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Research Article

Impact Assessment of an NAIP Intervention "Brackish Water Aquaculture Technology' Through Partial Budgeting Analysis

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ABSTRACT

Results of Impact Assessment of an intervention "Brackish Water Aquaculture Technology' implemented at farmer's field under NAIP project at different villages of south 24-Pargans district of West Bengal aiming for rainwater harvesting for irrigating crops is reported. Farm data was collected from the randomly selected farmers of both Intervened and control groups. Partial budgeting analysis was done to assess the comparative performances with respect to sources of income and livelihoods, diversification of input cost, labour cost, employment generation, production etc. Partial budgeting parameters like estimated costs, returns, net income and profit are found favorable for most Intervened Technologies compared to the existing farming practices The impact of 'Brackish Water Aquaculture Technology' can be assessed from the fact that the landscape and cropping pattern has been changed from single crop to multi crop round the year resulting in enhanced productivity, employment generation, income and related activities arresting migration of people to cities in search of jobs for livelihood in intervened farmer's plots compared to those in control plots. Livelihood opportunities have increased considerably in the area without affecting the environment. Beneficiaries and family members are observed fully engaged in farming, marketing and associated activities. Many people have been affected directly and indirectly in agriculture related activities like farming, input supply, trading, marketing and transport operations as a result of intervention of the proven technology of ICAR-CIBA adopted by NAIP for field extension. *The* 'Brackish Water Aquaculture Technology' having potential of manifold increase productivity in the low lying saline belt of Sundarbans which depends on tide water inflow, may be continued to a wider section of non-beneficiaries for long term social, economic, benefit and social equity resulting in a balanced society framework

INTRODUCTION

India is one of the fastest growing economies in the world, ranked among the top ten highest GDP countries, and is the world's second most populous country. During the past two decades, India's GDP grew at an average of 7 percent annually. The Government of India (GOI) has is focused on accelerating economic growth and poverty reduction, creating jobs, improving environmental management and achieving an annual growth in the agriculture and allied rural sectors of 4 percent; in its Union Budget, 2017-18, GOI articulated its resolve to double farmers' income in 5 years. It is widely accepted that Agriculture sector growth is essential in achieving India's development goals**.** The sector currently accounts for 14 percent of national GDP and is a source of livelihood for more than half of the population. More than two thirds of the country's poor live in rural areas, and their chance of getting out of poverty directly depends on the performance of agriculture and allied rural sectors. The success of ongoing massive rural development aiming enhanced agriculture productivity and value chains for agricultural products and off-farm job creation in rural areas, which would temper down current massive migrations to urban areas. The agriculture sector also has a major potential for creating rural employment and alleviation of poverty. In the

development of farming activities, socio-economic considerations, in addition to sustainability and equity, are necessary. Funding should be identified and committed to ensure long-term sustainability for the various developmental phases, from research, to fishery, to trade and economic analyses, and to training, monitoring and enforcement. Furthermore, a cost-benefit analysis should indicate that the benefits to society outweigh the costs of a CBA operation.

Against this backdrop, Government of India initiated through a Mega project entitled 'National Agricultural Innovation Project (NAIP)', funded by World Bank was in operation throughout the whole country and implemented through State Agricultural Universities, ICAR Institutes and NGO organization that operated in farmer's field with proven technologies from various fields of Agriculture, Animal Science, Forestry, Fisheries etc.

Under the subproject 'Strategies for Sustainable Management of Degraded Coastal land and Water for Enhancing Livelihood Security of the Farming Communities' an intervention named 'Brackish Water Aquaculture Technology' at the District South 24 Parganas in the state of West Bengal for improving rainwater harvesting and drainage for enhancing productivity at low lying degraded land including Tsunami affected land at the District South 24 Parganas in the state of West Bengal' was extended to farmer's field. The main objectives of Intervention were i) Sustainable enhancement of the productivity of degraded land and water resources of the coastal region through integrated approaches ii)Enhancement of livelihood security and employment generation for the poor farming communities of the coastal region iii)Empowerment through capacity building and skill development of stakeholders including men and women farmers.

