Analysis of Farmers' Perception in Pulse Enterprise: Economic and Ecological Terms

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Abstract—*The classical history of conflict and contradiction between economic prosperity and ecological decadence has hugely been researched and completed. The much proclaimed green revolution and growth in agriculture that did take place in India during 17th has also been substantially criticized for its deleterious impact on ecology and environment. The additional growth in agriculture has been put up counteractive in ecological terms in the form of contamination of ground water, soil and air pollution, emission of green-house gases and a pithy contribution to global warming. The present research paper examines the ecological values of pulse crops which is low consumers of water, nutrient on the other hand ensure sizable returns as expected by the practicing farmers. The variables like crop diversity, soil health maintained, impact on environment and economic productivities have been considered resultant once as against a set of agro-economic and techno-managerial factors. This crop enterprise efficiency has also been compared as against rice which is relatively a consumer of nutrient, water and investment as well. The outcome of this study has also incubated elements of policy implication wherein pulse can be thought of as a better alternative to rice in both economic and ecological terms.*

Keywords*: Ecology, Economy, Green revolution, Global Worming, Pulse Crop.*

1. INTRODUCTION

From biological production to value added marketable product and exactly this is the phase, Indian agriculture is passing through. The present level of entrepreneurship in Indian agriculture is much dominant in vegetable crops rather than field crops. The transformation process, from subsistence peasantry into an agripreneurship, needs itself a befitting farmers' perception, and to be followed by comprehensive socialization process as well. This socialization is essential because entrepreneurship is basically behavioral trait, not just adoption of some farm technology prescribed by the expert professionals. It goes beyond adaptation as well. In technology adaptation, compliances and acclimatization are the essential ingredients, while socialization assimilates the portion of adaptation in the form of socialized behavioral pattern of the individual and social community.

The new age agricultural science in India needs a blend of production, productivity and stewardship. This is to be done not just to ensure food security for millions but also to conserve the basics of agricultural production, the soil; water and bio-diversity (FAO, 2013). Pulse is a crop which can combine the properties of productivity as well as ecological resilience. Masood,A;**Venkatesh, M.S.(2009).** The crop needs least of investment to ensure an optimum income of the farmer. As an intercrop, pulse has got unique penetration into the existing crop geometry, becoming non intrusive as well as integrative. The Government of India has already initiated a massive pulse popularization programme through ISOPOM which has generated huge participation of the farming Diaspora. With the change in crop geometry, the change in motivation and farmers' psyche is well discernible.

The present research would be organized on a farmer's comparative perception and analytical texts between rice and pulse enterprises on the planks of net return, soil health, bio-diversity conservation, water retention and so on Dalias P (2015). When two crop enterprises are matched and compared, the benefits are well discernible and socializing. The operating social ecology of this study area is expected to support this entrepreneurial innovation with both skill and perception of performing communities. The participation and performance of farmers in the process of production and surplus generation depends on the kind of perceived benefits they are going to accrue. So, we need to have a plethora of functional variables so that they can respond to a new volume of social, economic and ecological interaction.While, rice in this area has developed a profile of modernization since late seventy's, it has a clear dent of of marketability and profitability in its entrepreneurial evolution, pulse on the other hand, having a renewed entry into the transforming agro-ecosystem of Bengal. Besides, they have got distinctively different phonological growth stages and ecological resilience. Sometimes, pulse is grown as a mixed crop, in other cases it is grown as an alternative to summer rice, a crop which depletes huge volume of ground water, consumes lots of nutrient and investment as well. These stark differences, grown on same land and compete for space, nutrient and affordability, have drawn the attention of the scholastic minds to organize this inquiry.

The objectives of this empirical study have been:

i) General description and unique features of pulse crop and enterprise.
ii) A comparative analysis based on selected variables and empirical tools between these two crops
iii) Two isolate different causal factors serendipitously influencing a series of criterion variables.
iv) To explore the domains wherein micro-level policy can be formulated based on the outcome of this empirical study.

