IMPACT ASSESSMENT OF AN INTERVENTION 'IMPROVED PIG FARMING TECHNOLOGY' FOR LIVELIHOOD IMPROVEMENT OF RURAL POOR AT DHALAI DISTRICT, TRIPURA.

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ABSTRACT
Impact assessment is the process of identifying the anticipated or actual impacts of a development intervention, on social, economic and environmental factors. An impact assessment study was carried out at Ambassa, Balaram and Morachera clusters of Dhalai district, Tripura during 2013 under NAIP project to evaluate and validate indigenous 'Improved Pig Farming Technology' (intervention) for enhancing production, profitability and competitiveness in agro ecosystem of disadvantageous areas of NEH region. Ex-post design covering both qualitative and quantitative data through random sampling and purposive selection method was taken for collection of Primary data for both treated and control groups of household farmers respectively. Primary data of fifty samples covering the above intervention are analysed for components of partial budgeting parameters. Net income from unit area was Rs.18515 for treated compared to Rs 4162 from control. B/C ratio of Treated: Control is worked out to be 0.66:0.28. Partial budgeting parameters like estimated costs, returns, net income and profit are found favourable for the Intervened Technology compared to the existing farming practices. The impact of Pig rearing Technology can be guessed from the fact that the productivity, employment generation and income has increased considerably. Livelihood opportunities have also increased in the area. Beneficiaries and family members are fully engaged in pig rearing/farming, marketing and associated activities. Assessment criteria like Relevance, Effectiveness, Efficiency, Impact and Sustainability for the Intervention are discussed in details. Finally, based on economic performance and feedback from various stakeholders it is recommended that to continue the programme for long term social and economic benefits.

Keywords: Impact Assessment, Partial Budgeting, Interventions, Pig Rearing, Livelihood, Sustainability

INTRODUCTION
Agriculture is considered as the mainstay of a majority of people in India. It contributes around 14 per cent to the gross domestic product (GDP) of the country. The livestock sector in India contributes to nearly 32% of total agricultural output. India with 2.3% share of global geographical area supports nearly 20% of the livestock population of the World. The present production of meat in India is estimated at 6.27 million tons in 2010 (FAO, 2012), which is 2.21% of the world's meat production. The contribution of meat from buffalo is about 23.33%, while cattle contributes about 17.34%, sheep 4.61%, goat 9.36%, pig 5.31%, poultry 36.68% and other species 3.37%. The meat production has increased from 764,000 tonnes in 1970-71 to 6.27 million tons in 2010. The compounded average growth rate (CAGR) during the last two decades works out to be 4.5%. State-wise Production of Pork in India are Arunachal Pradesh 3.3; Assam 13; Manipur 7.4; Meghalaya 10 ; Mizoram 5.3; Nagaland 31 and Tripura 7.6 metric tons. Pork consumption is negligible in India, with the exception of the north-east while it is a major item elsewhere. The total world consumption of meat is estimated to be of the order of 240 million tons per annum and India’s share of consumption is only 2.2%. The
eight states in North East India (Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura) are ethnically and culturally akin to South East Asia and are amongst the poorest in India. For the majority tribal population, livestock keeping especially pig keeping is integral to their way of life in the NE Region. There is a growing demand for pork due to increasing per capita income, urbanization and changes in lifestyle and food habits. Much of this demand is met from imports from other states in India and from Myanmar. North East India has much higher pork consumption that the rest of the country. Of these states, Nagaland has the highest per capita consumption. The tribal population in particular appears to consume more pork on average than other groups. Traders in both Assam and Nagaland reported that the demand for pork was increasing along with prices. Commercial pig farming in India for meat production is one of the profitable ventures. Pig breeding takes off in India’s northeast, which produces 25% of the country’s pigs and consumes 50% of the country’s pork.

In the NAIP project farmers were provided with input in the form of piglet and pig shed for rearing of pigs as part of intervention (Fig.1). The purpose of this Impact Assessment is to assess the impact of Interventions extended by organizations like ICAR, SAU, NGO, with the financial support of PIU, NAIP, ICAR, New Delhi. An important intervention 'Scientific Pig rearing' was selected spread over the states of Tripura. NAIP-PIU intends to evaluate and assess the impact of the sub-project 'Scientific Pig Rearing’ in meeting the objectives for which it was conceptualized based on the basic parameters of effectiveness, efficiency, results/impact and sustainability. Ghungroo – Pigs of this breed are found to have local consumer preferences are provided to the farmers. Besides an exotic high yielding variety 'Hampshire' – re also provided to farmers as an input as part of intervention. Animals are black with white strip across forelegs to shoulder. Typical characteristics include small and erect ears, small and compact body. Sows have good mothering ability.

