Sustainability of Agriculture as Perceived by Small Farm Operators in Remote Areas

B. Mishra[1], C. Satapathy[2] and R.Mishra[3]

1.Senior Extn. Specialist, Directorate of Research, OUAT, Bhubaneswar-751 003.

2.Retired Dean of Extension Education, OUAT, Bhubaneswar.

3.Associate Professor, College of Fisheries, Rangeilunda, Berhampur.

Corresponding author e-mail: bishnu6822@yahoo.co.in

ABSTRACT

Sustainable agriculture is the main theme of Green Revolution at post phase stage. The meaningful implementation of elements leading to sustainability needs to be fully understood by the farmers operating at the grass root level being mentioned by the concept of the study was undertaken in order to examine the preferences of small farm operators about i) ecological factor, ii) economic viability, iii) social accessibility & iv) adaptability measures and humaneness. After reviewing the literature, the study was conducted in four coastal districts of Odisha with a randomized sample of 200 small farm operators from eight villages spread over four blocks. The result reveals that soil, water, nutrients and type of farming of ecological factors followed by profitability, income and production are the factors of economic viability need to be fully understood to bring balance between sustainability and profitability. Social accessibility qualified by market opportunities, village resources and participatory decision making process enriched the feelings of small farm operators towards sustainable agriculture. To add to respect for honourable living, cordial relationship, feelings for others and social solidarity provide strong inputs for sustainable agriculture in coastal belt of Odisha. Accommodation to social change, preference of consumers, creation of market demand are important parameters of enhancing adaptability measures to work towards sustainable agriculture.

Key words : *Sustainability, Perception, Small Farm Operators*

Sustainable agriculture has been the theme of much discussion at state, national and international level. Sustainability in agriculture is considered from two important points of view, i.e. (i) Environmental conservation and (ii) Non-stagnant productivity. The non-stagnant productivity encompasses food grain availability and trend in agro-ecosystem consisting of irrigated area, coastal belt, rainfall area, and hill and mountain areas. To have sustainable agriculture many key elements have been identified which enlists, zero tillage crop waste management, organic matter recycling, soil enrichment, IPM, use of information technology and precision farming. To be very specific, agriculture only becomes sustainable if it ensures that today's development not at the cost of tomorrow's prospects (World Commission on economic development, 1987). Further, the Commission also pointed out that major component of sustainable agriculture is economic profitability and environmental health.

The Round Table on environment economy (1994) identified key actors of agricultural sustainability, as (a) the impact on rural economy system within its capacity, (b) present and projected environment, (c) depletion of non-renewable resources, (d) diversity and innovated resource efficiency, (e) equitable distribution of benefits and (f) participatory productive systems and area of information and education for sustainable agriculture. The eminent agricultural scientist Swaminathan (1991) has enlisted as many as 15 parameters like Technological Appropriability, Economic Feasibility, Economic Viability, Environmental Soundness, Temporal Stability, Resource Use Efficiency, Local Adaptability, Social Acceptability, Social Sustainability, Political Tactness, Administrative Manageability, Cultural Desirability, Renewability, Equity and Productivity to define the operational aspect of sustainability.

The above scenario leads to conclude that manipulation of environment for development in agriculture has brought ill effects in all the components that constitute / correlate agriculture. The manipulations can be arrested provided people gain sufficient insight to the problem and make use of recommendations to preserve the ecosystem. The state of Orissa in the map of Indian agriculture is not exceptional to the problems emerging out of environmental degradation.

Apart from national and international consideration, the grass root population needs to understand the meaning and concept of sustainability in agriculture. In a state like Odisha, where most people depend on farming for living, they need to have full idea being discussed about sustainability and what role local people have to play.

Keeping this consideration in view a study on, "Sustainability as perceived by Small Farm Operators in remote areas' was undertaken in Odisha with following specific objectives.

Objectives :

1. To determine perception of the small farm operators about ecological factors that supports sustainability
2. To ascertain the ideas of the sample about economic viability that needs to be considered in the light of sustainability
3. To find out reactions of the sample about social accessibility and humanness in the context of

sustainability

4. To examine the adaptability of the measures that count towards sustainability of agriculture at micro level in rural areas.

