Participatory Technology Development And Dissemination: A Methodology For PLEC-Tanzania

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Abstract

A methodology for Participatory in Technology Development and Dissemination (PTDD) was developed. The methodology is centered on empowerment of expert farmers to train other farmers using their own successful resource management models on their own fields. Farmer training other farmers enhances interactive discussions for exchange of knowledge and practices with facilitation by scientists and extensionists. On-site demonstrations, Farmer field days, Individual farmer experiments, Farmer groups training and farmer participation in stakeholder workshops are among potential tools for development and dissemination of technologies. Developed technologies are either adopted in the process of demonstration or testing, modified to cope with farmer resources endowment and biophysical conditions at homestead or rejected. All farmer categories particularly the poor, often left out in other approaches are involved. Due to farmer owning and taking the lead in experimenting, the rate of technology development, adoption and dissemination is reasonably fast.

Introduction

Farmers are the custodians of knowledge and practices that scientists base on to develop resources management technologies. A variety of participatory approaches in technology development that involve farmers exist. These methods are variously referred to. They include: Participatory Learning and Action (PLA), Participatory Technology Development (PTD), Farmer Participatory Research (FPR) and Participatory Extension Approach (PEA) (Jurgen et al. 1998). They apply participatory tools/methods aimed at: (1) Analysing community constraints and needs (i.e. Participatory Needs Assessment (PNA), or Participatory Situation Analysis (PSA). In this system communities are informers. (2) Joint identification (service providers in interaction) of solutions and actions to overcome constraints (i.e. Participatory Rural Appraisal (PRA) or Participatory Learning and Action (PLA). In this process communities take own responsible decisions.

Differences between participatory Approaches are often determined on how participatory participation is applied i.e. (a) Passive participation: Where communities

are mere recipients of messages, assistance and services. In this process communities have either to take it or leave it. (b) Active participation: Where communities are being consulted, they provide information on constraints, needs and even possible solutions. They carry out activities offered as solution by service providers based on PRAs and PNAs. Communities have a choice, but final solutions are offered by outsiders. Farmers don't feel the ownership. (c) Interactive participation: Communities, either among themselves or jointly with service providers, interact in knowledge exchange, solution finding, decision taking, in own implementation and monitoring and evaluation based on PRAs. Communities find own solutions, take own decisions and take responsibility of results. They feel ownership for actions and for results.

PLEC approach makes a step further to empower farmers to be trainers of other farmers based on their own successful management models. Successful farmers are termed "EXPERT FARMERS" within PLEC. These farmers have overtime accumulated knowledge and experience and developed and modified coping strategies to changes in environment for years to come to what currently supports their livelihood. PLEC uses scientists as facilitators to integrate scientific proven interventions with successful indigenous management models for their improvement.

The approach is to conduct PRAs in collaboration with farmers and identify constraints and appropriate management strategies that are environmentally, socially and financially sustainable, and that sustain biodivesrity, while also improving production and income. Unlike the conventional mainstream agricultural research at experimental stations, PLEC integrates locally developed knowledge of soil, climate, biological resources and other physical factors with scientific assessment of their quality in relation to crop production. It is a systems approach carried out in-situ on farmers own fields, taking into account current land use types and cropping systems. Appropriate technologies for a given system are selected from a basket of scientifically proved options and integrated to improve the quality of farmers' own models without conducting any new experiments. A set of sustainable agricultural technologies are devised so that crop diversity and management diversity are maintained.

The Process

Participatory Rural Appraisal (PRA).

Discussions are carried out between farmers, extension staff and researchers on key production constraints, farmers own copying strategies, extent of use of improved technologies, farmers evaluation of resources quality, crops and cropping systems, nutrient dynamics at farm level, differences in farmer abilities to cope with changes in climatic and biophysical changes, etc. Researchers and extension staff learn from farmers on their ways of resources assessment and management. Farmers are asked to draw maps of their farms indicating crops and cropping systems in each farm facet, reasons for allocating such crops and such cropping systems in a given part of the farm (field type) and the types and intensity of management of each field type. Figure 1 indicates an old farmer (with a stick) educating the researcher on plant indicators of fertile soils along a sloping land in Kiserian during PRA.