IMPACT ASSESSMENT METHODOLOGY

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.

Partial Budgeting

Partial budgeting is a planning and decision-making framework used to compare the costs and benefits of alternatives faced by a farm business. It focuses only on the changes in income and expenses that would result from implementing a specific alternative. In a nutshell, Partial Budgeting allows one to get a better handle on how a decision will affect the profitability of the enterprise, and ultimately the profitability of the farm itself. The partial budget framework can be used to analyze a number of important farm decisions, including adopting a new technology. There are seven common components to a partial budget: increased income, reduced cost, reduced income, increased costs, total of positive effects (increased income and reduced cost), total of negative effects (reduced income and increased costs),and net change (positive minus negative effects).
Economic Impact Assessment

Fig. 1a. Piglet-Yorkshire variety
Fig. 1b. A progressive farmer with pigs
Fig. 1c. Piglet-Ghungro variety
Fig. 1d. Halhuli market, Dhalai, Tripura

Fig. 1. Intervention: Piglet(Ghungro & Yorkshire variety) and pig shed provided by NAIP, ICAR & Dhalai Zilla Parisad, Ambasa, Dhalai, Tripura

Methodology for the Present Impact Assessment Household Survey
Based on reviewing a number of specific International and National best practice, latest literature on Impact assessment specifically on livelihood presenting overall information related to development of survey instrument, analysis tools & techniques and data presentation are taken up.

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 data through random sampling and purposive selection method is taken for collection of Primary data for both treated and control groups of household farmers respectively.

Survey Instrument /Assessment Tools for Household Survey
After thorough discussion it was decided that the survey instrument designed by PWC to be taken up for field data collection that was approved in the meeting at PIU, NAIP on 21st January, 2014. PWC questionnaire is designed mainly for financial impact assessment was administered for primary data collection from the field.
Sample Size Selection
Thirty samples of beneficiary farmers and twenty samples of control group farmers are covered for primary HH data collection for the intervention, from the frame of beneficiary farmer's household, sample was be selected at random to avoid bias. In case of non-beneficiary farmers (control) purposive sample method is resorted to because of non availability of sampling frame.

Primary and secondary sources of data collection
Household survey, Market visits, Field Observations, Key informants Interview and Transect walk besides Existing literature of best practice of IA survey/study.

Overall Field Observation
Financial data in prescribed questionnaire aiming Partial Budgeting of Interventions collected to capture change in profit particularly Household assets, sources of income and livelihoods, diversification of input cost, labour cost, employment generation, production etc were emphasised 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 organised for each intervention taken up at each site to take stock of the present scenario and validation. Details of Primary data collected from the selected interventions covering Dhalai district of Tripura (Pig Rearing(adopted-30 samples and control-20 samples)

Statistical Analysis, Tabulation and Presentation of Data
Tabulation and presentation of descriptive statistics of the economic indicators/parameters is being done and presented,. Graphical presentation of salient features is being taken care of for easy comprehension and analysis is done using software package like SPSS and MS Excel. Descriptive statistics of partial budgeting parameters for the Interventions is presented.

Area of Operation/Geographical Coverage
Ambassa, Balaram and Morachera clusters of Dhalai district, Tripura

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 A.K. Roy, National Consultant (IA), East & N.E. Region, India as part of TOR with NAIP.

Table 1. Ownership of Basic Production Asset (Intervention: Scientific Pig farming)

<table>
<thead>
<tr>
<th>Field</th>
<th>Treated</th>
<th>Control</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land (owned/leased)</td>
<td>0.7747</td>
<td>1.61036</td>
<td></td>
</tr>
<tr>
<td>Total (acre)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal/livestock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of animal/livestock</td>
<td>Pig</td>
<td>Pig</td>
<td></td>
</tr>
<tr>
<td>No. of animal/livestock</td>
<td>2.53</td>
<td>1.83</td>
<td></td>
</tr>
</tbody>
</table>

Cropping Pattern

It reveals from the survey data of households that there is a distinct difference between the cropping pattern of adopted /treated households for the intervention Scientific Pig Rearing at the Dhalai District, Tripura compared to those in the Control farmers selected from the neighbouring areas. As a result of intervention in the form of Pig sheds and piglets to beneficiaries, farmers are resorting to integrated farming also involving pig cum fish that is a proven technology. 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, output in the form of table and graphs for easy understanding of the differences between treated and control farmers.

