Research Article:

EVALUATING THE SERVICE DELIVERY OF IRRI-STRASA PROJECT FOR DISSEMINATING IMPROVED RICE VARIETIES IN NEPAL

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ABSTRACT

STRASA project is the joint venture of IRRI-IAAS focusing in disseminating improved and tolerant rice varieties suitable to local conditions. A study was carried out to evaluate the extension service delivery of the project in two municipalities namely Bhanu, and Sundarbazar, selecting 101 sample households. Survey design with structured questionnaire, Focus Group Discussion and direct observation were used for data collection under pragmatic paradigm. The study showed that the average participation of respondents in project was 6.14 years, which had significant impact on their economic yield, production cost, food sufficiency and social networks. Majority of respondents were in frequent contact with extension personnel (fortnightly and monthly) and perceived that the services were credible, applicable, relevant and timely delivered with cost efficiency of 0.62 implying that the project was cost efficient in study areas. The technical competency and managerial skills were acquired by respondents highly through project, with decision making and social mobilization levels of women participation significantly increasing after project intervention. The disseminated varieties were highly adopted while post-harvest techniques were least adopted. As only 9% respondents were dissatisfied and remaining respondents had positive attitude towards project activities, the service delivery could be deemed effective and impressive in study areas.

Key words: Impacts, participation, pragmatic paradigm, satisfaction, service delivery

INTRODUCTION

The world is being subjected to the issues of food insecurity, inefficient use of resources, poverty and high impacts of climate change in present context (Baral et. al, 2018), wherefore, strong focus is being laid on agriculture for increasing the productivity and accessibility of food. Recent increase in world population and rising income in developing countries (especially in Asia) along with the land constraints (difficulty for expansion of agricultural land) is believed to create enormous demand for food, especially rice (FAO, 2010). Thus, to meet this climbing demand, about 25% of additional rice will be required by 2025 (IRRI, 2009), whose global demand is projected to rise up to 551 million tons by 2030 (FAO, 2016). The scenario of Nepal is no different where the production and accessibility of rice directly influence the food security issues in the nation. Covering wide range of lands in about 52 lacs hectare, with the productivity of 3.76 mt/ha (MoALD, 2019), rice solely contributed 16.33% of total agriculture GDP shared by food and cash crops (which is 47% of total agriculture GDP). Therefore, it is crucial to expand the productivity and accessibility of rice in order to ensure the national food security. The recent advancement in technologies and development of improved and high yielding varieties of rice has

created huge potential for higher yields (Chen Li-yun, Xiao, Tang & LEI, 2007) in limited land and reduced resource (water, labor, land) for sustainable production (Johnson & Vijayaragavan, 2011) creating significant innovation in rice production and productivity (Adedeji et al., 2013). However, different studies suggests that these technologies are being adopted in lesser number (about 40%) by the rice growers in Nepal because of which the contribution of rice in national GDP has been continuously declining over years (Pandey et. al, 2012).

In the past few years, several improved rice varieties along with the improved practices were released by different governmental and non-governmental institutions in Nepal with aim of increasing rice productivity and achieving the nation target of ensuring food security using different extension methods. However, these services were mainly supply driven and did not meet the interests of rice farmers (Baral, 2018). Also, there are no sufficient evidences to prove that the innovation/release of such varieties and practices actually benefitted the rice growers as expected (Kafle, Paudel & Ghimire, 2012) which made farmers unenthusiastic in the adoption of new technologies; hence, they follow their own conventional practices. Despite the various attempts to increase productivity and improve livelihood of farmers, the overall performance in rice production is not satisfactory because of which the farmers seem reluctant to use the improved varieties and cultivation technologies (Nzully, 2007); the risk in the prospect of obtaining a marginal surplus due to higher weather dependence (rain-fed condition) in the country and the fear of possible crop failure might have been the reasons for such reluctance and lower productivity (Shaikh, Magsi & Qureshi, 2016). So, it is of utter importance for responsible institutions to motivate farmers for adopting the improved varieties and cultivation practices through efficient use of different extension methods and bring substantial change in livelihood of rice growers.