Types of Assistances provided to farmers

Farmers' plots/farm was constructed by NAIP; Formation of sustainable fund; Information regarding better input availability & supply like quality seeds of brackish water species. After completion of implementation of the project, NAIP intended to assess the impact of the sub-projects based on the basic parameters of effectiveness, efficiency, results/impact and sustainability. More precisely, NAIP wants to undertake Outcome Focused Impact Evaluation of sub-projects with the aim of Identification and quantification of the field level impacts of the project interventions in terms productivity, profitability, sustainability, employment, equity, gender, input saving, cropping intensity, etc.

One of the Technology Intervention named ''Brackish Water Aquaculture Technology' was taken up as an intervention for improving rainwater harvesting and drainage for enhancing productivity in the Sundarbans region was assigned to me for carrying out Impact Assessment Study.

In its broadest sense, impact assessment is the process of identifying the anticipated or actual impacts of a development intervention, on those social, economic and environmental factors which the intervention is designed to affect or may inadvertently affect. It may take place before approval of an intervention (ex ante), after completion (ex post), or at any stage in between. Ex ante assessment forecasts potential impacts as part of the planning, design and approval of an intervention. Ex post assessment identifies actual impacts during and after implementation, to enable corrective action to be taken if necessary, and to provide information for improving the design of future interventions. In line with the evaluation criteria outlined in International manuals, the key evaluation criteria applied will include Relevance, Effectiveness, Efficiency, Rural poverty impact, Sustainability, Pro-poor innovation and scaling up, Gender equality and women's empowerment.

Earlier reports on impact assessment study on various interventions are reported worldwide covering methodology as well as field implementations from EES,2007;IEG,2006;UNDP,2011a;,UN,2011a;ADB,2006a; NAIP,2012 and different researchers on various crops technologies, intervention and scenario (NAIP, 2012; 2014; Mandal, *et al*., 2013; Fiszbein, 2006; IEG, 2006; ADB,2006a, 2006b; EES,2007; Wu,2010; UN,2011a; SC,2006c; Kessie,2011; WB,2016).

As it is well known that Partial budget analysis is a simple but effective technique for assessing the profitability of new technology for an existing enterprise. It also provides the foundation for comparing the relative profitability of alternative treatments, evaluating their riskiness, and testing how robust profits are in the event of changing product or input prices. The method developed by International Wheat and Maize Improvement Center (CIMMYT), is extensively used for estimating the financial impact of implementing a new technology, in dairy research and plant protection research and on various crops. Reports on Partial Budgeting, economic analysis, Partial Budget to Analyze Farm Change, to estimate the cost and benefit of adaptation of a new technology, Partial budgeting technique, assessment of new technology that can be evaluated in terms of its impact on the productivity, profitability, acceptability and sustainability of farming systems are available (CIMMYT,1988; Dayohimi, 2017; Roy, 2016).

The present study is attempted to assess the impact assessment of an intervention named ''Brackish Water Aquaculture Technology', developed by ICAR-CIBA ***;*** (Mandal *et al*., 2013**)** and extended under NAIP project on farmer's field utilizing the Partial budgeting technique in terms of productivity, profitability, acceptability and sustainability of farming systems.

Intervention

Fig. 1: Intervention: 'Brackish Water Aquaculture Technology' in the form of Pond construction under NAIP programme (Left) and Output after Intervention (Right).

Brackish Water Aquaculture Technology' at the District South 24 Parganas in the state of West Bengal. NAIP intervention of ''Brackish Water Aquaculture Technology' at farmer's field (left) and improved fish harvest after extension of the technology (right) is shown in Fig.-1

Methodology for the Present Impact Assessment Household Survey

Based on my professional expertise and by reviewing a number of specific International and National best practices, latest literature on Impact assessment presenting overall information related to development of survey instrument, analysis tools & techniques (Singer, 2013; Fiszbein, 2006; Bamberger, 2006; Bamberger, M., and White. 2007; Roy, 2010; 2010a; 2010b and data presentation are taken up as follows.

i) Experimental Design

In the present impact assessment study *Ex Post design* was adopted with provision for comparison between intervened and control group of households. Both qualitative and quantitative primary data through random sampling and purposive selection method are collected from treated and control groups of household farmers respectively.

ii) Survey Instrument /Assessment Tools for Household Survey

After thorough study and discussion the survey instrument designed by NAIP was taken up for field data collection.The questionnaire was designed mainly for financial impact assessment was administered for primary data collection from the farmers those adopted the technology at their fields along with control group of farmers(NAIP,2014).