2. RESEARCH METHODOLOGY :

The deliberation on the methodology has been made to understand the concept, methods and techniques which are utilized to design the study, collection of information, analysis of data and interpretation of the findings for revelation of truths and formulation of theories. These chapter deals with the method and a procedure used in the study an consist of eight main parts-

A. Locale of research, Pilot study, Sampling Design, Empirical measurement of the variables, Preparation of interview Schedule, Pre-testing of Interview Schedule, Techniques of Data collection, Statistical Tools used for Analysis of Data.

B. Sampling Design:

C. Purposive as well as simple random sampling techniques were adopted to select finally 60 respondents from Rautari village of Chakdah Block for the study.

Result and Discussion

The chapter deals with the result of the study discussed about it. At the end of this chapter interpretation has been made, explanation has been tried to put down and an attempt has been done to reveal the cause behind it.

3. COEFFICIENT OF CORRELATION:

Table 1: Coefficient of correlation between crop diversity (Y_{cd}) and 15 exogenous variables (x1-x15)

Independent Variable	r Value
Age(x1)	-0.1
Education(x2)	-0.044
Exposure Unit(x3)	0.073
Family Members(x4)	0.05
Family Labour(x5)	0.079
Size of holding(x6)	0.052
No of Fragments(x7)	0.109
Cropping Intensity(x8)	0.220
Home-stead Land(x9)	0.051
Marketable Surplus(x10)	0.139
Marketed Surplus(x11)	0.056
Distance From Market(x12)	-0.241
Cost of fuel(x13)	0.003
Family Expenditure(x14)	0.013
NRM Motivation(x15)	-0.038

Result: Table shows that co-efficient of correlation between Crop diversity (Y_{cd}) and Distance from market (X_{12}). They have been found that 5% level of significance**.**

Revelation: Distance from market co related with crop diversity.

Table 5: Coefficient of correlation between Disease Pest Incident in Pulse (Y_{p1}) and 15 exogenous variable(x1-x15)

Independent Variable	r Value
Age(x1)	-0.011
Education(x2)	0.101
Exposure Unit(x3)	-0.165
Family Members(x4)	0.088
Family Labour(x5)	0.157
Size of holding(x6)	0.025
No of Fragments(x7)	0.207*
Cropping Intensity(x8)	0.081
Home-stead Land(x9)	0.098
Marketable Surplus(x10)	-0.057
Marketed Surplus(x11)	-0.045
Distance From Market(x12)	0.085
Cost of fuel(x13)	0.066
Family Expenditure(x14)	0.007
NRM Motivation(x15)	-0.026

Result: Table shows that co-efficient of correlation between Disease pest incident in pulse (Y_{p1}) and No of fragments (X_7). They have been found that 0.1 level of significance.

Revelation: The more the number of fragments, it has been difficult to manage. Fragmentation has been found a character to disease pest incident.

Table 6: Coefficient of correlation between Disease Pest Management (Y_{p2}) and 15 exogenous variables(X1-X15)

Independent Variable	r Value	Remarks
Age(x_1)	-0.128	
Education(x_2)	0.263	*
Exposure Unit(x_3)	-0.044	
Family Members(x_4)	0.052	
Family Labour(x_5)	0.006	
Size of holding(x_6)	0.268	*
No of Fragments(x_7)	0.142	
Cropping Intensity(x_8)	0.088	
Home-stead Land(x_9)	-0.210	
Marketable Surplus(x_{10})	0.228	
Marketed Surplus(x_{11})	-0.022	
Distance From Market(x_{12})	-0.287	*
Cost of fuel(x_{13})	0.123	
Family Expenditure(x_{14})	0.081	
NRM Motivation(x_{15})	-0.174	

Result: Table shows that co-efficient of correlation between Disease pest management in pulse (Y_{p2}) and Education (X2), Size of holding(X6) and Distance from market (X_{12}). They have been found that 5% level of significance.

Revelation: The higher size of holding, higher resource backup and when its supported by education and market, the better has been disease pest management.