International Institute of Rice Research (IRRI), being engaged in rice related research in Nepal since 1985, has been increasing its activity in the recent years and worked for increasing rice production in Nepal collaborating with different governmental institutions, Nepal Agriculture Research Council (NARC) and Institute of Agriculture and Animal Science (IAAS). Different projects under IRRI have set their objectives to develop and deliver rice varieties tolerant of abiotic stresses to farmers in the unfavorable rice-growing environments to achieve sustainable outcomes. Stress Tolerant Rice for Africa and South Asia (STRASA) is one of the IRRI-IAAS joint venture project implemented since 2008. The main aim of the project is to identify the drought tolerant improved varieties of rice with good management packages and develop a network for seed production and adoption in farmer's level. The first phase of STRASA project was launched from 2008 to 2010 as technology validating phase and after 2011 the second phase has been running as technology dissemination phase. IAAS has been working in seven villages in mid hill districts namely Lamjung, Tanahun and Gorkha for technology dissemination especially drought tolerant rice. In this context, the paper attempts to evaluate the service delivered by the project in the periphery of following research questions:

a) How effective has the project been in reaching the clientele with the content of their need and interest?
b) Are the services of the project cost and time efficient?
c) What is the adoption status of varieties and technologies disseminated by project?
d) Are these methods inclusive and gender responsive? What extension methods are preferred by men and women?
e) Are the participants in the project activities satisfied with its service? What are its impact areas?

MATERIALS AND METHODS

The proper plan including the objectives and methods of study is first and most important step which determines how successful any study will be. An attempt is being made to evaluate the extension methods of IRRI-STRASA project in western midhills (Lamjung and Tanahun districts) in Nepal, with Sundarbazar and Bhanu Municipal selected for study due to their feasibility and high intervention of the project in these areas. Pragmatic paradigm has been used for the study as it facilitates the use of mixed (both qualitative and quantitative methods) (Neuman, 2000) for evaluating the effectiveness and efficiency of the project regarding the dissemination of improved varieties and modern cultivation practices in real farm situations of study areas.

The study incorporated the survey design using farmer's household as unit of analysis, using a structured interview schedule for data collection. The design was selected due to the time constraint, its flexibility and simplicity, so that both qualitative and quantitative methods could be included.

The sampling size was estimated using the simplified formula by Yamane (1967):

$$n=\frac{N}{1+N(e)^2}$$

Where; e is the desired level of precision (i.e. the margin of error), here a 10% margin error was considered; N is the population size, here the project beneficiaries were considered the population which was 4662 farmers' households in study areas; and n is the required sample size.

The formula gives a sample size of 97. However, 10 percent extra samples were collected for use in case of outliers and missing data, making the sample size 107. Removing the outliers and adjusting the missing data, the sample size was reduced to 101 for this study. Purposive Sampling technique was used for selection of the study households to ensure representation from different groups and key participants based on gender, socio-economic class and caste.

For primary data collection from the selected respondents, a structured interview schedule was prepared and its reliability and validity were ensured through experts' consultation and pretesting by interviewing five respondents so that the schedule covers the overall objectives of the study. Also, a FGD and on-site observation were done to analyze and record qualitative data and behavioral aspects of respondents. Detailed interviews were conducted and collected data were carefully managed and analyzed using Ms excel and STATA 12 using analytical tools like frequencies, means, standard deviation, rank order, simple indexing and charts.

The evaluation parameters for study were adapted from NALEP (2011), and seven broad parameters were outlined:

a) Participation: Years of participation in project and reasons for participation.
b) Perceived impacts of project by respondents
c) Effectiveness: Clientele reached and content delivered as per need of clientele.
d) Efficiency: Time and Cost
e) Adoption: Skills acquired and adopted varieties and technologies
f) Gender responsiveness: Women participation level after project intervention, preferred methods on gender basis.
g) Satisfaction: Satisfaction level and attitude towards project

RESULTS AND DISCUSSIONS

Socio-economic characteristics of respondents

The socio-economic parameters of respondent households, as presented in Table 1, shows that about 70.6 % of household heads were economically active, with the average age found to be 52.74 years implying that most of the household heads were experienced farmers and thus were likely to take risks, try new innovations and adopt them if satisfactory results are achieved (Baral, 2020). Similarly, the female headed households were quite higher (40.6 %), this could be the indicator of women empowerment due to mobilization and participation in different project activities. Majority of household heads were literate (about 89%), among them 77.2% had received formal education, allowing them to benefit from information and services provided by different agencies and increase assess to different information sources regarding rice cultivation. The major ethnic groups in the study areas were Brahmins and Chhetris followed by Indigenous and Dalits respectively. The average family size was 4.88, similar to national average of 4.88 (CBS, 2016).