Figure 1. Farmer training the researcher on diagnostic indicators of fertile soil in previously maize cropped fallow.

Identification Of Expert Farmers

The second step is to select expert farmers to train other farmers. The process involves conducting more close discussions with more successful individual farmers in resources management at their homes. Researchers and extension staff learn from farmers on the reasons for their successes and failures of certain management practices. Also understand the value of such management models within the cultural and social framework of the area. An evaluation of the farmers' communication skills, willingness to share experiences with other farmers and the kind of respect they commands amongst fellow village farmers is made. Trainer expert farmers are then selected each for a specific model to train other farmers. They are also asked to prepare teaching aids and sites for training, demonstration and practice.

Expert Farmers Training Other Farmers

Expert farmers' successful management models are used as demonstration sites to teach other farmers. Village members are informed of the day, time and venue for training. The training is prepared carried out by the expert farmer at his/her farm. He demonstrates the management practices to other farmers and explains why the practice works. Interactions between the expert farmer, other participating farmers, researchers and extension staff continue during the demonstration. Where appropriate, researchers/extension chip in scientific facts that support performance of the practice and possibilities for improvement. Participating farmers may offer even better practical examples than those demonstrated by the expert trainer. Figure 2 indicates an expert farmer demonstrating agricultural intensification strategies in sub-humid land scarce Ng'iresi village.

Figure 2. Agricultural intensification demonstration in land scarce sub-humid Ng'iresi village.

The farmer (in red shirt and teaching notes) demonstrates to other farmers and experts methods of agricultural intensification under conditions of land scarcity. The fore field contains round potatoes at crop development where maize was planted after weeding and hilling up potatoes. The practice is to ensure that throughout the year there is a crop in the field. Behind participating farmers is a boundary narrow field planted with grevillea, chariandra and yams, an agroforestry system to meet food, fodder and timber household requirements from a narrow boundary strip).

A demonstration site becomes a class, the farm becomes a chalkboard, the expert farmer becomes a teacher, while experts become facilitators and participating farmers become both trainees and modifiers of the technology. At the same time, since the demonstration site field type is common in the village and different participating farmers manage it differently, some individuals pick part or the whole of the demonstrated practices for trying on their own farms. Others pick the technology and modify it their own way, while others pick nothing. In case of crops and crop varieties, interested farmers take with them planting materials or find out where to buy materials demonstrated during the training to plant.

Where the training is recorded, the video is used to train other farmers elsewhere or borrowed by participating farmers to follow up the training on video once more. At another date farmers convene at another expert farmer's field for training on a different management model. Farmers and experts from outside the sites also participate. They learn from on-site discussions but also contribute to the discussions. Their input adds to the experiences of host farmers. They also carry with them knowledge and practices or materials to their localities. In some cases groups of farmers from neighboring villages apply for an extended training in their village.

Technology development is also carried out through farmer managed experiments. Through PRAs

Resource management constraints are itemized and prioritized. Scientifically proved Interventions are identified for testing on volunteer farmers fields. Researchers and extension staff facilitate the administration of the interventions leaving the entire husbandry to the farmers. At crop development and maturity stages field days are organized for farmers evaluation of the performance of interventions and their potential for adoption. Figure 3 indicates comparative maize performance under soil fertility and water harvesting conditions with farmyard manure and tie-ridges (right) compared with fertility improvement using manure only under semi-arid farming conditions. During the field day all farmers were pleased with maize performance under manure and tie-ridging but rejected the use of tie-ridges and selected deep tillage and thorough manure incorporation (treatment not shown) instead. Deep tillage was easy to adopt under cultivation with oxen and resolved the problem of subsurface hardpan created by ox-plowing and hampering water infiltration.

