# Soft technology development in an agricultural R&D project: Farmer empowerment to bring about practice change, lesson learnt from Eastern Indonesia

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**ABSTRACT:** Sustainable practice change from agricultural research and development projects in Indonesia has been a tangible issue. Many farmers return to their previous behavior after the project finished. On the other hand, a lot of R&D projects focused on hard technologies development while often overlooked methods and approaches required in changing farmers practice. At the same time, the government's institutions to support and spread the practice change like extension institutions have also been in disarray. The aim of this paper is to provide another perspective on approach and methods to bring about change in farmers' practice in agricultural R&D projects that involve multi stakeholders. A case study research was conducted on a pilot project during September 2009 in Oebola village, Kupang District. It was a collaborative project between IAARD Indonesia and ACIAR Australia on integrated crop-livestock system base. Methods for data collection in this study included document analysis, focus group discussion, in-depth interview and direct observation. The study found that partner farmers in the project willingly changed their practices and promised themselves to keep practicing the new ones. This was attributed to the soft technology developed during the project life including participatory need and opportunity assessment, multi stakeholder linkage under participatory communication framework and participatory learning for action based on adult learning principles. By the time the study was conducted, the practice change spread widely from only seven collaborative farmers to majority of farmers in Oebola and the neighboring villages. Furthermore, the provincial Office of Agriculture and partner NGO have implemented model from this pilot project in their respective programs.

**Key words:** participatory approach, participatory communication, collaborative research

Abbreviation:
ACIAR = Australia Centre for International Agricultural Research
AIAT = Assessment Institute for Agricultural Technology (Balai Pengkajian Teknologi Pertanian/BPTP)
ENT = East Nusa Tenggara
IAARD = Indonesia Agency for Agricultural Research and Development (Badan Penelitian dan Pengembangan Pertanian Indonesia).
NGO = Non Government Organization
R&D = Research and Development
SMAR = Support for Market-driven Agricultural Research

## INTRODUCTION

Agricultural research and development in Indonesia has undergone transformation from the transfer of technology model during *the Green revolution era* into a more participatory approach post Green Revolution. During the Green Revolution era (1970s to1980s), Indonesia followed the global trend of development through modernization. Driving in with modernization paradigm, agricultural research and development mostly adopted the "transfer–of– technology" model (Chambers & Ghildyal, 1985; Pretty &

Chambers, 1993) where extension activities applied "training and visit" model (Van de Fliert, 1993). Technologies were developed by scientists in the research centers to be handed over to extension to pass on to farmers (Pretty & Chambers, 1993). ExtensionistS trains farmers in a demonstration plot and visit them to ensure farmers are doing exactly what they have been told and also to help the trained farmers influence others to follow the practice (Van der Eng, 1996). Farmers were seen as either "adopters" or "rejecters" of technology (Scoones & Thompson, 1993).

However, despite more than thirty years of agricultural development, problems still haunt Indonesian farmers. Increasing poverty rate, high dependency on foreign agriculture products and increasing unemployment in rural areas still remain (Harianto, 2007). A number of critics (Birowo & Hansen, 1981; Thorbecke & Van der Pluijm, 1993; Van der Eng, 1996) underlined that the top down approach of transfer-of-technology model contributed greatly to the disability to bring proportional prosperity for rural people. Therefore, there have been calls for more participatory approach in rural development process that facilitate active involvement of local people (Anugrah & Suryani, 2007; Saptana & Ashari, 2007). This call is strengthened by the fact that many agricultural research and development projects achieved limited impacts on farmers' livelihood. In the Eastern Indonesia, only few recommended technologies have been taken up and practiced by farmers, while many others are being neglected (ACIAR, 2008). Hence, alternative approaches for R&D projects will be necessary.

As an attempt to answer the call for more participatory approach in agricultural R&D projects, a pilot project based on integrated crop-livestock system was initiated by the IAARD in collaboration with the ACIAR in Kupang. This paper aims to provide another perspective on approach and methods to bring about change in farmers' practice in collaborative agricultural R&D projects that involve multi stakeholders.

## RESEARCH METHODOLOGY

### *Case Study Research*

A case study research was conducted in 2009 for a project entitle "assessment of technology and management development model for integrated maize-cattle farming system to support agribusiness in semi-arid East Nusa Tenggara". The study aimed to analyze approach and strategies that could enhance effectiveness of collaborative agricultural R&D project in supporting farmers practice change and hence impact. This project will be called Kupang project onward for writing purpose. Case study research (Yin, 2003) was chosen because the project is a complex social phenomenon that involves farmers' life and interaction between stakeholders. This particular research methodology would help investigator(s) to understand complex social phenomena and to retain the holistic and meaningful characteristics of real-life events (Burns, 2000). Kupang project was selected as study case because it had significant different approach and methodology in comparison to other similar collaborative research projects in the region.