The economic dimensions of study household showed that majority of households (56.5 %) were dependent on agriculture as their major source of income, followed by remittance (14.8 %) and service (13.9 %) with monthly income of NRs. 36217.82 and monthly savings of about NRs 7593.88 in average. The average landholdings of households was 0.42 ha, rice cultivation was done in 0.21 ha (about 50% of total landholdings) with the average productivity 2.63 $mtha^{-1}$, quite lower than the national average i.e. 3.76 t/ha (MoALD, 2019). Limitations in timely availability of inputs and services, irregular rainfall, hailstorms, lower knowledge on improved cultivation practices and innovative technologies etc. were the reasons for lower rice productivity. The farmers had about 49 years of experience in rice farming on average.

Table 1. Socio-economic characteristics of respondents

Descriptive	Statistics
Social	
Age group of HHH	Economically active (70.3%) and Economically inactive (29.7%)
Average age of the HHH (years)	52.74±1.14
Gender of HHH	Male (59.4%) and Female (40.6%)
Education status	Illiterate (10.9%), Non-formal education (11.9%) and Formal education (77.2%)
Average years of schooling of HHH (years)	4.52±0.50
Average family size (number)	5.10±0.17
Ethnicity	Brahmin and Chhetri (65.3%), Indigenous (25.8%) and Dalits (8.9%)
Rice Farming Experience (years)	49.31±1.06
Economic	
Main occupation	Agriculture (56.5 %), Remittance (14.8 %), Service (13.9 %), Business (8.9%) and others (5.9%).
Average income monthly (NRs)	36217.82±1506.55
Average savings monthly (NRs)	7593.88±803.01
Average area of rice cultivation per HH	4.17±0.24
Average productivity of rice	2.63 t/ha

Participation in project activities

IRRI has been effectively carrying out STRASA project in the study villages since 12 years. However, the years of participation of farmers in the project varied from 2 years to 12 years. The mean year of participation was found to be 6.15 years. The respondents were subjectively asked for the main reasons of participation in the project. Among which, the most common reasons are listed below:

- To gain knowledge and skills
- To get higher yield/ production
- Access to quality seed, inputs and technical support
- To improve household food security
- Impressed by success of other farmers
- Persuasion from fellow farmers and extension personnel
- Interested in the innovations/ varieties promoted
- To get quick and close services from the project personnel
- To improve livelihoods and save promising landraces of rice
- Effective pest management
- To create linkage with IRRI and IAAS.

Perceived impacts of the project in farmer's households

The respondents were asked about the perceived benefits from project, which is presented in Table 2.

Table 2. Perceived Benefits of the project

Impacts	Change	Frequency	Percentage	Chi-square value
Economic Yield	Increased	95	94.1	4.13*
	Constant	6	5.9	
	Decreased	0	0	
Food Sufficiency	Year round	68	67.3	8.92*
	4 to 8 months	20	19.8	
	0 to 4 months	13	12.9	
Production cost	Increased	10	9.9	9.43*
	Constant	36	35.6	
	Decreased	55	54.5	
Marketing Benefits	Higher	91	90.2	6.8NS
	Same	6	5.9	
	Lower	4	3.9	
Increased Social Networks	Yes	92	91.1	21.3**
	No	9	8.9	

It was found that the project had significant impact on economic yield, food sufficiency, production cost and increased social network, while it had no significant effect in market value of yield. The different improved varieties with higher yield potential and less disease-pest infestation along with improved cultivation practices disseminated by the project might have increased the economic yield of the respondents. The increased yield ultimately increased the food sufficiency in farmers' households; the year round food sufficiency was increased to 67.3% from 31.6% while the households with less than 4 months food sufficiency were decreased to 12.9% from 34.6%. Similarly, the improved varieties had significantly lower production cost,

this might be due to less incidence of disease pests and weed, thus lower cost for their control. However, the project had no significant effect on market value of rice in study areas, though 90.2% respondents recorded the higher market value for produced rice. Similarly, the project had significantly increased the social networks of the respondents; this might be due to inter- and intra-group discussions, exposures, trainings, field schools etc. conducted by the project and the higher frequency of contact of respondents with extension personnel of the projects.

