5. Knowledge-based Entry Point for Enhancing Community Participation in Integrated Watershed Management

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Abstract

Introducing watershed development program to the community has always been recognized as an important activity. This is done through what are called 'entry point activities' (EPA) in the parlance of watershed literature. It involves building the rapport with the community, strengthening and sustaining it through out the program and beyond. Knowledge-based EPAs are found more effective to build rapport with the community by ensuring tangible economic benefits for the community.

Keywords: Community participation, watersheds, entry point activity, knowledge sharing.

Introduction

In rain-fed areas to conserve soil and harvest rainwater community watershed management approach is adopted. Community's participation in program activities from planning, execution, and monitoring is critical for the success and sustainability of the interventions. However, mobilizing community participation is a challenging task and lack of community participation is identified as a major factor for less impact of watershed programs (Farrington et al. 1999, Kerr et al. 2000, Joshi et al. 2005 and Wani et al. 2003). Introducing watershed development program to the community has always been recognized as an important activity. This is done through what are called 'entry point activities' (EPA) in the parlance of watershed literature. It involves building the rapport with the community, strengthening and sustaining it through out the program and beyond.

To build a rapport between the project implementing agency (PIA) and the villagers before initiating the watershed programs, an EPA is envisaged. The entry point intervention/activity is identified through participatory rural appraisal (PRA). The

Common watershed guidelines released by the Government of India (GOI, 2008) mention a specific budgetary allocation of 4 percent which works out to Rs. 4 lakhs (US$ 8510) for 1000 ha micro-watershed to undertake the entry point activity.

An entry point activity, such as providing drinking water and sanitation to the community, conducting health awareness camps, construction of community halls, class rooms, repairing or construction of culverts, approach roads, promotion of kitchen gardens, etc., are carried out. Support to group income activities such as fish farming in village tanks and providing power threshers with the community contribution are some other rapport building measures that are practiced (Fernandes, 2000).

Over the years a lot of time and resources have been spent in trying out various types of EPA. Based on critical analysis of various watershed projects in India, it was observed that major reasons for low impacts of projects were the lack of equity, sustainability and participation by the stakeholders (Kerr et al. 2000, Wani et al. 2002, 2003 and Joshi et al. 2005). Further, low community participation was because of top down approach adopted in the projects and lack of tangible economic benefits due to project interventions for large number of small and marginal farmers. Adoption of top down target driven approach by the implementing agencies followed subsidy approach to enlist stakeholder involvement. Such involvement promoted contractual arrangement and stakeholders never took active interest, which sacrificed the sustainability (Wani et al. 2005). In an innovative farmer participatory consortium model for watershed management by ICRISAT-led consortium, one of the important components is no subsidy for interventions on private farmlands and need-based interventions as demanded by farmers instead of supply-driven interventions padded with free inputs (Wani et al. 2003). An important lesson learned during this time was that undertaking community level EPA such as drinking water schemes, building roads and community halls, identified as priorities during PRAs, do not provide enough incentive to motivate people to participate in the long term conservation activities that provide no immediate benefit (World Bank and FAO, 2001). On the contrary, such direct money-based (subsidy-based) EPA undertaken by the projects to build rapport, are misinterpreted by the community that project will invest financial resources for all the interventions and that the project has financial resources to work with the community. Following the principle of no free inputs for the individual farmers it was decided not to have money-based EPA in the watersheds to build the rapport with the community, in the Asian Development Bank (ADB) supported project started in 1999 for evaluating a new consortium approach (Wani et al. 2003).

Constraints

Earlier, watershed research and development work in the SAT emphasized on augmenting availability of water through constructing soil and water conservation structures within the watersheds. This structure-driven watershed development approach neither provided a positive impact on the productivity nor encouraged the farmers to participate in development and management of watersheds and maintain these structures when the implementing agency withdrew the support mainly because only a few resourceful farmers benefitted from the program (Wani et al. 2003).

Lack of community participation was one of the major factors affecting sustainability and impact of watershed interventions. Major constraints for community watershed are:

- lack of involvement of different stakeholders in watershed development;
- lack of tangible economic benefit to large number of small and marginal farmers;
- showed benefits favouring well to do farmers with well endowed resource base;
- top down approach to identify and execute watershed interventions.