### *Data Collection and Analysis*

As qualitative study, this research relied on several methods for data collection including document analysis, direct observation, in-depth interview, and focus group discussion (Marshall & Rossman, 2006; Yin, 2003). Focus group discussion was carried out for farmers group attended by seven participants while in-depth interview was conducted for the representative of project's stakeholders. All data were transcribed, coded and filed using Nvivo software (Saldana, 2009). Data were examined, categorized and themed to address study purpose (Yin, 2003).

### *Results*

Apart from delivering several hard technology contents to improve integrated maize-cattle productivity, more importantly the Kupang project also developed soft technology (approach and methodology of choice) targeting human as actor and factor. This soft technology development was reflected in the methodology applied during project implementation as will be discussed further.

### *Project Scope*

***Project Design .*** The Kupang project was part of a large collaborative program between IAARD and ACIAR under SMAR program. One of SMAR objectives was to develop improved approaches in collaborative research and establish more effective knowledge exchange processes between R&D providers (ACIAR SADI a, 2009). Therefore, SMAR sponsored this pilot project as a means to achieve its objectives. IAARD appointed AIAT of East Nusa Tenggara as the project coordinator.

By referring to SMAR guidelines for pilot project where commodities should embrace a great number of farmers, researchers from AIAT proposed cattle and maize as project priority topic. Maize is staple food for majority of Timorese while most farmers rear cattle that play crucial roles as family economy buffer. Topic selection also counted possible support could be obtained from interested stakeholders. Detail of design process for Kupang project is depicted in figure 1.

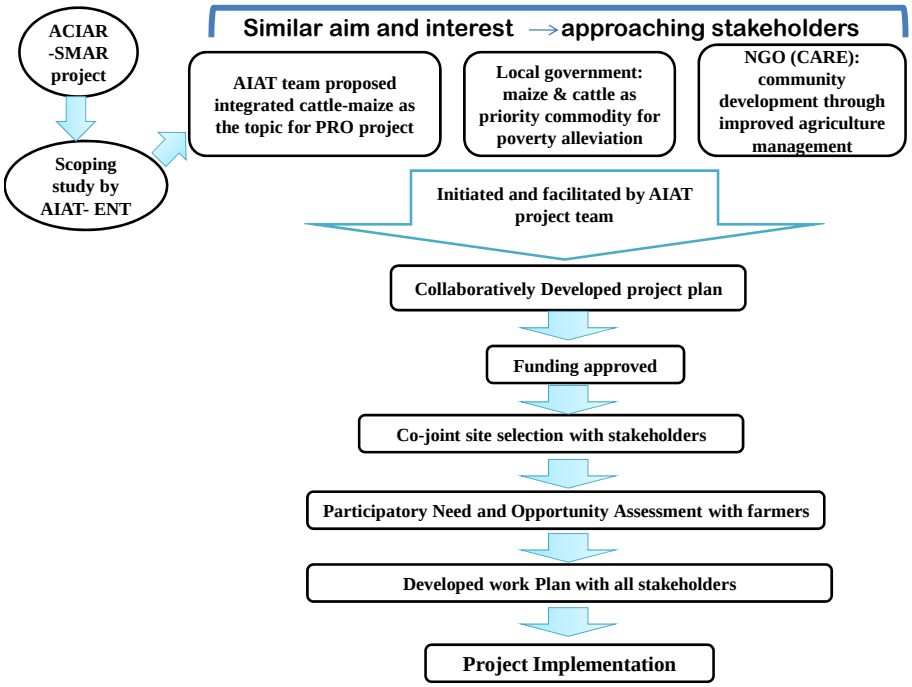


**Figure 1.** design process of Kupang project

The objective of Kupang project was to enhance farmers' income through improved technology and management system for integrated maize-cattle. By this income enhancement, farmers who mostly reared someone else cattle were expected to have their own cattle. The project was divided into two phase, the first phase was to develop, adapt, test and adjust a model of collaborative project involving multi stakeholders based on integrated maize-cattle; while the second phase was a rolling out phase of the

model to be adjusted for wider implementation. It was expected that by the end second phase, a model for region wide would be established (Kupang project document).

This pilot project collaborated with several stakeholders that were two farmers' group in Oebola and Tuapanaf villages, Provincial Office of Agriculture, local field extensionist, NGO and AIAT team. Due to resource limitation, this study only focused in Oebola village for the first phase of the project. The first phase started in July 2008 and finished in July 2009.

***Farming System .*** Oebola is located around 120 kms North East of Kupang. As common geographical conditions in Eastern Indonesia, Oebola only experiences four wet months in one year. Hence, vast majority farmers establish maize farming for food security and rely on dry tolerant livestock such as Bali cattle as source of cash income. Most villagers are subsistent farmers who rear someone' else cattle under grazing system.