iii) Sample Size Selection

As per PIU, NAIP guideline that at least 30 random samples of beneficiary farmers and 20 samples of control group farmers are covered for primary HH data collection for the intervention, from the frame of beneficiary farmer's household. In case of non-beneficiary farmers (control) purposive sample method is resorted to from the neighboring areas where intervention was made.

iv) Sources of Data Collection: Primary and secondary sources

Household survey, Market visits, Field Observations, Key informants Interview and Transect walk besides existing literature of best practice of IA survey/study, NAIP Project documents, Reports, etc.,

v) Overall Field Observation

Financial data in prescribed questionnaire aiming Partial Budgeting of Interventions were collected to capture change particularly in Household assets, sources of income and livelihoods, diversification of input cost, labour cost, employment generation, production etc. were emphasized for field data collection. Besides few qualitative parameters like income, profit, adoption, sustainability, etc., are also covered. Key informant Interview/farmers' meet/transect walk were also organized for each intervention at each site to take stock of the present scenario and validation.

vi) Partial Budget Analysis

To estimate the cost and benefit of adaptation of 'Brackish Water Aquaculture Technology' Partial budgeting technique was employed. Partial budgeting is a basic method designed to evaluate the economic consequences of minor adjustments in a farming business. Partial budgets are based on the principle that small business changes have effects in one or more of the following areas i)Increase in income ii) Reduction or elimination of costs iii)Increase in costs iv) Reduction or elimination of income. The worked out net impact of the above effects will be the positive financial changes minus the negative financial changes. A positive net indicates that farm income will increase due to the change, while a negative net indicates the change will reduce farm income.

vii) Areas of Operation/Geographical Location:

Coastal districts of West Bengal, South 24 Parganas Districts, West Bengal. Blocks: Kakdwip, Namkhana, Freserganj and Patharpratima (6 clusters -18 villages). Implementation: Kakdwip Research Centre, Central Institute of Brackish Water Aquaculture, ICAR, Kakdwip, South 24 Parganas, West Bengal. *Consortium Partners:* ICAR-CSSRI, Canning Town; R.K.Mission KVK, Nimpith; KRC, ICAR-CIBA, Kakdwip, South 24-Parganas

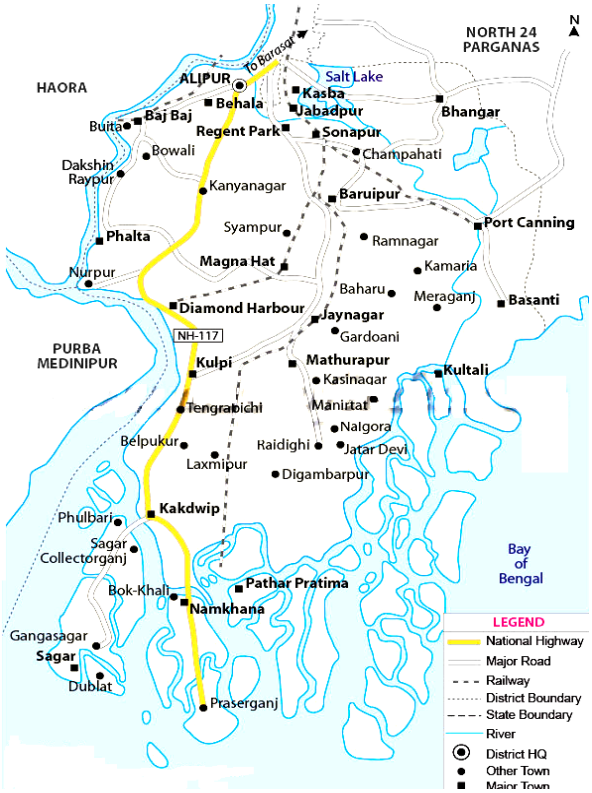

Fig. 2: Map showing locations of data collection spots at Sundarbans, South 24 Parganas, West Bengal

Identification of Interventions and Sampling Methodology and Framework

Identified interventions through discussion with PIU, NAIP and CPI's, CCPI's of consortium partners and followed by field visit to arrive at a final decision on selection of appropriate interventions to cover under impact assessment survey located at south 24 Parganas districts of West Bengal. From the frame of beneficiary farmer's household, sample is selected at random to avoid bias. In case of non-beneficiary farmers (control) purposive sampling method is resorted to because in the given time frame between January-April,2014,construction of sampling frame of control farmers followed by random selection was next to impossible.