Strategy and Approaches

Constraint Identification through Participatory Rural Appraisal (PRA)

For selection of micro watersheds consortium team members conducted a *gram sabha* (village meeting) and discussed current status of crop productivity, incomes, difficulties faced, possible reasons for low crop yields, current soil, water, crop and nutrient management options followed by the farmers.

During PRA, farmers described the declining status of their natural resources, such as soil, water and vegetation in the watershed. Declining groundwater table, water scarcity, decreased number of trees and need to apply more fertilizer year after year for maintaining crop yields were described by the farmers. Land degradation was described in terms of more run off, less soil moisture, low production capacity, low vegetation as well as continuing need to add increased amounts of plant nutrients to maintain crop yields. Farmers also described good status of NRs in terms of price of land, higher price of land having high production capacity and good groundwater availability (Joshi et al. 1997).During the PRA, rules for implementing project activities were discussed and agreed upon (Fig 1).

The principle of 'beneficiary pays the costs' for individual farm-based productivity enhancement activities was followed. Further, it was optional for the farmers to participate in the participatory evaluations. It was made clear that except knowledge nothing will be provided free.

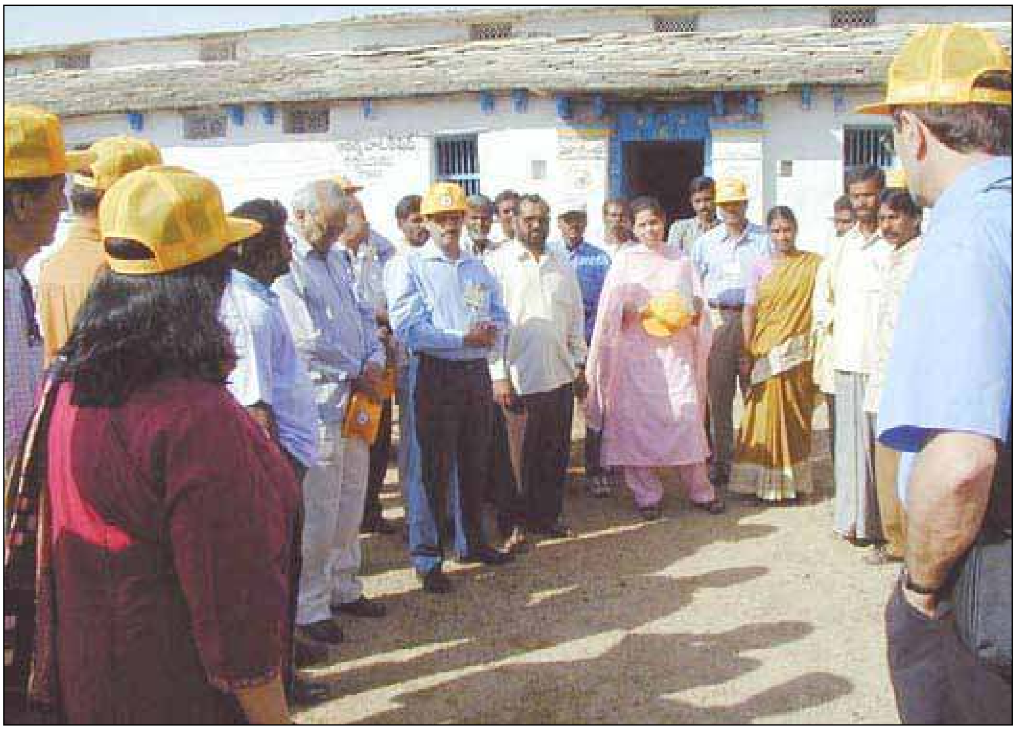

Figure 1. Meeting with farmers.

Identification of Appropriate Entry Point Activity (EPA)

Selection of the appropriate knowledge-based EPA for building rapport with the community is very critical. While selecting appropriate EPA, consider the following points.

- It should be knowledge-based and should not involve direct cash payment through the project in the village.
- Activity should have high success probability (>80-90%) and be based on strategic research results.
- It should involve participatory research and development (PR&D) approach.

- Community members to be involved in undertaking the activity.
- It should result in measurable tangible economic benefits for the farmers with a high Benefit: Cost (B:C) ratio
- It should be simple for farmers to undertake participatory evaluation
- Most importantly, it should be applicable for majority of the farmers
- Should have a reliable and cost-effective approach/method to assess the constraint.