Perceived effectiveness of extension methods used by project

The effectiveness of project was assessed using clientele contact frequency and utility, credibility and relevancy of content (information, service, technical support) provided.

Contact of project extension personnel with respondents

Extension personnel contact can also play important role in adoption of new innovation by farmers (Lukkainen, 2015). Thus, the frequency of contact of extension personnel of the STRASA project with the respondent farmers was assessed by using 5 point scale ranging from weekly, fortnightly, monthly, bimonthly and semi-annually or less, which is presented in Fig. 1.

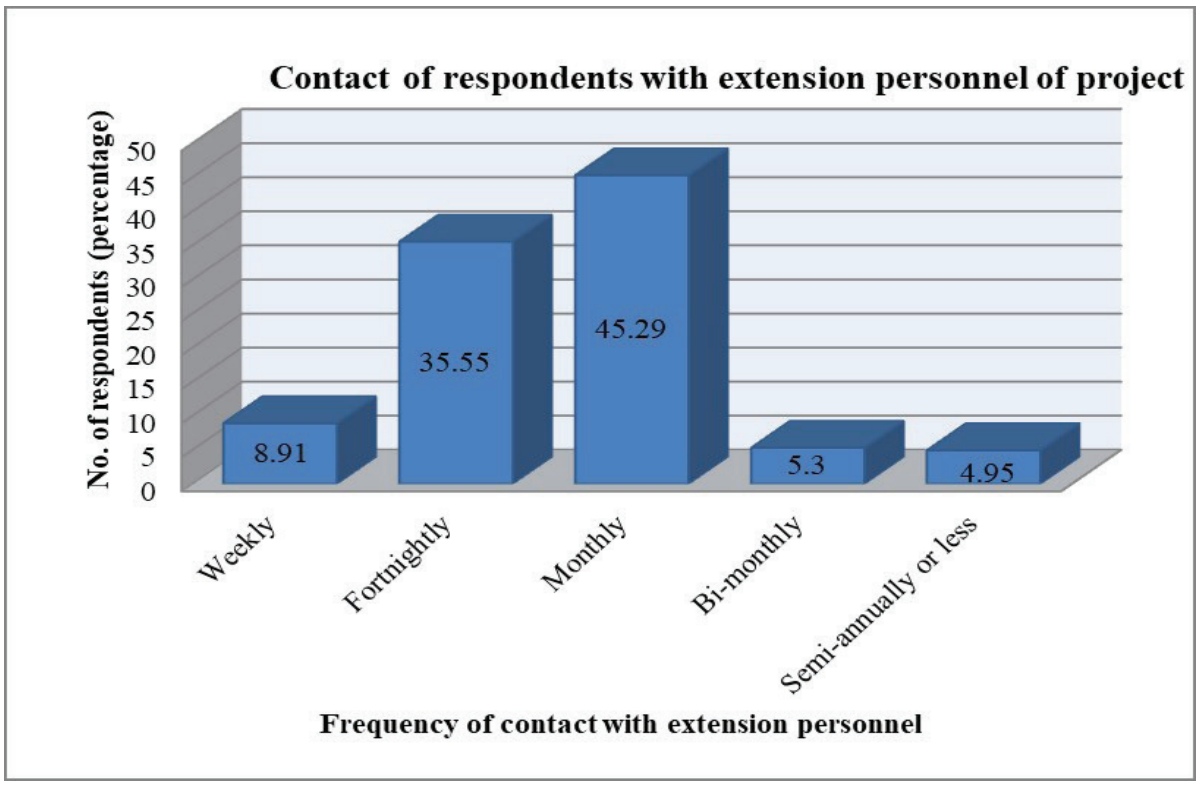

Fig. 1. Frequency of project extension personnel contact with respondents

As majority of respondents were in frequent contact with extension personnel of project regularly on weekly, fortnightly and monthly basis (8.91%, 34.65% and 40.59% respectively), the clientele reach of the project could be deemed effective in study areas. The extension agent contact was converted to an index value calculate to be 0.59, meaning the extension agent contact of the project with farmers was satisfactory, it shows that the extension personnel need to increase their contact with the farmers so as to foster the effective adoption of the rice varieties..