RESULTS AND DISCUSSIONS

Financial Analysis and Partial Budgeting

Partial budgeting also known as marginal analysis is a management tool that can compare the costs and returns that are affected by a potential change in an intervention. It is especially useful in evaluating budgets that involve small, specific, and limited changes within an intervention by helping to determine the *profitability of that change*. The partial budget can be divided into three main sections: (I) costs, (II) benefits, and (III) analysis. The analysis section includes net change in profits and a break-even analysis also known as benefit/cost ratio. The possible changes that can occur in an intervention fall into four categories. These categories are added returns, reduced returns, added costs, and reduced costs. Added costs and reduced returns compose the cost section of the partial budget. They represent the negative effects of a proposed change. Added returns and reduced costs fall into the benefits section of the partial budget and are the positive effects of a proposed change in the business. The analysis section of the partial budget contains both net change in profits and benefit/cost ratio analysis. In this section as part of partial budgeting an attempt has been made to present and discuss comparative figures of the socio-economic status of farm households (adopted-30 & control 20) in terms of basic production assets, Area under various activities, Employment Generation, Cost of Cultivation (in Rs. / Acre), Income (Rs. / Acre)and cost benefit ratio. Financial impact analysis based on primary data collected by Roy, National Consultant (IA), East& N.E. Region, India as part of TOR with NAIP. Details of Ownership of Basic Production Asset and Area under various activities for each of treated and control group of farmers are presented in Table-1 and Table-2 respectively.

Table 1: Ownership of Basic Production Asset (Intervention: Brackish water Aquaculture: (Treated VS Control)

Field Land (owned/leased)	Treated	Control
Total (acre)	0.49	1.13
Irrigated (acre)	0.50	1.01
Rain fed (acre)	0.34	1.19
Animal/livestock		
Type of animal/livestock		
No. of animal/livestock	10.4	11
Fishery		
No. of fish ponds	2.41	1.61
No. of fingerlings introduced	5275	1659
Poultry/Duckery		
No. of birds	0	0

Table 2: Area under various activities (Intervention: Brackish water Aquaculture :(Treated VS Control)

Field	Treated	Control
Total Crop area (in Acre)	0.51	0.69
Rainy (Kharif in Acre)	0.51	0.63
Post-rainy (Rabi in Acre)	0	0.51
Summer (in Acre)	0	0
Total Area under vegetable cultivation (in Acre)	0.37	0.67
Vegetable 1 (in Acre)	0.14	0.41
Vegetable 2 (in Acre)	0.10	0.18
Vegetable 3 (in Acre)	0.14	0
Area under fish culture (in Acre)	0.49	0.24
Total Area involved for various activity (in Acre)	1.37	1.59

Cropping Pattern

It appears from the survey data of households that there is a distinct difference between the cropping pattern of adopted/ treated land of households for the intervention land shaping for Brackish Water Aquaculture aiming for improving rainwater harvesting and drainage for enhancing productivity at low lying degraded land located at Kakdwip and Patharpratima blocks of South 24 Parganas District, West Bengal compared to those in the Control farmers selected from the adjoining neighbouring areas. As a result of intervention in the form of construction of ponds for rainwater harvesting for Brackish Water Aquaculture that in turn was available for irrigation for cropping on the pond dyke used for vegetable cultivation depending on the size of the pond. Irrigation was available for the neighbouring plots also almost round the year whereas in the control plots famers used to cultivate one seasonal crop like conventional low yielding paddy. On the treated plots good quantity of vegetables like tomato, bitter gourd, cucumber, brinjal etc. are grown. This practice resulted in high production from unit area accruing higher output. Therefore, it is attempted to depict the input-output, components of cost of cultivation, components of input cost and output in the form of table and graphs for easy understanding of the differences between treated and control farmers.