Considering all the above-stated points and based on the PRA, wilt tolerant and high-yielding pigeonpea cultivar was introduced in Adarsha watershed, Kothapally, India. Poor soil health was identified as the EPA for the Andhra Pradesh Rural Livelihoods Program (APRLP) nucleus watersheds.

Representative Soil Sampling of a Micro-Watershed Involving Farmers

Once soil health was identified as knowledge-based EPA, representative, simple and cost-effective method had to be identified for sampling the micro-watershed of 500 - 1000 ha. For identifying representative sampling locations in a micro-watershed farmers meeting was conducted in a village. During discussions, farmers were asked to identify different fertility/soil quality locations which are uniform. Through discussions, it emerged that naturally soil quality varied on a toposequence with good quality soils at lower toposequence position. Another important factor causing variation in soil quality was differential amounts of inputs by individual farmers.

Both these points were factored in while deciding sampling procedure. The micro-watershed was divided on a map in three toposequences. Farm size was taken as a surrogate for socio-economic status of the farmer, which could affect quantity of inputs in the field. For each toposequence, number of farms as per farm size were identified and grouped in to small (< 2 ha), medium (>2 to <5 ha) and large (>5 ha) farm holders. Based on the proportion of small, medium and large farm holders on each toposequence location, stratified random sampling approach was adopted to identify five sampling locations on each toposequence location. Number of samples to be collected depended on proportion of small, medium and large farm holders. Once the numbers of samples for a particular category were decided, farmers were asked to identify the fields which should be sampled.

Farmers were trained in collecting representative soil samples from the selected fields. During discussions it was highlighted to all the farmers that these samples are representative for all the farmers from that category on a topo sequence and these results are not only for the field which is sampled. From each sampling location five samples up to 15 cm depth were collected and pooled together by mixing to form a single sample. Samples were divided into four quarters. Each quarter of soil sample was mixed well and one composite sample of one kg was prepared by collecting mixed soil sample from each quarter. Total number of soil samples collected was 15-20% farmers' fields in a watershed depending on its size.

Figure 2. Participatory farmers with the soil sampling.

Enhanced Awareness through Knowledge Sharing for EPA

Soil samples from all nucleus watersheds were analyzed for biological, physical and chemical parameters by following standard analytical procedures as described (Rego et al. 2005 and Wani et al. 2003).

The results were compiled and along with nutrient uptake data for one or two major cropping systems were used for explaining to the farmers. Simple approach of nutrient budgeting was followed, which included additions to and withdrawals from a farm. For each toposequence field samples charts were prepared highlighting soil nutrient content and used for explanation.

The critical limits for each nutrient along with the results of soil analyses were shared with the farmer groups concerned. The lead farmers selected to sample their fields explained the process of soil sampling to the farmers. In the meeting it was reiterated that the samples collected from randomly selected fields, were representative of the fields in that particular category (topo sequence position and farm holding). During *gram sabha* (village meeting) discussion on soil analysis EPA results, the lead farmers got hands on experience and responded to queries from their peers.

Researchers shared and discussed the soil analysis results with the farmers and during discussions planned PR&D trials for evaluating crop responses to deficient micro-nutrients with simple plus and minus approach along with the existing farmers practice as a control. Voluntary farmers were identified in the *gram sabha* to evaluate the responses in their fields. Necessary guidance, technical support and availability of inputs on payment basis were arranged by the project staff. For PR&D along with responses to deficient micro-nutrients some farmers also volunteered to evaluate improved cultivars of important crops based on yield potential, and available information about pests and disease resistance of the new cultivars.

Participatory Research & Development Trials

Based on the discussions in the gram sabha lead farmers started preparing for experimentation. The lead farmers were told to maintain records for all the operations, inputs as well as crop observations regularly. Farmers who needed help for recording observations took help of other farmers in the village or project staff or their school going children. Internalization of these experiments in *gram sabha* and subsequent discussions in the family served the purpose of creating awareness and interest in the work. The + and - (farmers' practice) trials with specific micronutrients or all deficient nutrients separately and in combinations were laid out depending on the farmers' choice. For each treatment plot size was minimum 1000 m^2. For statistical analysis of results individual farmers served as replications.