Also, different extension methods employed by the project were assessed among which trainings, minikit trials, group methods and demonstrations were used quite often, whereas participatory varietal selection, farmer's field school and ICTs and printed media were used sometimes. The

frequency of study visits and tours, however, was relatively lower, seldom conducted by the project. The result is presented in Table 3.

Table 3. Frequency Extension methods used by project

Methods used by STRASA Project	Index value	Interpretation
PVS	0.49	Sometimes
Trainings	0.62	Often
Study visits and tours	0.38	Seldom
Minikit	0.68	Often
Group	0.73	Often
FFS	0.42	Sometimes
ICTs and printed media	0.58	Sometimes
Demonstration	0.63	Often

Service delivered as per need of farmers

The respondents were whether the services provided by the project were significant or not in terms of utility (applicable), credibility (trustworthy) and relevancy (suited) to their farm situations, the result of which is presented in Fig. 2.

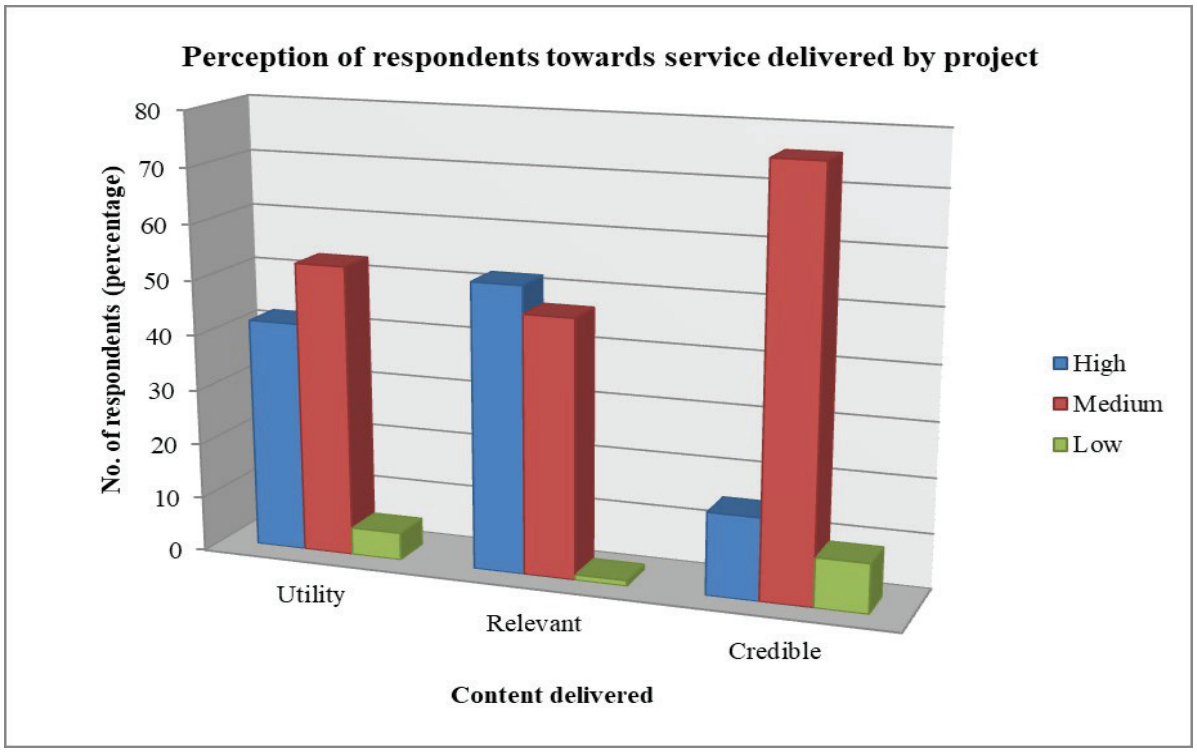

Fig. 2. Perception towards service delivered by project

It was found that 42% respondents perceived the service to be highly applicable to their farm situation followed by 53% respondents who found the service to be moderately applicable and only 5% perceived that the service was not much applicable to them. Similarly, 52% respondents felt that the services provided were highly relevant to their condition, while 47% felt it to be moderately relevant and only 1% perceived the service to be not so relevant to their condition. Similarly, the services delivered by the project was found highly credible by 15% respondents while majority (76%) perceived it to be moderately credible and about 9% felt the service were

less credible. This might have been due to the extension personnel contact. The less frequent contact with extension personnel might have reduced the credibility of the service delivered.