Yield Comparison Between Treated and Control Plots

As can be seen per acre Yield of fish mainly from brackish water species and partly freshwater Fish are

observed 4.98 time higher compared to that produced in control (Fig. 3).

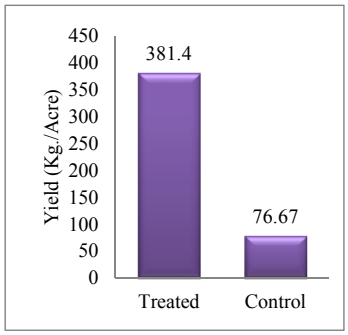

Fig. 3: Yield Comparison for the intervention

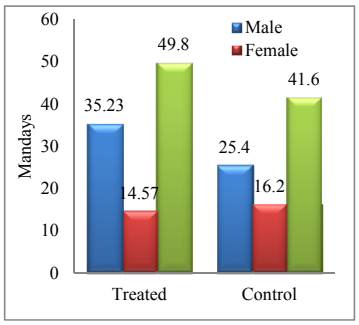

Fig. 4: Comparison of employment generation

Employment Generation

Employment Generation out of the Intervention' Brackish Water Aquaculture' along with that of control group is presented in the Table-3 as because it was an indicator to observe changes due to intervention of the technology by NAIP compared to the conventional practices followed by the farmers of the low lying saline belt of the Sundarbans.

Interestingly, employment generation was found higher for male, female and total in the intervened plots to the extent of 1.39, 0.90, and 1.20 times respectively compared to those created in the control group (Table3 &Fig.4).

Table-3: Employment Generation (Intervention: Brackish water Aquaculture): (Treated VS Control)

Field **Employment Generation**	Treated	Control	Comparison **Additional man days generated**
Total man days (for male labour)	35.23	25.4	9.83
Total man days (for female labour)	14.57	16.2	-1.63
Total Man days (male + female)	49.80	41.6	8.20
Percentage of women employment	29.26	38.94	-9.68

Cost of Cultivation

An account of cost of cultivation being a very important factor is being compiled and presented for both intervened and control groups and displayed in table-4 for comprehension of changes that has occurred as a result of adoption technology compared to the control groups.

It is observed that the cost of cultivation demonstrated 2.15 times higher in treated plots compared to that incurred in the control plots (Table-4 & Fig.5).Cost of cultivation is more in intervened group because of scientific practices.

Table 4: Cost of Cultivation (in Rs. / Acre): Intervention-Brackish water Aquaculture :(Treated VS Control)

Field	Treated	Control	Comparison
Average Labour cost	3678.50	3722.48	-43.97
Average Farm power cost	947.23	1685.39	-738.16
Material Inputs cost	4068.23	1235.54	2832.68
Other associated cost	9.99	15.11	-5.12
Total capital/long term investment per year	4445.44	1877.43	2568.00
Other cost if any	0	575.79	-575.79
Total cost of cultivation (in Rs./ acre) without support from NAIP	13149.40	9111.75	4037.64
Support provided by the project		N.A.	
Average support provided in Labour cost	0	N.A.	
Average support provided in farm power cost	0	N.A.	
Average support provided in input cost	0	N.A.	
Average support provided in associated cost	0	N.A.	
Average support provided in Capital cost/long term investment	4445.44	N.A.	
Total support provided from project	4445.44	N.A.	
Actual cost of cultivation borne by farmer	8703.96	9111.75	-407.79

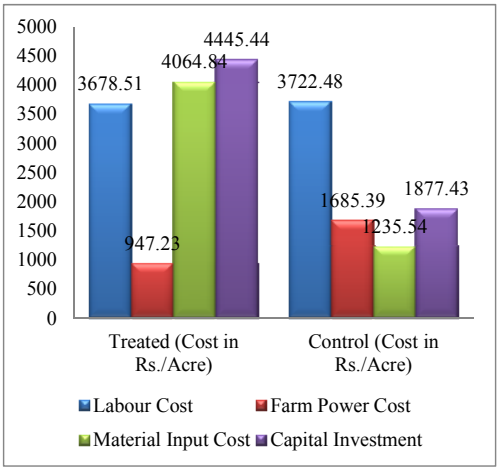

Fig.5: Bar Diagram showing Comparative Cost of Cultivation (Rs/acre)

Component wise break up of cost of cultivation

Further component wise break up of cost of cultivation within treated plots demonstrates on an average labour cost constituted 28%, material input cost (31%),capital investment (34%) and farm power (7%) whereas cost of cultivation for control plots were on an average are found labour(44%), material input (14%), farm power cost(20%), and capital cost (22%). Proportion of labour cost is comparatively more in control compared to intervened plots and as per the partial budget analysis this is termed as added cost.