The existing farming practices in Oebola adopted traditional model from their ancestor teaching with obvious low productivity. An interviewee (K8, farmer) gave an example, if a farmer would like to plant maize, he would plant the seed in triangle pattern based on their random feet step in the field. The wider the step, the wider the space between plants. They usually put 4-5 seeds every hole. Another interviewee (K3) added that farming in Oebola is without target. They commonly practiced patchy farming in the backyard often less than 100 $m^2$. After planting usually they neglected the farm and only wait for whatever yield they would harvest. Very often the harvest yield is very low that could not meet food security requirement for one family in a year. Hence, poverty is a common scene in Oebola.

Contrastingly, land tenure is not a limitation factor for farming in Oebola. One household can own/manage four hectare land. Nonetheless, only one tenth or even less of this land is planted due to labor shortage. A great portion of labor is allocated for manual weeding and fencing. Land fencing is very crucial to protect crops from grazing cattle. It is an annual routine as the fence cannot stand until the next year planting season.

### *Project Approach and Contents*

This project employed on-farm research where technologies would be tried, assessed and adjusted by farmers in their land. Although this type of research may look similar to other agricultural R&D projects,

**Table 1**. project contents for the first phase

| Farming management | | Existing practice | Improved practice |
|---|---|---|---|
| | | ≤ 0.25 hectare/household | ≥ 1 hectare/household |
| | Farming orientation | For food security and purchasing cattle as cash income | For food security and purchasing breeding cattle |
| | Production target | No target | ≥ 5 ton/hectare |
| | Extension system | Conventional (Training and Visit) | · Cross visit.<br>· Thematic training<br>· Farmers workshop |
| Farming practices | Tillage | None, slash and burn | Minimum tillage or none |
| | Seed/hole | 4-5 seed/hole | 1 seed/hole |
| | Planting pattern | random | Rows in order |
| | Maize variety | Local and descendant superior variety | Var. Lamuru |
| | Fertilizing | None | Low dose of urea |
| | Weeding | Manual in all plantation area | Confined weeding and application of herbicides |
| | Pest management | None | Insecticides |

this pilot project has particularity on its approach and philosophy. The project held on participatory approach as philosophy underpinning this on-farm research project. Stakeholders were actively involved in every stage of the project including for decision making. "*..from the beginning we plan the project until final workshop, farmers had to say what they expected from the project..*" (K3, extensionist). "*..the planning process started from farmers based on local opportunity. So the decider was farmers in collaboration with project team, we facilitated them then provided technical suggestion..*" (K4, field extensionist). "*..indeed this is an extra ordinary project for us; incorporating researchers, community, related government offices and farmers, this is our dream..*" (K6, NGO). "*..I have to say this project is a great model because we were involved from the beginning..*" (K5, Office of Agriculture).

In order to achieve its objective, the project brought several technology contents as shown in table 1.

***Project Methodology***

The methodology for project implementation involved a number of processes including:

***Participatory Need and Opportunity Assessment (PNOA).*** PNOA was conducted as the initial step of project implementation. It was employed to raise farmers' awareness about their needs and potency as well as to uplift their motivation for livelihood improvement through practice change (K1, researcher). Several methods and tools of participatory approaches were used for PNOA such as focus group discussion, seasonal calendar, matrix ranking and in-depth interview. Project team acted as facilitator that encouraged farmers to mention their ideas. It was challenging in the beginning as partner farmers tended to keep silent and pointed other counterparts particularly group leader to speak. However, after several ice breaker activities with project team, they gained confidence to start expressing their opinion.

***Selection of Partner Farmers.*** The pilot project worked closely with seven out of twenty two group members as main collaborator, the remaining group members became side collaborator yet actively observed the processes. The selection process was run by group members by considering requirements and commitment to the project. This project held on participatory approach, however partner farmers were also bond with commitment to plant ≥ 1 hectare land/HH, implement improved technical practices that were developed in collaboration between farmers and project team and to allocate a portion of harvest yield to purchase cattle.

***Socialization of Annual Work Plan.*** Based on the PNOA results, the AIAT team developed annual work plan. However, prior to the implementation, they put emphasis to socialize and discuss this work plan among stakeholders especially partner farmers. All stakeholders were given opportunity to assess, question and even alter the work plan. The approved work plan was then used to bind stakeholders' commitment for further project implementation.

***Incentives.*** The project provided small amount of incentives for farmers to support the implementation of project contents. This incentive was supporting material for technology implementation that partner farmers had no access to them such as quality maize seed and small amount of chemicals.