Time and cost efficiency of project

The time efficiency was assessed by determining the timeliness of the services and information provided by the project at time of need by the respondents, the result of which is presented in Table 4.

Table 4. Timeliness of service delivery by project

Parameters	Score	Interpretation
Services		
Inputs and seeds	0.77	Very timely
Technical Assistance	0.69	Timely
Market related	0.54	Timely
Information related		
Agronomic/Cultivation practices	0.58	Timely
Innovative technologies	0.53	Timely
Weather/Climatic information	0.48	Moderately timely

While the Inputs and Seeds were timely available, technical assistance and market-related services were perceived timely by respondents. As the project was prioritizing the disseminating the new improved varieties of rice suited to local condition in study areas, the inputs and seeds had to be made timely available, so the project was found sensitive for supplying inputs and seeds to its clientele. The technical assistance and market related services were provided only when demanded by its clientele. Regarding information, the project had made sure package of practices (cultivation) of the improved varieties which were timely available to the people. The latest and innovative technologies were also timely informed to rice farmers. However, the weather and climatic information was comparatively slow, this might be due to the absence of any meteorological and weather stations in study areas in close proximity.

The cost efficiency was also assessed by using 5 point rating scale (viz. highly efficient, efficient, neutral, less efficient, inefficient) to determine simple index for cost efficiency of services provided by project, the index was calculated to be 0.62, implying that the services of project were cost efficient as perceived by respondents, the reasons might have been the subsidies in inputs provided by project, decreased production costs in cultivating improved varieties, high market value for yield (if sold) and incentives for seed growers and good performers.

Adoption of varieties and technologies

The adoption parameter of the project was assessed by determining the perceived acquired skills by respondents and the adopted technologies disseminated by the project which is shown in Table 5 and Table 6.

Table 5. Skills acquired by respondents

Acquired Skills	Mean score	Rank
Technical competency	0.97	I
Managerial Aspects	0.75	II
Risk adaptation	0.53	IV
Communication and social interaction skills	0.58	III
Leadership development	0.35	V

Table 5 shows that the project has increased the technical competency of the farmers the most. The respondents credited the methods like trainings, demonstrations, PVS, FFS used by the project for their increased technical competency regarding rice cultivation. This was followed by Managerial skills (decision making, farm record keeping and budgeting, planning etc.), communication and social interaction skills (inter and intra), risk adaptation and lastly leadership skill was believed to have been acquired by respondents.

Among the disseminated technologies by the project, improved varieties like Ram Dhan, Sukha series etc. were highly adopted by the farmers of study area (as shown in Table 6) due to their higher yield, adaptation to local environmental conditions, quality rice and beaten rice and lower insect pest infestation. It was followed by the disease-pest control measures, inputs (seeds, fertilizers) use and management techniques, improved cultivation practices and innovative technologies (DSR, SRI, azolla incorporation etc.) and post-harvest and marketing technologies. Though the project had established collection center and cooperatives for facilitating the marketing of rice yields, the respondents were managing that aspect by themselves (mainly used for home consumption and relatives) and very few farmers produced rice for marketing. The least adopted technology was irrigation and water management as the respondents had not faced any irrigation problem in study areas.

Table 6. Adopted technologies by farmers

Disseminated technology	Mean score	Rank
Varieties selection	0.94	I
Improved cultivation practices	0.80	IV
Doses and techniques of input use (Seeds, fertilizers)	0.86	III
Identification and control of pests and diseases	0.89	II
Irrigation and water management	0.54	VI
Post-Harvesting and marketing	0.58	V

Gender responsiveness

The participation level of respondent before and after project intervention and the preferred extension methods used by project on gender basis were assessed for this parameter. Fig. 3 shows the change in women participation level in study households.

