support the farmers produce through organic fertilizers, NABARD has also constructed a vegetable market for the farmers in the district where an outlet was opened for sale of organic products.

### **OBJECTIVES & UTILITY OF THE EMPIRICAL STUDY**

1. To study the behavioural and related aspects for designing organic fertilizers.
2. To classify the behavioural and related aspects for designing organic fertilizers.
3. To evaluate the effectiveness of the various behavioural and related aspects that will help to bring new reforms in the designing process of organic fertilizers.

### **HYPOTHETICAL OBSERVATION(S)**

1. Nutritional Value is highly important in changing the mindset of the people towards organic fertilizers.
2. There is a strong association between Involvement and Green Profile
3. There is significant difference in importance ratings for adaptability among the respondents as an effective tool

### **LIMITATIONS OF THE STUDY**

1. The data collected for the study might reveal variations in the findings due to the lack of awareness among the people in various social and economic issues affecting the environment.
2. The information gathered from the respondents mainly depends on the extent of familiarity on the various environmental issues towards the organic fertilizers.
3. Due to the restricted sample size, the interpretation may not be deriving persuasive conclusions.

### **METHODOLOGY OF THE STUDY**

#### **Sources of Data**

#### **Primary data**

Survey & Schedule using structured questionnaire to farmers and professionals from B-schools

The structured questionnaire has been designed by Nominal, Ordinal and Likert-Rating scales

**Secondary Data**

Literature from Text Books, articles published in Newspapers, articles published in journals pertaining to Environmental issues and Websites

**Research Design****Descriptive Longitudinal design:**

The research aims to quantify the opinions of the respondents for behavioural and related aspects in designing Organic fertilizers. The data has been collected from the farmers and professionals of B-schools and their responses are analysed by using appropriate statistical tools. The study is referred to be longitudinal because as the information is collected from the same sample of respondents (farmers) on the same variables related to fertilizers. Thus the research design adopted for the study is Quantitative Descriptive Longitudinal design to classify the behavioural aspects influencing organic fertilizers.

**Sampling Method:** It refers how sampling units are selected.

**Types of sampling** – Non Probability Sampling

**Method of Non Probability Sampling**

**Quota Sampling** – This method is viewed as a two-stage restricted judgmental sampling and it is as follows:

Firstly, the relevant control characteristics of the sampling elements (farmers & B-School professionals) are identified. The farmers who are possessing the right knowledge and the usage of organic fertilizers is treated as a control characteristic and similarly in the case of B-school professionals also.

Secondly, based on the convenience and accessibility of the sample elements, the information has been collected to match their control characteristics.

**Sample Size:** The sample of respondents for this study consists of two groups (100 farmers + 100 B-school professionals)

**Research Area**

**For Farmers:** In the state of Andhra Pradesh across Prakasam & Guntur districts

**For B – school Professionals:** In the state of Maharashtra from South Mumbai

**Tests of Hypothesis**

The hypothesis has been tested by using the following statistical tools :

**Non Parametric tests**

- Chi – Square test
- Kolmogorov Smirnov D test

In addition to the above hypothetical tests, the statistical tools like Simple Percentage Method and Cluster Analysis are used for analyzing the data.

**Analysis and Interpretation**

The following Statistical tools have been used by using SPSS for analyzing and interpreting the data:

**Univariate Analysis**

- Simple Percentage Method
- Chi-Square Test

**Bivariate Analysis**

- Pearson Correlation

**Multivariate Analysis**

- Cluster Analysis

**HYPOTHESIS 1**

**H<sub>0</sub>** : Nutritional Value is not a significant tool in promoting Organic Fertilizers.

**H<sub>1</sub>** : Nutritional Value is highly significant tool in promoting Organic Fertilizers.

**Table 1.** Nutritional Value as an Effective Indicator

<b>Dimension</b>	<b>Observed</b>	<b>Expected</b>	<b>Residual</b>
Strongly Agree	56	40	16.0
Agree	82	40	42.0
Neutral	28	40	-12.0
Disagree	18	40	-22.0
Strongly Disagree	16	40	-24.0
Total	200		

**Source:** Primary Data

**Table 2.** Chi-Square Analysis Output

<b>Description</b>	<b>Value</b>
Chi-Square	80.600
Df	4
Asymp.Sig	.000

**Source:** Primary Data

It can be seen from the table(s) that the significance (0.00) is less than the assumed value (at 5% significance level). So we reject H<sub>0</sub>. This means that Nutritional Value is highly significant in influencing the people.

The following hypothesis is tested to know the Correlation between the two variables Green Profile and Involvement. The hypothesis is tested by using Pearson Correlation

**HYPOTHESIS 2**

**Null Hypothesis(H<sub>0</sub>)** : There is no correlation between Green Profile & Involvement

**Alternative Hypothesis(H1) :** There is a strong correlation between Green Profile & Involvement

**Table 3.** Pearson Correlation between Green Profile & Involvement

Variables	Green Profile	Involvement
<b>Green Profile</b>	1	<b>.797</b>
Pearson Correlation		
Sig, (2-tailed)		.000
N		200
<b>Involvement</b>	<b>.797</b>	1
Pearson Correlation		
Sig, (2-tailed)	.000	
N	200	

**Source:** Primary Data

**Inference:** It can be seen from the table 3 that the significance (0.00) is less than the assumed value (0.05). So we reject H0. It shows that Green Profile & Involvement are significant in the usage of the Organic fertilizers. It also reveals that the Green Profile and Involvement are positively and highly correlated to each other.