During early grain-filling stage, field days were conducted in villages wherein all villagers were invited. In a group farmers moved through all the PR&D trial fields. In each field lead farmers explained what they did from the beginning, what they observed and what they expect. Farmers visiting the fields also collectively evaluated different treatments, discussed different crop growth parameters and compared not only treatments but also provided good suggestions. Cross learning across the lead farmers was also quite effective.

At maturity researchers harvested 6 m^2 from three different spots in the plot for each treatment. Farmers also harvested crops treatment wise and threshed separately and recorded grain and straw yields.

Up-scaling Strategy from Nucleus to Satellite Watersheds.

ICRISAT-led consortium has adopted up-scaling strategy from nucleus to satellite watershed in the APRLP-ICRISAT project. For each nucleus watershed four satellite watersheds were selected during the second year. Farmers from the satellite watersheds were sensitized by using the knowledge-based EPA for which *gram sabha* was conducted in one of the selected satellite watershed villages. For *gram sabha* villagers from all the four satellite watersheds were invited as well as farmers from the nucleus watersheds. Lead farmers were trained to serve as trainers for satellite watersheds and all the necessary information and material were provided. Project staff did hand holding for the lead farmers to serve as trainers. Four to five lead farmers from the nucleus watershed narrated their experiences from the beginning ie, *gram sabha* in their village till the time they are standing as trainers. The complete progress of PR&D starting with problem diagnosis, designing of trials, evaluation of trial results and learning/results and further improvement in planning such trials were discussed by the lead farmers.

Results and Discussions

Improved crop cultivar as an entry point in Adarsha watershed, Kothapally, during the village meetings, farmers while describing the reasons for low crop productivity, indicated that during flowering large number of pigeonpea plants died due to drying and wilting (Fig. 3) Diagnosis of the problem suggested that the pigeonpea cultivars used by the farmers were susceptible to wilt disease. Following the diagnosis of the problem, the introduction of improved, wilt- tolerant pigeonpea cultivars was identified as an appropriate candidate for EPA (Fig. 4). The pigeonpea yields harvested by farmers from the intercropping system were around 200 kg per ha^{-1}. Following discussion with the villagers, the local pigeonpea variety was replaced by wilt-tolerant cultivar, Asha (ICPL-87119). The seeds of improved cultivars ICPL-

Figure 3. Wilted pigeonpea plants.

Figure 4. Good pigeonpea crop.

87119 were made available to the farmers on cost basis or on the condition that after harvest, they will return the seed at the ratio of 1:1.25. During the first season in 1999, farmers harvested 600 kg ha^{-1} of pigeonpea, which were 3-4 folds higher than the yield harvested by growing local cultivar (Table 1). Pigeonpea being a legume and high-value crop, net benefit for the farmers was almost Rs. 6000 ha^{-1} (US$ 146) which acted as a trigger for the community to participate actively in the program. During the subsequent years also, pigeonpea yields improved further with improved nutrient and water management practices during both low and high rainfall years. This knowledge-based EPA proved the power of suitable EPA for building the rapport with the community.

Table 1. Improved crop variety as an EPA-grain yield improved and traditional cultivar of pigeonpea in Adarsha watershed, Kothapally.

Crop	1998 baseline yield	Yield (Kg ha^{-1})									
		1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	Average yields	SE +
Improved Intercropped pigeonpea	190	640	940	800	720	949	680	925	970	861	120.3
Traditional Intercropped pigeonpea	-	200	180	-	-	-	-	-	-	190	-

Soil Sampling, Analysis of Results and Discussions in a Village Meeting.

It was observed during the PRA discussions in all the APRLP nucleus watersheds that farmers were aware of degradation of land. They expressed in simple terms such as need to add increased quantities of fertilizers for maintaining crop yields over the years. Land unit price was used as a composite surrogate indicator for land and water quality/availability in the villages (Joshi et al. 1997). Secondly farmers easily understood the nutrient budget concept and expressed lack of information about their soil quality. Listening to the responses from the farmers, it was clear that traditional extension service model was not working. By adopting PR&D approach in all the nucleus watersheds farmers appeared enthusiastic and willingly came forward to participate in the soil sampling of their fields. Good number of farmers were involved in collecting soil samples along with the NGO/PIA supervision. Farmers collected representative soil samples on a toposequence and sub-sampled, and properly marked soil samples were handed over to the project staff (Rego et al. 2007).