Table 7: Coefficient of correlation between Soil health in pulse (Y_{p3}) and 15 exogenous variable(X1-X15)

Independent Variable	r Value	Remarks
Age(x1)	0.005	
Education(x2)	0.007	
Exposure Unit(x3)	-0.071	
Family Members(x4)	0.096	
Family Labour(x5)	0.179	
Size of holding(x6)	-0.090	
No of Fragments(x7)	0.108	
Cropping Intensity(x8)	-0.137	
Home-stead Land(x9)	0.129	
Marketable Surplus(x10)	0.181	
Marketed Surplus(x11)	0.305	*
Distance From Market(x12)	-0.033	
Cost of fuel(x13)	0.298	*
Family Expenditure(x14)	0.257	*
NRM Motivation(x15)	0.028	

Result: Table shows that co-efficient of correlation between Soil health maintained in pulse(Y_{p3}) and Marketed surplus(X_{11}), Cost of fuel (X_{13}), Family expenditure(X_{14}). They have been found that 5% level of significance.

Revelation: Soil health maintained in pulse cultivation has invited three causal support, better market price, family expenditure and better mobility. It has natural property to improve soil health.

Table 8: Coefficient of correlation between No. of irrigation in pulse(Y_{p4}) and 15 exogenous variable(x1-x15)

Independent Variable	r Value
Age(x1)	-0.059
Education(x2)	0.134
Exposure Unit(x3)	-0.138
Family Members(x4)	-0.068
Family Labour(x5)	-0.070
Size of holding(x6)	0.005
No of Fragments(x7)	0.034
Cropping Intensity(x8)	0.096
Home-stead Land(x9)	-0.160
Marketable Surplus(x10)	-0.325*
Marketed Surplus(x11)	0.045
Distance From Market(x12)	0.066
Cost of fuel(x13)	-0.116
Family Expenditure(x14)	-0.218
NRM Motivation(x15)	-0.057

Result: Table shows that co-efficient of correlation between No of Irrigation in pulse (Y_{p4}) and Marketed Surplus (X_{10}). They have been found that 5% level of significance.

Revelation: Irrigation has become important to augment the productivity per unit are beyond the optimal. Hence it contributes to generate marketable surplus.

Table 9 Coefficient of correlation between Pollution due to agro-chemicals in pulse crop cultivation (Y_{p5}) and 15 exogenous variable(x1-x15)

Independent Variable	r Value	Remarks
Age(x1)	-0.151	
Education(x2)	0.106	
Exposure Unit(x3)	-0.311	*
Family Members(x4)	0.154	
Family Labour(x5)	0.104	
Size of holding(x6)	-0.148	
No of Fragments(x7)	-0.162	
Cropping Intensity(x8)	-0.204	
Home-stead Land(x9)	-0.063	
Marketable Surplus(x10)	0.045	
Marketed Surplus(x11)	0.176	
Distance From Market(x12)	0.076	
Cost of fuel(x13)	-0.026	
Family Expenditure(x14)	-0.037	
NRM Motivation(x15)	-0.084	

Result: Table shows that co-efficient of correlation between Pollution due to agro-chemical in pulse crop cultivation (Y_{p5}) and Exposure unit (X_3). They have been found that 5% level of significance.

Revelation: Pulse is most ecological tuned requires less fertilizer, management and irrigation. So, for the farmers they need better exposure in terms of environmental education make the crop economic viable and ecological suitable crop enterprise.

Table 10 Coefficient of correlation between combating climate change (Y_{p6}) and 15 exogenous variables(x1-x15)

Independent Variable	r Value
Age(x1)	-0.262
Education(x2)	0.075
Exposure Unit(x3)	-0.052
Family Members(x4)	-0.052
Family Labour(x5)	-0.068
Size of holding(x6)	0.119
No of Fragments(x7)	0.058
Cropping Intensity(x8)	0.045
Home-stead Land(x9)	-0.162
Marketable Surplus(x10)	0.126
Marketed Surplus(x11)	0.109
Distance From Market(x12)	0.001
Cost of fuel(x13)	0.040
Family Expenditure(x14)	0.044
NRM Motivation(x15)	-0.022

Result: Table shows that co-efficient of correlation between Combating climate change (Y_{p6}) and Age (X_1). They have been found that 5% level of significance.

Revelation: Combating climate change has been related to the age character of respondent. Ecological education has got categorical responses to the target groups persuading pulse as the defeating crop enterprises having ruthless conformation with ecological function.