Figure 3. Farmer led experiment on fertility and water harvesting in semi-arid Kiserian village

Training is also carried out at individual farmers fields based on farmers own initiated experiments. Individual farmer experiments were not known to scientists before in Arumeru. Neither were the results documented nor disseminated. Related research work happens to be on-going at neighboring research stations. Farmer experiments are diverse, dynamic and private. They range from plant breeding, soil management, pastures and forest management to pest and disease control. Hardly any farmer discusses his/her research with somebody else nor do they document their success or failures. One farmer may conduct more than one experiment at the same time. Table 1. Indicates individual farmer experiments in Olgilai/Ng'iresi and Kiserian.

Table 1. Individual farmer experiments in Olgilai/Ng'iresi and Kiserian sites.

Farmer	Experiment	Duration	Outcome
Konyokyo	Maize/beans intercrop spacing	2 years	Spacing (cm) of 75x30 (75x60) maize and 45x15 changed to 90x30 (90x60) maize and 30x15 for beans.
Gidiel	Ratios of urine and water in making pesticides and accaricides for crop and animal pests control respectively	3 year, on-going	Urine:water ratio of 1:20 lters for vegetables and fruits and 1:20 plus some tithonis spp leaves leaves once a week.
	Sorghum, millet and soyabeans production under sub-humid environments	1st season second season for soyabeans	Plant sorghum and millet in March /April and Soysbeans in June/July. Sorghum and Soyabean perform well in all soil types unlike beans. Millet performs well in fertile soils.
	Maize breeding of HB 622 vs Larusa	1997 and 1998	Matatu cross breed with the following qualities: better milling quality, sweet, small cob with many grains, post harvest pest tolerant, more tolerant to lodging when well spaced.
	Use of different types of fertilizers for couliflower production: ordinary soil, ashes, chicken maure, manure, forest soil. SA	One season	Poorest performance with ordinary soil, premature leaf shedding with ashes.

	soda at planting and after second weeding		Highest yield with chicken manure followed by farmyard manure. Others comparable.
Navaya	Breeding for CBD tolerant coffee	9 years	Good seedlings transplanted to the farm after 9 yrs. Also source of proper seedlings proposed by neighboring farmer during farmer field day at his place.
Logoro	Soil moisture conservation in semi-arid Kiserian.	2 years	Hilling up of maize and weed control to reduce soil moisture competition.
	Early bright control in beans in semi-arid environments.	Continuous	Continuous selection of upright varieties leaving out others.
Kisioky	Evaluation of palatability of grasses in the conserved household pastures.	Since 2000	Natural palatable grasses species maintained (Emurwai, Ologor-oing'ok, Olkujita-onyokie, Osangari, Enyoru) and improved ones introduced (Elephant grass).

Farmer experiments are partly in response to constantly changing environments or changes in resources potential. They are also a result of lack of needed advisory services. Farmers also conduct experiments to evaluate the performance of techniques they get through outreach programmes like farmer field days, national/regional agricultural shows, agriculture and extension workshops, etc. It is only through close interactions with them that experts can recognize, discuss and monitor progress of what they are

doing. Several of the commonly grown bean varieties in Arumeru, are either a result of farmers own acquisition from friends, local markets or their own crosses. They also plant varieties from research institutions. Individual farmer experimental sites are also alternative sites of technology development and demonstration using the same expert farmers. It is the Project intention to initiate joint research topics between farmers and researchers and improve on the quality and documentation of farmers research outputs but also save time and resources both ways.

Farmer groups training

Expert farmers are also influencial in organising farmer groups and group activities on resources management for biodiversity enhancement, production and livelihoods improvement. Farmer groups identify their leaders and establish a constitution for their operations and responsibilities. In most cases expert farmers become leaders of such groups and influence group activities. Training is one major activity of the group activities. Through group action the more skilled train the less skilled and experts carryout training on improved approaches to modify and improve on the performance of their group activities. Working with groups makes it possible to access females otherwise difficult to talk to and farmers who were difficult to meet under normal village visits. Women groups have also been established in order to address them easily using female experts. Figure 4 indicates a female expert training other woman on local chicken production alternatives. In the fore front is an ordinary box with holes and lantern to raise day old chicks, to the left and behind the trainer is an improved box made of ceiling board and wiremesh also to raise day old chicks. Local chicken were found to require little initial capital to start the project. The paper box costs 0.6 US$ and sometimes free while the improved box costs 15 US$. Chicken were also found to be women's cattle as they can do anything with them without asking the husbands.