Review of Literature

A number of studies have been conducted on sustainable agriculture. Many of the authors have studied the subject from location point of views. They have identified a variety of factors accountable for sustainability. A list of such factors is summarized to present view points of different authors.

Summary of ingredients sustainability stated by different authors

Sl. No.	Author	Year	Indicator
1.	Altirei	1992	(i) Crop Rotation (ii) Cover Crops (iii) Inter Cropping (iv) Agro-Forestry (v) Crop/Livestock Mixture
2.	Dunlap, *et. al*	1992	(i).Protect and enhance soil health (ii).Supply of safe and whole food (iii).Improve site specific knowledge of farmers (iv).Enhanced environment and wild life habitat (v).Increased diversity (vi).Improved farm economy (vii).Reduced agro-chemical use (viii).Reduced purchase of inputs
3.	Loker	1994	(i) Low external input agro forestry system i.e. LISA (low input sustainable agriculture) as alternative sustainable production system
4.	Lawrence	1994	(i) Ecological indicators (ii) Economic indicators (iii) Social indicators
5.	Cai and Smith	1994	(i) Combine all the components of sound husbandry into packages
6.	Kutty	1996	(i) Resource use efficiency (ii) Environmental soundness (iii) Economic viability (iv) Technological appropriability (v) Economic feasibility (vi) Local adaptability
7.	Jalali, *et. al.*	1998	(i) Integrated disease management (ii) Biological control (iii) Biotechnology and disease management in reference to plant pathogens
8.	Koocheki, *et. al.*	1998	(i) Climatic factors (ii) Geographic factors (iii) Cultural practices (iv) Agro-biodiversity (v) Extension and education (vi) Demographic factors (vii) Financial issues (viii) Marketing
9.	Kern and Geiss	1999	(i) Protecting and improvement of agricultural resources (ii) Preserving and restoring soil and water quality (iii) Integrated crop management practices
10.	Dabrowski	2000	(i) Ecologically based pest management to meet the long term goals of safe, economically viable and sustainable agriculture (ii) Interaction between farmers, extensionists, researchers and policy makers
11.	Paroda and Anderson	2000	(i) Ecologically, economically and socially sustainable farming system centered approach to agricultural research (crops, livestock, fish, forestry and agro -forestry) (ii) Organizing education, extension and skill empowerment on the basis of farming system intensification, diversification and value addition (iii) Balance and efficient use of o rganic and inorganic plant nutrient (iv) Improved soil management practices
12.	Swaminathan	2000	(i) Farming systems that can help produc e more than the available land, water and labour resources without their ecological or social harm
13.	Singh and Kelayutham	2001	(i) Synergetic integration of crop, live stock and environment at farm level in the region to region as a long term strategy
14.	Al Jaloud, *et. al.*	2002	(i) Renewable crop production if certain soil water and crop management practices are considered in an arid environment
15.	Bhavsar	2002	(i) Certified organic food and fibre production as an important part of the agricultural economy
16.	Bussche	2002	(i) Given appropriate management, both farming systems organic as well as conventional farming can be ecologically and socially sustainable
17.	Cox, *et. al.*	2002	(i) High water use efficiency is needed to minimize the overuse of sea water resource
18.	Eichhorn, *et. al.*	2002	Agricultural engineering in sustainable agriculture that involves the technical adoption for – a. Soil protection, b. Energy cost sparing productio n procedures in crop production, c. Pastoral management, d. Care of the countryside including recycling of residual biological material
19.	Gelderman and Kogel	2002	(i) Scientific development of tools for a sensible management of resources
20.	Jonson	2002	(i) Integrated Production (IP) rules that have to be followed on entire farm state and crop protection should be based on: a. Biological control methods Minimizing the use of pesticides through monitoring of pests
21.	Kassa, *et. al.*	2002	(i) Crop and live stock components for success of agriculture development
22.	Liu, *et. al.*	2002	(ii) Soil conservation and restoration for improvement of the ecosystem health index
23.	Yadav	2004	(i) Sustainable resources management Increased crop yields without much reliance on costly external inputs (ii) Environmental and biodiversity protection through organic farming taking care of soil quality, water quality and air quality as well as energy use

A summary of the indicators of sustainability presented to reveal the wide range of factos accountable for sustainability.