![Yield Comparison Chart](image)

Fig. 2. Bar Charts: Yield Comparison; Intervention: Scientific Pig Rearing, Dhalai, Tripura

Yield Comparison

In the above figure two charts are there one showing piglet production and the other one with pigmeat. Through NAIP intervention on an average from a treated one piglet and pig meat were 7.82 nos. and 273.27 kg/unit as against 117.06 kg/unit only (Fig. 2). It is well that the smallholder livestock production systems improve livelihood and food security for the poorest people. In addition to providing protein for human consumption, pigs are often one of the main sources of cash income in rural areas and provide manure for cropping. Salient features of pig farming is that Pig farming has
been adopted mostly by small and landless farmers and in tribal areas. It is low-external input activity relying mainly upon women’s labour for rearing.

Table 2. Employment Generation (Intervention: Scientific Pig farming)

<table>
<thead>
<tr>
<th>Field</th>
<th>Treated</th>
<th>Control</th>
<th>Comparison</th>
<th>Additional man days generated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total man days (for male labour)</td>
<td>40.64</td>
<td>32.18</td>
<td></td>
<td>8.47</td>
</tr>
<tr>
<td>Total man days (for female labour)</td>
<td>41.17</td>
<td>25.18</td>
<td></td>
<td>15.99</td>
</tr>
<tr>
<td>Total Man days (male+female)</td>
<td>81.81</td>
<td>57.35</td>
<td></td>
<td>24.46</td>
</tr>
<tr>
<td>Percentage of women employment</td>
<td>50.32</td>
<td>43.90</td>
<td></td>
<td>6.42</td>
</tr>
</tbody>
</table>

Fig. 3. Comparison on Employment Generation; Intervention: Scientific Pig Rearing, District Dhalai, Tripura

Employment Generation

Pig rearing is a labour intensive enterprise therefore employment generation was also higher for male, female and total in the treated plots to the extent of 1.26, 1.63 and 1.46 times respectively compared to those generated in the control group (Table 2).
Table 3. Cost of Cultivation (Intervention: Scientific Pig farming)

<table>
<thead>
<tr>
<th>Field</th>
<th>Treated</th>
<th>Control</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Labour cost (in Rs.)</td>
<td>18571.67</td>
<td>11197.5</td>
<td>7374.17</td>
</tr>
<tr>
<td>Average Farm power cost (in Rs.)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Material Inputs cost (in Rs.)</td>
<td>10220.0</td>
<td>3833.4</td>
<td>6386.6</td>
</tr>
<tr>
<td>Other associated cost (in Rs.)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total capital/long term investment per year (in Rs.)</td>
<td>1291.70</td>
<td>0</td>
<td>1291.67</td>
</tr>
<tr>
<td>Other cost if any (in Rs.)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total cost of cultivation (in Rs./unit) without support from NAIP</strong></td>
<td>30083.33</td>
<td>15030.9</td>
<td>15052.43</td>
</tr>
<tr>
<td>Average support provided in Capital cost/long term investment (in Rs.)</td>
<td>1291.67</td>
<td>N.A.</td>
<td></td>
</tr>
<tr>
<td><strong>Total support provided from project (in Rs.)</strong></td>
<td>1291.67</td>
<td>N.A.</td>
<td></td>
</tr>
<tr>
<td>Actual cost of cultivation borne by farmer (in Rs/Acre)</td>
<td>28791.67</td>
<td>15030.9</td>
<td>13760.77</td>
</tr>
</tbody>
</table>

Fig. 4. Bar chart for Comparative Cost of Cultivation; Intervention: Pig Farming, District Dhalai, Tripura
Cost of Cultivation

Cost of cultivation was observed Rs.30083 in treated plots compared to Rs.15031/unit incurred in the control plots. Component wise break up of cost of cultivation within treated plots it is seen that on an average labour cost constituted 62% followed by material input cost (26%), and capital investment (4%) whereas cost of cultivation for control plots were on an average are found labour (74%), and material input (26%) (Fig. 4). Further partitioning of input cost for treated group exhibits that the highest cost of cultivation was borne toward Feed (51%) followed by piglet (31%), maintenance (18%) but in case of Control group highest was on account of piglet (64%) followed by feed (36%). (Fig. 4). It is interesting to note that in the intervened one NAIP provided pig shed that requires maintenance by way of washing where as in the control one pigs are reared in open therefore no maintenance cost.