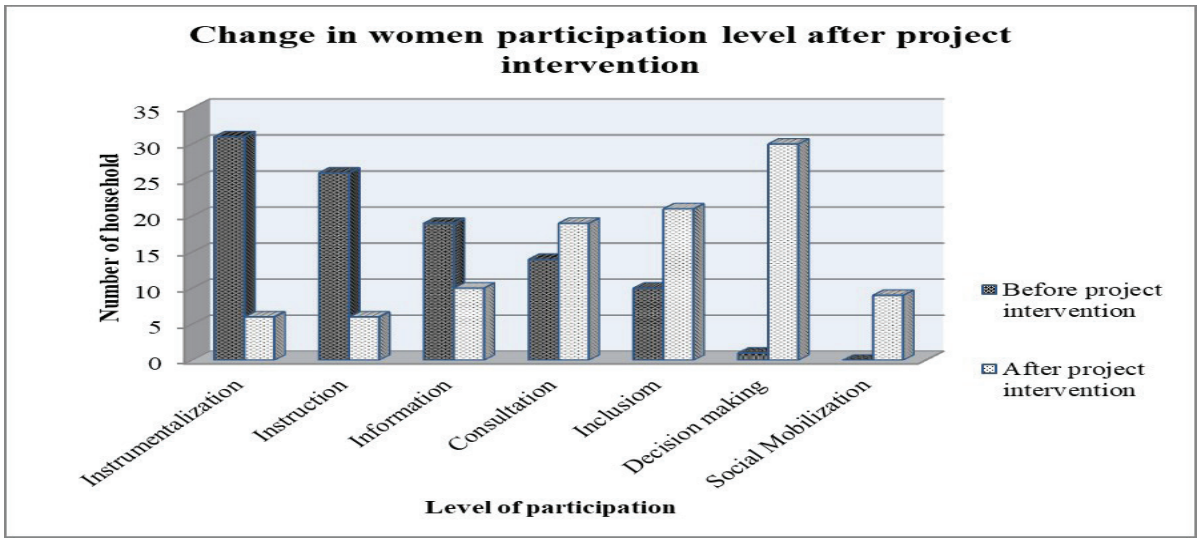

Fig. 3. Women participation in household after project intervention

It was seen that the instrumentalization level i.e. important decisions were made by male members and instruction level i.e. women were instructed to follow the decisions made by male members were reduced significantly after project intervention. The decision making of women in the households was increased significantly, the main reasons for this were the awareness in women, their higher mobility in project activities, their capacity building through trainings and groups and the women groups/cooperatives established by project for seed production, inputs delivery and other project objectives. Similarly, the mobilization level of women was also increased from 1% to 9%, as the women cooperatives and groups were highly active in study areas and the leaders of those institutions were highly active in project service delivery as project social mobilizers.

The respondents were then asked to rank the extension methods employed by the project as preferred by them and grouped on gender basis, highly preferred four methods by each gender was presented in Table 7. It was found that group, trainings, demonstrations and visits and tours were mostly preferred by female respectively while male members preferred trainings, study visits and tours, group and demonstration method respectively. Female members might have preferred study visits and tours less compared to other methods due to their responsibility of household chores and farm activities which deprives them of leisure time for study visits and tours. Also, the respondents agreed the fact that female participation in trainings and demonstrations was also comparatively low as compared to men despite the efforts by project to promote equal participation.

Table 7. Ranking of extension methods as per gender preferences

Areas	Frequency (n=59 for female and n=42 for male)	Mean score	S.D	Rank
Female ranking				
Group	54 (78.2)	0.87	0.34	I
Trainings	59 (64.4)	0.80	0.30	II
Demonstrations	47 (53.5)	0.79	0.31	III
Study tours and visits	48 (62.4)	0.77	0.30	IV
Male Ranking				
Trainings	26 (61.9)	0.92	0.37	I
Study visits and tours	16 (38.1)	0.9	0.35	II
Group	36 (85.7)	0.87	0.34	III
Demonstrations	28 (66.7)	0.76	0.28	IV

Satisfaction of farmers' towards project activities

The satisfaction level of study households towards project's service delivery was assessed by asking them to rate in 5 point Likert scale, viz. highly dissatisfied, dissatisfied, neither satisfied nor dissatisfied (neutral), satisfied and highly satisfied which is presented in Fig. 4.