Table 11 Coefficient of correlation between Return from pulse (Y_{7p}) and 15 exogenous variable (x1-x15)

Independent Variable	r Value
Age(x1)	0.278
Education(x2)	-0.154
Exposure Unit(x3)	-0.234
Family Members(x4)	0.108
Family Labour(x5)	0.117
Size of holding(x6)	-0.232
No of Fragments(x7)	-0.114
Cropping Intensity(x8)	-0.325
Home-stead Land(x9)	0.119
Marketable Surplus(x10)	-0.133
Marketed Surplus(x11)	0.588**
Distance From Market(x12)	0.010
Cost of fuel(x13)	0.179
Family Expenditure(x14)	0.108
NRM Motivation(x15)	-0.079

Result: Table shows that co-efficient of correlation between return from pulse (Y_{p7}) and marketed surplus (X_{11}). They have been found that 1% level of significance.

Revelation: It has the age dimension and better marketability produced maximum return from the pulse crop cultivation.

Table 12: Coefficient of correlation between Marketability in pulse (Y_{8p}) and 15 exogenous variable (x1-x15)

Independent Variable	r Value	Remarks
Age(x1)	-0.132	
Education(x2)	0.227	10%
Exposure Unit(x3)	0.128	
Family Members(x4)	0.039	
Family Labour(x5)	0.005	
Size of holding(x6)	0.059	
No of Fragments(x7)	-0.056	
Cropping Intensity(x8)	-0.169	
Home-stead Land(x9)	-0.106	
Marketable Surplus(x10)	0.148	
Marketed Surplus(x11)	0.088	
Distance From Market(x12)	0.178	
Cost of fuel(x13)	0.138	
Family Expenditure(x14)	0.123	
NRM Motivation(x15)	-0.225	

Result: Table shows that co-efficient of correlation between Marketability in pulse(Y_{p8}) and Education(X_2). They have been found that 5% level of significance.

Revelation: value added agriculture needs educational intervention from the practicing farmers in the form of verified skill, rejuvenated knowledge and reinforce practices. It's more relevant for pulse crop.

Table 13 Coefficient of correlation between Disease pest incident in rice (Y_{r1}) and 15 exogenous variables(x1-x15)

Independent Variable	r Value	Remarks
Age(x1)	-0.179	
Education(x2)	0.063	
Exposure Unit(x3)	-0.219	
Family Members(x4)	0.107	
Family Labour(x5)	0.083	
Size of holding(x6)	0.059	
No of Fragments(x7)	-0.075	
Cropping Intensity(x8)	-0.026	
Home-stead Land(x9)	0.020	
Marketable Surplus(x10)	0.106	
Marketed Surplus(x11)	-0.119	
Distance From Market(x12)	0.270	*
Cost of fuel(x13)	0.061	
Family Expenditure(x14)	0.071	
NRM Motivation(x15)	0.321	*

Result: Table shows that co-efficient of correlation between Disease pest incident in rice crop (Y_{1R}) and Distance from market (X_{12}), Natural resource management motivation(X_{15}). They have been found that 5% level of significance.

Revelation: Distance from market play a vital role in disease pest incident in rice. Increasing the distance of market from the field produces difficulty to the farmer to buy the pesticide within time and increasing the pesticide. NRM motivation is important in disease pest incident in rice.

Table 14: Coefficient of correlation between Disease pest management in rice(Y_{r2}) and 15 exogenous variable(x1-x15)

Independent Variable	r Value	Remarks
Age(x1)	-0.172	
Education(x2)	-0.041	
Exposure Unit(x3)	-0.092	
Family Members(x4)	0.086	
Family Labour(x5)	0.065	
Size of holding(x6)	0.113	
No of Fragments(x7)	0.062	
Cropping Intensity(x8)	0.201	
Home-stead Land(x9)	0.09	
Marketable Surplus(x10)	-0.161	
Marketed Surplus(x11)	-0.218	10%
Distance From Market(x12)	0.040	
Cost of fuel(x13)	-0.037	
Family Expenditure(x14)	-0.117	
NRM Motivation(x15)	0.028	

Result: Table shows that co-efficient of correlation between Disease pest management (Y_{R2}) and Marketed surplus (X_{11}). They have been found that 5% level of significance.