Component wise break up of input cost

Further partitioning of input cost for treated group exhibits that the highest cost of cultivation was borne toward Feed(49%) followed by fish fingerling (37%),and the rest 14% jointly by pesticide, fertiliser & pond maintenance but in case of Control group highest was on account of Fertilise (63%) followed by pesticide(37%). It is interesting to note that in the intervened one NAIP dug pond for rainwater harvesting that facilitated not only brackish water aquaculture but also irrigation for crops and vegetables yielding in higher return from unit area where as in the control plots farmers cultivated single crop of paddy only as can be evidenced from expenditure pattern and Input use.

Income

A complete picture of Income (in Rs. / Acre) (Intervention: Brackish water Aquaculture): Treated VS Control is presented in Table-5. The ultimate interest is income for any enterprise. Therefore, details of gross income, net income profit and cost benefit ratio is presented side by side for comparison of treated and control groups of farmers (Table-5).

Table-5: Income (in Rs. / Acre) (Intervention: Brackish water Aquaculture): Treated VS Control)

Field	Treated	Control	Comparison
Income from crop	0	0	0
Income from vegetable	0	0	0
Income from straw	0	223.54	-223.54
Income from Fishery	26363.84	4280.32	22083.52
Income from poultry	0	0	0
Income from Livestock	0	0	0
Gross Income generated	**26363.84**	**4503.86**	**21859.98**
Subtract total cost of cultivation without support from NAIP	13149.40	9111.75	
Net Income without support from NAIP	**13214.45**	**-4607.89**	**17822.34**
Add support provided from NAIP	4445.44	N.A.	
Net Income with support from NAIP	**17659.89**	**-4607.89**	**22267.78**
Benefit cost ratio *	**1.34**	**-0.51**	
Profit from competing crop/agro-enterprise	**80304.08**	**1370.47**	

* Net Income (in Rs. / Acre) / Total cost of cultivation (in Rs. / Acre)

The analysis section of the partial budget containing both net change in profits and benefit/cost ratio analysis. It is clear from above table that in case of Treated group average income was Rs.26364/acre as against an average income of Rs 4504/acre from Control group i.e. almost 6 times more. This is reflected in cost benefit ratio(Treated:1.34 & Control -0.51).It is well known that in theory, any project with a B/C ratio exceeding 1 is worthwhile, most public agencies have recognized that there is some uncertainty associated with both the benefit and the cost estimates. Accordingly, it is not uncommon for agencies to desire a threshold of B/C exceeding 1.5 for large new projects, and 1.3 for incremental projects in which uncertainty is less. The present case B/C ratio is at threshold level. Moreover; Added returns and reduced costs fall into the benefits section of the partial budget and are the positive effects of a proposed change in the business as can be evidenced from the present analysis.

Descriptive Statistics of some financial parameters of Intervention ‘ Brackish Water Aquaculture’(Treated), at South 24 Parganas, West Bengal is presented in the table-6 to see the relative variations with respect to various parameters is furnished in Table-6.

Estimate of Relative Variation in Financial Parameters

Descriptive statistics of various parameters are presented for Treated Group (Table-6) and control group (Table-7).The coefficient of variation of Total Cost of Cultivation (Rs. /acre), Total Income (Rs. /Acre), Profit (Rs. /Acre) from competing fishery-enterprise are observed to be 858.65, 124.52 and 185.48% respectively and the same for the control group are estimated to be 89.12, 186.56 and 111.84% respectively. Very high variations indicate an alarming scenario of inconsistency in financial parametric values**.**

CONCLUSION

Relevance

The Intervention of Brackish Water Aquaculture by NAIP is found relevant as the activities and outputs of the programme consistent with the intended impacts and effects as envisaged in objective of the programme.