METHODOLOGY

The study was conducted in four coastal districts of the state where sustainability of agriculture is faced with serious problems. The selection of districts, blocks and village is presented below.

Table - 1
Villages, Blocks and Districts under study

District	Block	Village
Puri	Pipili	Aruha
		Bantalsingh
Khurda	Balipatna	Alasi
		Rajasa
Ganjam	Hinjilicut	Sampur
		Makarjhola
Balasore	Basta	Sadanandapur
		Baunsamukha

A. Selection of sample respondents :

The study considered only small and marginal farm operators as per definition of State Govt. of Orissa. From the list available at block level, a total of 200 respondents at the rate of 25 from each village were finally selected at random for interview and data collection given in Table 16 in the following page. The study encompasses 200 number of respondents selected randomly at the rate of 25 from each village covering 8 villages of 4 blocks of 4 districts

B. Selection of variables :

Independent variables included in the study were selected on the basis of review of literature, discussion with the experts, judges rating method and preliminary study conducted in the area of investigation. Only those variables, which were found having relevance with sustainability of agriculture were included within the framework of the study. The variables grouped under independent factors and their relationship with dependent variables on sustainability of agriculture was invariably studied in all the aspects. As per interview schedule, the variables have been arranged under three parts namely personal, social, economic, communication, marketing behaviour, farming behaviour and training components

C. Statistical analysis : Appropriate statistical measures were applied as per data to reveal desired results including both parametric and non-parametric

RESULTS AND DISCUSSION

Ecological soundness

It was within the scope of study to enlist as many factors possible to define ecological soundness that could be included in the study. The response of the sample as well as experts in determining the relative position of subcomponents is given in Table 2.

Table 2
Sub-components of Ecological soundness

Sl. No.	Item	Sample		Experts		ρ-value
		Score	Rank	Score	Rank	
1	Soil	2.13	III	4.25	I	-0.61 N.S.
2	Water	1.74	VI	4.00	II	
3	Nutrient	1.84	V	2.75	III	
4	Types of farming	2.02	IV	2.75	III	
5	Use of Bio-pesticides and fungicides	2.14	II	2.25	IV	
6.	Use of organic manure	2.20	I	2.24	V	

As contained in the Table 2 the sub-components under ecological soundness was found to be soil, water, nutrient, and type of farming, use of bio-pesticides and fungicides and organic manure. The sample viewed use of organic manure as first important element followed by use of bio-pesticides and fungicides, soil, type of farming, nutrient and water in order. The judges ranked soil as first element followed by water, nutrient, and type of farming, use of bio-pesticides and fungicides and use of organic manure in order. The rank order correlation being non-significant the difference between the two groups of sample is not significant to make consideration while deciding the sub-components of ecological soundness.

Economic viability

Economic viability of sustainability in agriculture was studied under six dimensions like production, profitability, natural resource conservation, income, profitable crop and animal husbandry.

Table 3
Sub-components of economic viability

Sl. No.	Item	Sample		Expert		ρ value
		Score	Rank	Score	Rank	
1	Production	2.10	III	4.00	III	0.14
2	Profitability	2.38	I	5.25	I	
3	Resource conservation	2.02	V	3.50	IV	
4	Adequate income	1.97	VI	5.00	II	
5	Profitable animal husbandry	2.07	IV	2.00	VI	
6.	Profitable crop husbandry	2.26	II	2.25	V	

The ranking made by the two groups of sample is found to be equal in case of profitability and production with difference in opinion on other sub-components. However, the rank order correlation being non-significant there is no difference between the two groups of sample so far as sub-components of economic viability is concerned.

Social accessibility

Social accessibility which can be obtained through sustainability in agriculture was measured in terms of access to common resources, use of energy, technological support, capital, market opportunity and participatory decision making. The differential ranking of farmers and experts is shown in the Table 4.