**Table 4.** Cluster Analysis – Agglomeration Schedule for Determining the Number of Clusters

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	13	14	22.5.00	0	0	3
2	9	10	46.000	0	0	10
3	13	15	71.500	1	0	5
4	5	6	101.000	0	0	8
5	12	13	131.500	0	3	11
6	1	3	165.000	0	0	7
7	1	2	200.833	6	0	12
8	4	5	240.667	0	4	9
9	4	7	286.083	8	0	12
10	9	11	333.250	2	0	11
11	9	12	406..940	10	5	14
12	1	4	483.143	7	9	13
13	1	8	594.482	12	0	14
14	1	9	724.000	13	11	0

**Source:** Primary Data

It can be seen from the above table, there are three clusters and the membership of the cases can be determined from the next table.

**Table 5.** Membership of the Clusters

<b>Variables</b>	<b>3 Clusters</b>
Awareness	1
Sensitivity	1
Desire	1
Productivity	1
Acceptability	1
Sustainability	1
Profitability	1
Nutritional Value	2
Adaptability	3
Passion	3
Commitment	3
Teamwork	3
Green Profile	3
Involvement	3
Motivation	3

**Source:** Primary Data

It can be seen from the above table, 3 clusters emerged with the following cases :

**Cluster 1** – Awareness, Sensitivity, Desire, Productivity, Acceptability, Sustainability & Profitability

**Cluster 2** – Nutritional Value

**Cluster 3** – Adaptability, Passion, Commitment, Teamwork, Green Profile, Involvement & Motivation

### **HYPOTHESIS 3**

**H0** : There is no difference in importance ratings for adaptability among the respondents as an effective tool.

**H2** : There is significant difference in importance ratings for adaptability among the respondents as an effective tool.

**Table 6.** Kolmogorov-Smirnov D Test for Testing the Importance of Adaptability as an Effective Tool in Using the Organic Fertilizers

<b>Importance of Adaptability (1)</b>	<b>Observed (2)</b>	<b>Observed Proportion (3)</b>	<b>Observed Cumulative Proportion (4)</b>	<b>Null Proportion (5)</b>	<b>Null Cumulative Proportion (6)</b>	<b>Absolute Difference (7)=(4)-(6)</b>
Very Important	54	0.27	0.27	0.2	0.2	0.07
Somewhat Important	86	0.43	0.70	0.2	0.4	0.30



**Table 6.** Kolmogorov-Smirnov D Test for Testing the Importance of Adaptability as an Effective Tool in Using the Organic Fertilizers (Contd....)

Importance of Adaptability (1)	Observed (2)	Observed Proportion (3)	Observed Cumulative Proportion (4)	Null Proportion (5)	Null Cumulative Proportion (6)	Absolute Difference (7)=(4)-(6)
Neutral	36	0.18	0.88	0.2	0.6	0.28
Somewhat Unimportant	18	0.09	0.97	0.2	0.8	0.17
Very Unimportant	6	0.03	1	0.2	1.0	0.00
Total	200					

**Source:** Primary Data

It can be seen from the table 3 that the largest absolute difference is 0.30, which is known as the Kolmogorov-Smirnov D value. For a sample size of more than 35, the critical value of D at a significance level of 5% is  $1.36/\sqrt{n}$ . As sample size is 200,  $D = 1.36/\sqrt{200} = 0.0096$ . As the calculated value (highest absolute difference) of 0.3 exceeds the critical value 0.0096(table value), the null hypothesis that there is no difference in importance ratings for Adaptability as an effective tool in using organic fertilizers among the respondents is rejected.

**FINDING(S) AND CONCLUSION(S) FROM THE EMPIRICAL STUDY**

- From the hypothetical analysis, It clearly indicates that Nutritional Value is highly significant and also it can be treated as an effective tool in influencing the farmers towards the organic fertilizers. By highlighting that yield achieved through organic fertilizers have high Nutritional Value , the interest of the potential customers who are sensitive towards the environment-friendly products can be enhanced. It will provide an opportunity for the marketers to position their products better than competitors.
- The output generated through Cluster Analysis reveals the following clusters :

**Cluster 1** – Awareness, Sensitivity, Desire, Productivity, Acceptability, Sustainability & Profitability

**Cluster 2** – Nutritional Value

**Cluster 3** – Adaptability, Passion, Commitment, Teamwork, Green Profile, Involvement & Motivation

- The Cluster 1 can be regrouped into Sensitivity & Sustainability, Productivity & Profitability. If the people are highly sensitive towards the environment-friendly products, the products are bound to be sustainable. Similarly, if the products produced through organic fertilizers are highly productive, then it will be mutually beneficial to both marketers and consumers and they can be termed as profitable.
- The Cluster 2 emphasises that Nutritional Value will be the major attribute of the organic fertilizers

- The dimensions of Cluster 3 are highly crucial in designing the organic fertilizers
- 3. The hypothetical study using the Kolmogorov-Smirnov D test indicates that Adaptability is an important tool for increasing the usage rate of the organic fertilizers. It is the responsibility of Government and Fertilizer Industry to encourage the farming community in the usage of organic fertilizers through the demonstrations at their crop sites so that the rate of adaptability can be increased.
- 4. There is a positive and high correlation between Green Profile and Involvement. If the employees of the Organizations manufacturing organic fertilizers have prolific attitude in the development of eco-friendly products then their involvement will be high in influencing and motivating the farmers to become environmentally sensitive.
- 5. The farmers will be benefited through using organic fertilizers as it protects the soil friendly microorganisms and it has improved biological position of the soil. The success stories of using organic fertilizers in India revealed that the farmers are doing well in achieving better profit for their yield than the chemical fertilizers. The popularization of the successful implementation of organic fertilizers can change the mindset of the farmers for Sustainable Development. The study has further scope to focus on the steps to be taken for developing sufficient infrastructure for organic fertilizers and also in the implementation of various Indicative behavioral aspects for designing Organic fertilizers.

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