Effectiveness

The Intervention is observed to be effective also as this intervention attained its objectives of rainwater harvesting and utilization saline and Tsunami affected land for productive use to create employment and livelihood opportunities of marginal farmers of Sundarbans.

Table 6: Descriptive Statistics of some financial parameters of Intervention

Statistical Analysis		Total area under control of farmer (Acre)	Area under NAIP Intervention (Acre)	Capital support provided by NAIP (Rs./Acre)	Total Cost of Cultivation (Rs./Acre)	Total Income (Rs./Acre)	Profit from competing agro-enterprise (Rs./Acre)
Average		2.06	0.49	26633.06	78759.06	157948.44	80324.37
Range	**Max.**	6.10	1.52	36905.82	137486.47	369058.16	290540.30
	Min.	0.34	0.34	9841.55	10383.82	46058.46	3675.82
Standard Deviation		1.83	0.32	18407.92	67453.83	196677.44	149792.90
C. V. (St Dev/ Avg x 100)		88.83%	65.31%	69.12%	85.65%	124.52%	186.48%

Table 7: Descriptive Statistics of some financial parameters of Control plots

Statistical Analysis		Total area under control of farmer (Acre)	Area under NAIP Intervention (Acre)	Capital support provided by NAIP (Rs./Acre)	Total Cost of Cultivation (Rs./Acre)	Total Income (Rs./Acre)	Profit from competing agro-enterprise (Rs./Acre)
Average		1.13	N. A.	N. A.	23888.00	11807.64	1370.47
Range	**Max.**	2.71	N. A.	N. A.	33726.01	34661.94	7613.42
	Min.	0.34	N. A.	N. A.	9127.05	4650.13	-11012.70
Standard Deviation		0.90	N. A.	N. A.	21289.27	22028.66	1532.78
C. V. (St Dev/ Avg x 100)		79.65%	N. A.	N. A.	89.12%	186.56%	111.84%

Efficiency

Farmers adopting Brackish Water Aquaculture technology are observed accrued higher output compared to that achieved in control group. From B/C ratio is also it is apparent that the technology is cost- efficient.

Sustainability

Sustainability is concerned with measuring whether the benefits of an activity are likely to continue after donor funding has been withdrawn. Projects need to be environmentally as well as financially sustainable. To what extent did the benefits of a programme or project continue after donor funding ceased? Particularly, of this capital intensive intervention /technology, once the land shaping in the form of pond is done it will remain so and can be used for at least 5-10 years for productive purposes without much maintenance. Interviewing cross section of adopted and control farmers go impressed that the farmers are going to continue with the technology even after the funding is discontinued. 2014. It is also observed that a lot of non beneficiaries are also interested to adopt the technology but unable to do so because of paucity of fund of the poor and marginal farmers. Of course, some well to do farmers of the area have invested money and adopted the technology for higher productivity and return in Sundarbans.

Impact

Impact is known as the positive and negative changes produced by a development intervention, directly or indirectly, intended or unintended. This involves the main impacts and effects resulting from the activity on the local social, economic, environmental and other development indicators. The examination should be concerned with both intended and unintended results and must also include the positive and negative impact of external factors, such as changes in terms of trade and financial conditions. The impact of *Brackish water Aquaculture Technology* can be guessed from the fact that the cropping pattern has been changed from single crop to multi crop round the year resulting in enhanced productivity, employment generation, income and related activities arresting migration of people to cities in search of jobs for livelihood. Livelihood opportunities have increased considerably in the area. Beneficiaries and family members are fully engaged in farming, marketing and associated activities besides creating forward and backward business linkages in directly and indirectly in Fisheries and agriculture related activities like farming, input supply, trading, marketing, transport operations etc.

Recommendations

Partial budgeting parameters like estimated costs, returns and netincomeare found favourable for brackish water Aquaculture compared to the existing farming practices. At Kakdwip, Namkhana, Patharpratima and Freserganj areas of lower reaches of the Sundarbans Region, South 24 parganas district, West Bengal. Only a handful of adopted farmers have got the benefit, while a lot of farmers await such interventions to continue further. Some of the common point expressed by the farmers of almost all the intervention sites are i)Further adoption of neighboring farmers ii)Creation of adequate marketing infrastructure for fair price of their produce iii) Timely and regular supply of input and iv) Regular interaction with the beneficiaries.

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