Figure 4. Female expert training a women group on low cost commercial raising of local chicken.

They provide manure, improve farmers nutrition and enhance biodiversity. After one year of training more than five women groups were formed and more than 70% of the households kept chicken. The groups are dynamic units of information sharing and technology development and dissemination first within groups and to neighboring and distant interested villages.

Active Participation Of Farmers In Stakeholder Workshops

Another tool for participatory technology development and dissemination is participation of farmers in various stakeholder workshops. Their physical presence and participation in deliberations inspires them work more and much better than before. Figure 5 indicates a one of the poorest widow with only 0.12 ha of land addressing workshop participants on how she is closely working with PLEC to diversify production from her small piece of land.

Figure 5. Female farmer addressing a stakeholders PLEC workshop in New Arusha Hotel.

As she could not speak Kiswahili, an extensionist helps translate Kimeru into Kiswahili. For this farmer crop livestock interaction interventions helped improve her food requirements and some cash from egg sales. Such poor farmers particularly women are in most cases left out in participatory rural development activities. PLEC works with all farmer categories women and men. Results on agrobiodiversity assessment also indicated poor farmers to be custodians of biodiversity (Elia et.al., 2000).

Such workshops have also been training occasions for policy and decision makers who least visit farmers in the villages. From workshops policy makers help sensitize other farmers and experts to practice/demonstrate good practices. We have seen decisions taken during or after farmers-experts-policy and decision makers interactive deliberations in PLEC workshops and meetings. Previously it was not a common practice to involve farmers in meetings/workshops that deliberate on farmers resources management practices or small scale farming and rural development

Advantages of the methodology:

Farmer centered: Farmers indicated during different workshops that technologies developed address existing constraints and touch farmers daily life. Experiments and demonstrations are owned and managed by farmers well known to other farmers.

The adoption of the technology with or without modification is based on farmers own assessment and is advocated and promoted by farmers themselves instead of extension/research staff.

The process starts from what farmers are already successfully doing on their farms that is improved using scientifically proven technologies.

Adoption is gradual and in-situ taking place with continued evaluation on farmers own fields. Adoption may also take time depending on the types of farmers in partnership.

Dissemination is rapid and extensive. It starts immediately with farmer participants. spreads widely to neighboring villages, districts, regions and the whole nation at the same time.

Improved technologies depend on integration of existing scientific methods instead of taking a long time of experimentation and evaluation to develop new technologies. It is cost and practically effective.

The methodology is expensive to implement due to frequent visits that are needed by experts to continuously interact with farmers.

Summary and conclusion

PLEC-Tanzania approach of Participatory Technology Development and Dissemination (PTDD) is centered on expert farmers as trainers of other farmers. Successful models of resources management are demonstrated to other farmers. The training provides room for exchange of knowledge and experiences, besides exchanging materials and testing and/or modifying techniques to fit individual farmer field conditions. Experts facilitate the process by introducing ways of integrating scientifically proved interventions into local models to improve their quality or effectiveness. School children who are future custodians of the resources currently being used are also involved in on-site farmer training sessions. The methodology requires experts to work as equal partners with farmers in information sharing and implementation. Besides demonstrations of successful models on expert farmers fields, individual farmer experimental sites, joint researchers, farmers and extensionists research projects on farmers fields, outreach and farmer field days and farmers participation in stakeholders workshops are other tools that facilitates and fasten the process of information exchange, technology development and testing, adoption and dissemination with the farmer at the steering seat. It has

shown to be fast in technology development and dissemination to many farmers at a desirable rate. The approach is recommended for further testing before recommending its wide adoption.

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