![Pie-Chart showing Comparative Cost of Cultivation; Intervention: Scientific Pig Rearing, District Dhalai, Tripura](image1)

![Pie-Chart showing Comparative Cost of Material Input; Intervention: Scientific Pig Rearing, District Dhalai, Tripura](image2)
### Table 4. Income (Intervention: Scientific Pig farming)

<table>
<thead>
<tr>
<th>Field</th>
<th>Treated</th>
<th>Control</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income from crop (in Rs./Acre)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Income from vegetable (in Rs./Acre)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Income from straw (in Rs./Acre)</td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Income from Fishery (in Rs./Acre)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Income from piglets</td>
<td>48398.33</td>
<td>19192.65</td>
<td>29205.69</td>
</tr>
<tr>
<td>Income from Livestock</td>
<td>200</td>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td><strong>Gross Income generated (in Rs./acre)</strong></td>
<td><strong>48598.33</strong></td>
<td><strong>19192.65</strong></td>
<td><strong>29405.69</strong></td>
</tr>
<tr>
<td>Subtract total cost of cultivation</td>
<td>30083.33</td>
<td>15030.90</td>
<td>15052.43</td>
</tr>
<tr>
<td>without support from NAIP (in Rs.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Net Income (in Rs.) without support from NAIP</strong></td>
<td><strong>18515.00</strong></td>
<td><strong>4161.75</strong></td>
<td><strong>14353.25</strong></td>
</tr>
<tr>
<td>Add support provided from NAIP (Rs.)</td>
<td>1291.67</td>
<td>N.A.</td>
<td></td>
</tr>
<tr>
<td><strong>Net Income (in Rs.) with support from NAIP</strong></td>
<td><strong>19806.67</strong></td>
<td><strong>4161.75</strong></td>
<td><strong>15644.92</strong></td>
</tr>
<tr>
<td>Benefit cost ratio *</td>
<td>0.66</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>Profit from competing crop/agro-enterprise (in Rs.)</td>
<td>20846.30</td>
<td>6154.58</td>
<td></td>
</tr>
</tbody>
</table>

*Net Income / Total cost of cultivation; Source: Primary data collection by National Consultant (IA) for East & NE Region*
Fig. 7. Comparison of Income; Intervention: Pig Farming, District Dhalai, Tripura

Income
Net income from unit area was Rs. 18515 for treated compared to Rs. 4162 from control. B/C ratio of Treated: Control (0.66:0.28). These ratios are far below threshold level proving that Pig rearing is not a commercially viable option for Dhalai district of Tripura. Cost benefit ratios for both treated and control groups are below one. That means the venture is not economically viable (Table 4).

CONCLUSIONS

Relevance
The Intervention of Pig Rearing by NAIP is 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 found to be effective also as this intervention attained its objectives of creating employment and livelihood opportunities of marginal farmers of Backward Dhalai dist. of Tripura.

Efficiency
Farmers adopting Pig rearing technology are observed accrued higher output compared to that achieved in control group. From B/C ratio also it is clear 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. In search of the fact that to what extent did the benefits of the intervention likely to continue after donor funding ceased, it is evident that this capital intensive intervention/technology (Pig hutment) if once constructed it will remain so and can be used for at least 5-7 years without much maintenance. Interviewing cross section of adopted/non-adopted/control farmers under the Intervention got an impression that the farmers are going to continue with the technology even after the funding is discontinued with the end of the project. 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 by the poor and marginal farmers. Some well to do farmers of the area are reported to have invested money and adopted the technology for higher productivity and return in Moracherra and Balaram areas of Dhalai dist. Tripura.

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 Pig rearing Technology can be guessed from the fact that the productivity, emplyment generation, income has increased considerably. Livelihood opportunities have also increased in the area. Beneficiaries and family members are fully engaged in pig rearing/farming, marketing and associated activities. Pigs are potential source of animal proteins and avenues for additional income and employment that can improve the livelihood in a sustainable manner in the study areas.

RECCOMENDATIONS
Partial budgeting parameters like estimated costs, returns and net income are found higher for Scientific Pig Rearing compared to the existing pig farming practices. Therefore based on financial performance as well as interaction with stakeholders it is recommended that i) Further support in terms of pig shed construction and quality piglet ii) Regular supply of balanced pig feed iii) Provision for small pumps for daily washing of pig shed iv) Further adoption of neighbouring farmers v) Regular interaction with the beneficiaries.

Given its prospects, scientific pig farming has proved of its potential to have a positive impact on the livelihood of millions of resource poor, under-privileged, landless and marginal tribal farmers of Dhalai district of Tripura.

ACKNOWLEDGEMENT
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