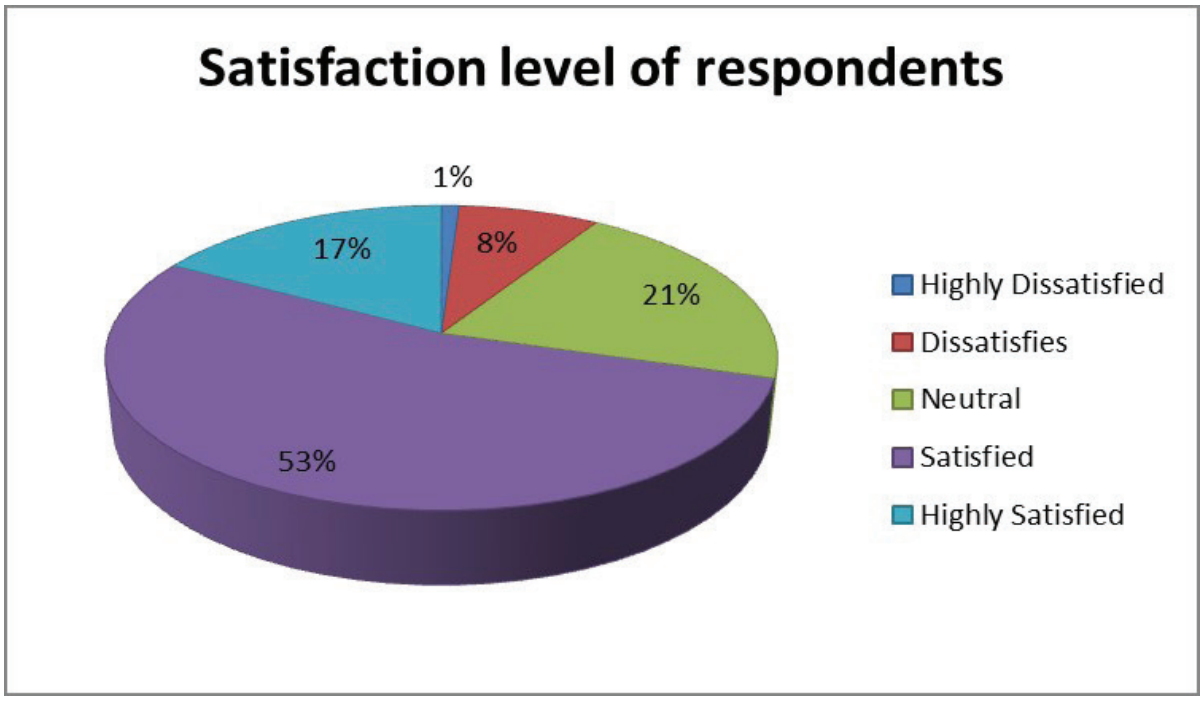

Fig. 4. Satisfaction of respondents towards project activities

More than half respondents (53%) were highly satisfied and had positive attitude towards the project activities, with 17% satisfied, 21% had neutral feeling towards project activities and remaining 9% were dissatisfied. The dissatisfaction might be due to the constraints in assessing and benefitting from the project services, some respondents has still not got chance to participate in trainings, exposures and other capacity building activities of project, thus might be dissatisfied.

CONCLUSION

STRASA project, the joint venture of IRRI and IAAS, was found quite impressive and effective regarding its service delivery in study areas. The project had significant impact on cost effectiveness, resource saving, gender participation and inclusiveness, extent of contact with farmers, technical assistance and support to farmers. The timely delivery of services, information and inputs were according to the interests of rice farmers and suited to their local field conditions, which had encouraged the adoption of disseminated varieties in study areas. However, there were some constraints which the project needs to address in the future for efficient service delivery. The market related information and services were perceived to be comparatively lower and hence, the project needs to ensure the market information and channels are strengthened and as per needs of the rice growers. The project had prioritized rice cultivation, however, the respondents felt that there was need of support in vegetable and fruits farming and livestock rearing too as Nepalese agriculture system is of integrated nature. Thus, the project needs to focus on supportive programs on those areas too. The small and marginal farmers were still inaccessible to some project activities like exposures, demonstrations, trainings, subsidy and incentives. The project, therefore, need to ensure those marginal farmers are equally benefitted. Similarly, the establishment of Ghumti Kosh along with cooperatives for fluent flow of financial resources and credit and targeted programmes to increase competency of illiterate and incompetent farmers in the project command areas were required. Hence, it is of utter importance for the project personnel to solve these issues and deliver effective service to the farmers through appropriate extension methods for increasing its efficiency in study areas.

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