Revelation: Disease pest management in rice has been related to marketed surplus. So, increasing marketed surplus helps in better disease pest management in rice crop cultivation.

Table 15 Coefficient of correlation between Soil Health maintained in rice (Y_{r3}) and 15 exogenous variable(x1-x15)

Independent Variable	r Value	Remarks
Age(x1)	0.170	
Education(x2)	0.067	
Exposure Unit(x3)	-0.061	
Family Members(x4)	0.008	
Family Labour(x5)	0.112	
Size of holding(x6)	-0.055	
No of Fragments(x7)	-0.014	
Cropping Intensity(x8)	-0.141	
Home-stead Land(x9)	-0.137	
Marketable Surplus(x10)	0.063	
Marketed Surplus(x11)	0.087	
Distance From Market(x12)	0.183	
Cost of fuel(x13)	0.178	
Family Expenditure(x14)	0.214	10%
NRM Motivation(x15)	0.120	

Result: Table shows that co-efficient of correlation between soil health maintained in rice (Y_{3R}) and Family expenditure (X_{12}). They have been found that 10% level of significance.

Revelation: Family expenditure has been related to soil health maintained in rice crop.

Table 16 Coefficient of correlation between No of irrigation in rice(Y_{r4}) and 15 exogenous variable(x1-x15)

Independent Variable	r Value	Remarks
Age(x1)	0.0127	
Education(x2)	0.014	
Exposure Unit(x3)	0.052	
Family Members(x4)	0.090	
Family Labour(x5)	0.068	
Size of holding(x6)	-0.006	
No of Fragments(x7)	0.148	
Cropping Intensity(x8)	-0.181	
Home-stead Land(x9)	-0.130	
Marketable Surplus(x10)	0.088	
Marketed Surplus(x11)	0.091	
Distance From Market(x12)	0.183	
Cost of fuel(x13)	0.179	
Family Expenditure(x14)	0.163	
NRM Motivation(x15)	-0.194	

Result: Table shows that none of the variable has been found significant.

Table 17: Coefficient of correlation between Pollution due to agro chemical in rice (Y_{r5}) and 15 exogenous variables (x1-x15)

Independent Variable	r Value	Remarks
Age(x1)	0.074	
Education(x2)	0.099	
Exposure Unit(x3)	0.045	
Family Members(x4)	-0.086	
Family Labour(x5)	-0.030	
Size of holding(x6)	-0.008	
No of Fragments(x7)	0.051	
Cropping Intensity(x8)	-0.059	
Home-stead Land(x9)	-0.002	
Marketable Surplus(x10)	0.075	
Marketed Surplus(x11)	-0.195	
Distance From Market(x12)	0.109	
Cost of fuel(x13)	0.120	
Family Expenditure(x14)	0.246	*
NRM Motivation(x15)	0.132	

Result: Table shows that co-efficient of correlation between Pollution due to agrochemical in rice (Y_{R4}) and Family expenditure (X_{12}). They have been found that 5% level of significance.

Revelation: Irrigation in rice is cost effective. So increasing the irrigation cost also increased the family expenditure.

Table 18 Coefficient of correlation between combating climate change in rice crop cultivation (Y_{r6}) and 15 exogenous variable(x1-x15)

Independent Variable	r Value	Remarks
Age(x1)	-0.061	
Education(x2)	0.057	
Exposure Unit(x3)	-0.095	
Family Members(x4)	-0.058	
Family Labour(x5)	-0.050	
Size of holding(x6)	-0.072	
No of Fragments(x7)	-0.121	
Cropping Intensity(x8)	0.054	
Home-stead Land(x9)	-0.009	
Marketable Surplus(x10)	-0.049	
Marketed Surplus(x11)	0.063	
Distance From Market(x12)	-0.048	
Cost of fuel(x13)	0.018	
Family Expenditure(x14)	-0.032	
NRM Motivation(x15)	-0.039	

Result: Table shows that none of the variable has been found significant.