The results showed that in all the nucleus watersheds 81 to 99% soil samples were found deficient in zinc, boron and sulphur, in addition to 100% deficiency in total nitrogen content. These results showed that carefully conducted PRA along with local practices knowledge could help diagnose constraint for identifying knowledge and constraint-based EPA (Fig.5).

Figure 5. Village meeting to share the knowledge and identifiy constraints.

In nucleus watersheds farmers were very happy to learn about their soil health as well as the remedies to address the constraints. In the first year (2002) 15 volunteer farmers from each nucleus watershed were identified for conducting on-farm participatory trials using crop of their choice. In 2002, there were two treatments, ie, control (farmer's nutrient input practice) and application of micronutrients (30 kg S ha^{-1} 0.5 kg B ha^{-1} and 10 kg Zn ha^{-1}) in addition to farmers' nutrient inputs. In all 150 trials in three districts using different crops like mungbean (9), maize (22), groundnut (19), pigeonpea (43) and castor (8) were conducted. Due to drought few trials were abandoned. Impressive responses of grain yield to applied B+Zn+S in all crops (maize 65%, groundnut 33%, mungbean 43%, pigeonpea 63% and castor 50%) (Table 2) were recorded.

Farmers not only harvested increased grain yields but benefited economically (Fig. 6) by additionally investing Rs. 1750/- (US$ 39) per ha for these nutrients.

These results clearly demonstrated that appropriate EPA could ensure tangible economic benefit to individual farmers. As indicated earlier identification of major constraint limiting crop production and its alleviation ensured tangible economic benefits to individuals triggering their interest to participate in project activities (Olson, 1971 and Wani et al. 2003, Sreedevi et al. 2004). These lead farmers not only

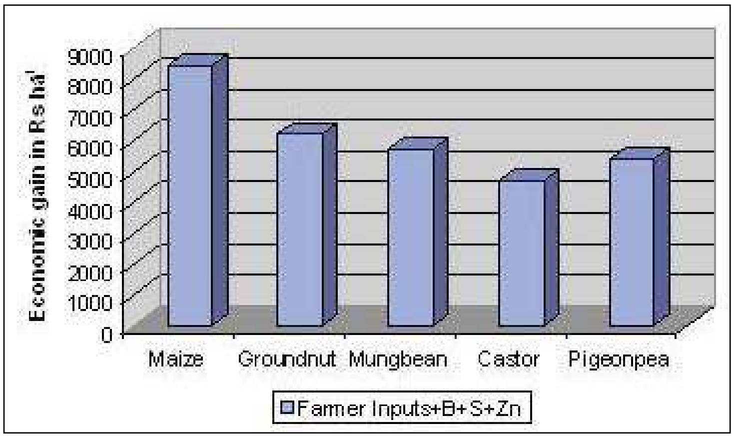

Figure 6. Economic gains due to micronutrient application to various crops in the APRLP watersheds in three districts in Andhra Pradesh, India ,during 2002 rainy season.

continued application of micronutrients and participated actively in community watershed program but also spent their time as resource farmers/trainers for satellite watersheds.

Table 2. Crop response to micronutrients in watersheds in Andhra Pradesh, India, 2002/03

		Grain yield (t ha^{-1})		
Watershed	Crop	Control	Treated	Yield increase over control (%)
Mahabubnagar				
Sripuram	Maize	2.38	4.37	84
	Pigeonpea1	0.24	0.42	75
Malleboinpally	Maize	2.98	4.57	53
Mentepally	Maize	1.20	1.74	45
Nalgonda				
Tirumalapuram	Castor	0.43	0.64	49
	Pigeonpea1	0.41	0.46	12
Nemikal	Mungbean	0.84	1.10	31
	Pigeonpea1	0.35	0.66	89
Kurnool				
Karivemula	Groundnut	1.44	1.96	36
	Pigeonpea1	0.13	0.33	154
Devanakonda	Groundnut	0.94	1.24	32
	Pigeonpea1	0.23	0.50	117
Nandavaram	Castor	0.86	1.29	50
	Pigeonpea1	1.63	2.64	62

1. Represents intercrop

Lead Farmers as Trainers for Up-scaling Strategy

During 2003, in all watersheds (10 nucleus + 40 satellite) operationalized for up-scaling strategy where principle of internal learning was introduced within the PIA as each PIA implemented at least 10 other micro watersheds as well as nucleus watersheds as sites of learning.