Table 4
Sub-components of social accessibility

Sl. No.	Item	Sample		Experts		ρ Value
		Score	Rank	Score	Rank	
1	Accessibility to village resources	2.23	II	4.25	II	
2	Availability of energy for agriculture	2.61	I	2.75	V	-0.31
3	Technological support	2.08	III	2.50	VI	
4	Availability of Capital	1.96	VI	3.00	IV	
5	Market opportunity	2.06	V	4.75	I	
6.	Participatory decision making	2.07	IV	3.75	III	

A look at the Table relating to the common accessibility to the village resources, both the samples are unanimous with difference in other sub-factors. However, rank order correlation being non-significant the study infers that both the groups are unanimous in rating the sub-components of social accessibility.

Humaneness

The core value of quality living is humaneness. As the study hypothesized that humaneness may emerge out of sustainability in agriculture, the aspects like respect for honorable living, cordial relationship, climate of trust worthiness, feeling for others and social solidarity were ranked by the two groups of sample.

Table 5
Sub-components of humaneness

Sl. No.	Item	Sample		Experts		ρ Value
		Score	Rank	Score	Rank	
1	Respect for honorable living	2.18	I	5.25	I	
2	Cordial relationship	2.14	II	3.25	II	0.81
3	Honorable living	1.98	IV	2.75	IV	
4	Climate of trustworthiness	1.95	V	2.00	V	
5	Feeling for others	2.04	III	4.00	III	
6.	Social solidarity	2.04	III	3.75	III	

The rank order correlation reveals a non-significant result indicating that the difference between two groups is not valid. However, both the groups are unanimous in the matter of respect for honorable living, which sustainable agriculture should yield through society.

Adaptability

Adaptability has been operationally defined as the scope to accommodate change in agriculture, Govt. policy, market demand, consumers preference, conflict owing to adoption and scope for disaster management were considered under adaptability.

Table 6
Sub-components of adaptability

Sl. No.	Item	Sample		Experts		ρ Value
		Score	Rank	Score	Rank	
1	Accommodation for social change	1.97	VI	5.00	I	
2	Accommodation for Govt. Policy and technological change	2.07	II	2.25	V	-0.04
3	Creation of market demand	2.06	III	3.50	II	
4	Preference of consumers	2.13	I	5.00	I	
5	Possible conflict in adoption of sustainability measures	2.04	IV	2.75	III	
6.	Scope for disaster management	2.01	V	2.50	IV	

Analysis pertaining to the Table above reveals a non-significant result. In other words both the groups agree for the enlisted sub-components under adaptability. However, the final ranking of sub-components under respective measures are taken into consideration for both the groups of samples as shown in Table.

Taking both sample farmers and judges together the relative position of subcomponents under ecological soundness are soil, water, type of farming, nutrient status, use of organic manure and use of bio-pesticides and fungicides.

Economic viability leading to sustainability of agriculture emphasized the components of profitability, adequate income, production level, resource conservation, profitable crop husbandry and profitable animal husbandry.

Social accessibility considered relative position of subcomponents as market opportunity, common access to village resources, participatory decision making, use of energy, availability of capital and technological support.

Under humaneness the preferred subcomponents in order are found to be respect for honorable living, feeling for others, social solidarity, cordial relationship, honorable living and climate of trust worthiness.

Adaptability measures to have sustainability in agriculture considered consumer preference, accommodation for change in agriculture, creation for market demand, conflict owing to adoption, scope for disaster management and accommodation for Govt. policy in order.

CONCLUSION

Sustainability as perceived by small farm operators in remote areas' conducted in four coastal districts of Odisha with a randomized smple of 200 small farm operators reveal the following conclusions about sustainability of agriculture in the locality.

1. There are five important factors which count towards sustainability of agriculture in coastal areas. These are ecological soundness, economic viability, social accessibility, humanness and adaptability.
2. Out of the components of ecological factors, soil. water, nutrient and type of farming greatly influence the sustainability of agriculture as perceived by the small farm operators.
3. Profitability, adequate income and productivity are considered as important factors by the farmers when plan for agriculture which in turn compel them to manipulate environment to achieve more. But these factors could be taken care by applying the recommended practices to add to sustainability.
4. Village resources, use of energy and appropriate technological support can help to sustain sustainability in coastal agriculture.

5. To create an atmosphere among the farmers to guard sustainability, there is need to give attention to respect human beings, cordiality and feeling for neighbors.

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