Table 19: Coefficient of correlation between Return from rice crop (Y_{r7}) and 15 exogenous variables(x1-x15)

Independent Variable	r Value	Remarks
Age(x1)	-0.467	
Education(x2)	0.442	**
Exposure Unit(x3)	-0.292	
Family Members(x4)	0.114	
Family Labour(x5)	0.048	
Size of holding(x6)	0.335	**
No of Fragments(x7)	0.372	**
Cropping Intensity(x8)	0.136	
Home-stead Land(x9)	-0.073	
Marketable Surplus(x10)	0.173	
Marketed Surplus(x11)	-0.176	
Distance From Market(x12)	0.033	

Cost of fuel(x13)	0.026	
Family Expenditure(x14)	0.041	
NRM Motivation(x15)	0.097	

Result: Table shows that co-efficient of correlation between Return from rice (Y_{r7}) and Education(X2), Size of holding, No of fragments(C7) . They have been found that 1% level of significance.

Revelation: Return has been related to education, size of holding and no of fragmented land. The higher the size of holding, higher the fragmented land and when it's supported by education, the better has been the return from that crop.

Table 20: Coefficient of correlation between Marketability in rice (Y_{r8}) and 15 exogenous variables(x1-x15)

Independent Variable	r Value	Remarks
Age(x1)	-0.085	
Education(x2)	-0.217	
Exposure Unit(x3)	0.311	*
Family Members(x4)	0.073	
Family Labour(x5)	0.026	
Size of holding(x6)	-0.044	
No of Fragments(x7)	-0.027	
Cropping Intensity(x8)	0.036	
Home-stead Land(x9)	-0.020	
Marketable Surplus(x10)	-0.157	
Marketed Surplus(x11)	-0.055	
Distance From Market(x12)	-0.116	
Cost of fuel(x13)	-0.333	
Family Expenditure(x14)	-0.313	
NRM Motivation(x15)	-0.065	

Result: Table shows that co-efficient of correlation between Marketability in Rice (Y_{R8}) and Exposure unit (X_3). They have been found that 5% level of significance.

Revelation: Exposure unit has been related to Marketability in rice. For the farmer the need better exposure in terms of enterprise education make the crop economic viable and ecological suitable.

4. CONCLUSION AND SUMMARY:

The entire study offers us a unique opportunity to have a differential perception, differential in real sense, on the unique ecological and economic property in rice and pulse crop.

We have found that as a new intern crop enterprise pulse crop has been responsive to crop biodiversity, soil health management, distributive nature of land-resource in the form of fragments, the pest eco-dynamic and also other ecological and economical aspects where comparing pulse with rice ,rice has got a profile of technology and enterprise evolution across space and time, while investment dimension along with profitability of rice dominate the ecological issue have not been so important for pulse enterprises.

The fundamental conglomeration of different interactive variables, is by count, after a long term strategic intervention. The variance explained by respective factor, where in the independent variables have been gregarious based on factor loading, can invite the proportionate allocation of resources.

The variables retained in the stepwise regression has been splendidly matched and compared for both rice and pulse enterprise to have a binary look into the respective ecological and economical proficiency in differential socio ecological setup.

The micro-level polices are here derived in the form of recommendation can be called functional policy implication which can go a long in promoting pulse crop for its imaged ecological properties, nationalizing sprat of rice crop to save the water and civilization and for the most sensible farmers rice-pulse combination can offer the beauty of entrepreneurial symphony. The reason of ecological issues are more discernible simply because ecology begets economy, economy can never begets ecology as it is in nature.

5. RECOMMENDATIONS:

- Better awareness to be built up among the farmers to go for pulse crop with comprising the aspects of food security.
- The cliché of allotting marginal land for pulse crop needs to be changed, better introducing pulse crop as an intermingling intervention with existing rice crop to provide best possible crop ecology interaction.
- A micro level policy needs to be taken up so that better marketability of pulse crop can be assured and attuned with the performing supply chains.
- The drive for climate change mitigation, natural resource management, sustainable agriculture and promotion of rice-legume crop enterprise can go hand to hand to materialize the concept of synthesis economy, ecology, entrepreneurship a reality.

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