The nucleus PIA and lead farmers served as trainers for PIAs and farmers from the satellite watersheds. Lead farmers were equipped with all the details for explanation such as soil analysis data, total yield, nutrient uptake data and economic returns.

In 2003, farmers preferred to evaluate responses to individual micronutrients particularly in nucleus watersheds. Three volunteer farmers in each watershed evaluated B, Zn and S individually and B+Zn+S with and without optimum N and P. For simplicity these treatments were over and above farmers' nutrient inputs. With increased number of treatments plot size was reduced for each treatment to accommodate within 2000 m2. Combined application of micronutrients at optimum N+P resulted in the highest response and the additive response to each deficient element, was observed. Inadequate supply of N & P at farmer's input level, full potential of B, Zn and S could not be harnessed. Increased crop yield at farmers' input level for different crops varied from 37 to 88% and with optimum N and P levels response varied from 55 to 122% for different crops (Table 4).

Table 4. Crop response to micronutrients in watersheds in Andhra Pradesh, India, 2003/04.

District	Crop	No. of farmers	Grain yield1 (t ha^{-1})				
			Control	Control+ MN		Control + MN + NP	
Mahabubnagar	Maize	14	3.34	4.58	(37)	5.17	(55)
	Sorghum	6	0.90	1.46	(62)	1.97	(119)
	Castor	8	0.94	1.38	(48)	1.65	(77)
	Pigeonpea	3	0.86	1.48	(71)	1.88	(118)
Nalgonda	Maize	10	2.01	3.60	(80)	4.46	(122)
	Mungbean	6	0.91	1.39	(54)	1.54	(70)
	Castor	9	0.48	0.76	(59)	0.78	(64)
	Groundnut (pod)	7	0.62	0.93	(49)	1.14	(84)
	Pigeonpea	5	0.65	1.21	(88)	1.22	(90)
Kurnool	Groundnut (pod)	23	0.90	1.32	(47)	1.59	(77)
	pigeonpea	4	0.70	1.06	(50)	1.20	(70)

1. MN = micronutrients; NP = optimum nitrogen and phosphorus.

Figures in parentheses indicate percentage increase over control.

Source: Rego et al. 2005.

During the cropping season, the cycle of field days and data collection was repeated. During field days media reporters also participated and helped in dissemination of results to large number of stakeholders. Based on the successful evaluation of up-scaling strategy of one nucleus and four satellite watersheds this approach was used in other community watershed projects in Thailand, Vietnam, China and India supported by the ADB and in different states of India supported by Sir Dorabji Tata Trust in Madhya Pradesh and Rajasthan and World Bank supported Sujala watershed program in Karnataka. Some of the other knowledge-based EPA we have tested in programs are improved stress-tolerant cultivars, village seed banks. However, while selecting EPA main criteria the benefit large number of individuals in a given watershed must be followed.

Recommendation for Practitioners

- Invest good time and resources to conduct initial PRA by a qualified expert along with a multidisciplinary team of scientists.
- Carefully identify most suitable EPA considering the criteria mentioned earlier.
- Ensure active participation of as many farmers through facilitation and engagement.
- Use simple and jargon-free language to communicate with farmers .
- Identify local examples to get realistically farmers engaged in PRA.
- Build and describe scenarios using example of EPA and show potential and realistic benefits.
- Clearly highlight Do's and Don'ts for the EPA.

Conclusion

- For building rapport with the community, good PRA and knowledge about local natural resources can be used to identify knowledge-based EPA.
- Knowledge-based EPA was found far superior than traditional subsidy or cash-based EPA for enabling community participation of higher order ie, cooperative and collegiate rather than contractual mode.
- Lead farmers and PIAs served as good trainers and contributed significantly in up-scaling strategy.
- Field days during the season where lead farmers explained the results to their peers, media personnel and policy makers proved very effective tool for up-scaling community watersheds in the SAT and benefited large number of families.
- This new approach of extension based on enhanced awareness of primary stakeholders by sharing knowledge proved more effective than cash-based EPA.

- There is much need to innovate new methods to share knowledge with primary stakeholders as traditional methods of extension are failing miserably in most of the developing countries in Asia and Africa.

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