***Trainings.*** Thematic training model (one training one theme) was chosen in this project to improve partner farmers' knowledge and skills. Prior to the next activities, partner farmers were trained on themes based on the next agenda. Trainings were initiated with short class of theory by the project team followed by field practice. There were several interesting parts of this thematic training. Unlike in other trainings, here every participant had to re-explain the theory in front of the class in their own language and understanding. In the first training, participants were very reluctant and quite shy to speak. The trainer that also acted as facilitator attempted to create conducive environment by using informal and personal approach to encourage participant speaking out. After several training, farmers gradually gained confident to speak and act as resource person. When this study was conducted, every participant was willing to speak in the focus group discussion confidently even though some of them did not speak in Bahasa Indonesia. Another interesting part was that training also used as opportunity for knowledge exchange for all participants. Anyone could be the source of information. This was supported by the project environment that enabled knowledge exchange and information sharing in multi ways at equal level.

### *Participatory Monitoring and Evaluation*

Partner farmers and all stakeholders were involved for monitoring and evaluating of the project. For the purpose of evaluation, project team in collaboration with farmers determined indicators of every project stage. Therefore, farmers could assess themselves whether they were performing well or not in achieving their target. Target for farmers were realistic and achievable that farmers felt no extra burden over implementing the technology to achieve the target (K1). In assessing their performance, partner farmers were trained to do on-going record for every activity in their farm and the results. This record were then compared with their target and analyzed for its strengths and weaknesses.

***Communication to Engage Stakeholders.*** Stakeholders in this pilot project were engaged through three main communication mechanisms, formal, informal, and through gate keeper communication. The two last mechanisms were considered as the most important mechanisms by majority of interviewees. "*..communication through formal letter is ok…but..some forms of informal communications are very-very important because when we are in the field, there are several things need to be communicated and decided immediately, and they cannot wait for formal letter..*" (K5, Office of Agriculture). "*..if we had problems in the field, we told the Mister Leader to inform the project team so they could help us how to solve it. Our principle is…outsider cannot enter this village without going through Mister Leader, any coming in or going out information must be through him..*" (K9, K10, farmers).

### *Achievements of the Project*

Achievement of this project can be divided into, physical and non-physical achievements. Physical achievements were represented by improved farm productivity and the scope of practice change. Through farmers' practice change, the maize productivity increased impressively. "*..this year we got extraordinary harvest yield, I got 38 bags of maize, previously I never had more than ten bags, not enough to feed my family. I am very pleased with the results and I promise myself to continue this practice..*" (K9, farmer). This remarkable production increase has attracted many other farmers to practice the improved farm management. Majority of farmers in Oebola now have followed the practice change from Kupang Project (K7). This practice change has also reached other villages in significant distant (K2). For example in Tumnanu village, the practice change has been implemented by 70 households in 68 hectare land, while in Belu, another district close to Timor Leste border, the practice change was implemented through other Office of Agriculture program in 100 hectares land. To add, the NGO CARE duplicated the contents and methodology of this pilot project for farmer empowerment program in other areas (K6).

Meanwhile, non-physical achievement was shown by partner farmers' self-development. In the first interaction between project team and partner farmers, it was obvious they were somewhat unconfident and hardly spoke out. In contrast, during this study, everybody was willing to speak and pointed out their idea, analysis and opinion. "*…if there are new outsider, we would like to challenge them to compete farming with us..*"(K9, farmer). This expression shows that they are confident with knowledge and experiences they obtained from this pilot project. The knowledge and experiences they have mastered.

### *Lessons Learnt*

Considering the short duration of this pilot project (one year) and its wide implementation, there are several lessons can be learnt for an effective collaborative R&D project that involves multi stakeholders. Effective here is understood as project ability to achieve its outputs and outcomes with available time and resources. These lessons include:

***Priority Assessment.*** Prior to project design stage, the team from AIAT conducted assessment on research topic. A researcher (K1) admitted this step as critical point because it could determine level of acceptance and support from stakeholders. Descent project contents yet uninteresting for stakeholders would only end up for the sake of project itself with limited impacts. This important point is also

acknowledged by Raitzer and Norton (2009) who stated that priority assessment can be an important way to engage stakeholders for the process and a tool for monitoring and evaluation that stakeholders can always reflect on their achievement and their goal. Priority assessment in this project found cattle and maize as research priority that embrace great number of farmers. It was also the interest of other important stakeholders. This project proved that interested stakeholders would put assistance and resources to support the project gaining its objectives.

***Active Participation.*** Active involvement of stakeholders in various stages of the project has contributed building sense of ownership to the stakeholders to great extent. This instigated them to implement the project idea in their own program. The provincial Office of Agriculture launched a program based on the project idea in other areas in East Nusa Tenggara as well as brought supporting programs in Oebola. Meanwhile, the NGO CARE adopted the model for their community development model in their working areas. This depicts that active involvement of stakeholders will contribute to escalate the impact of a collaborative project. Similar evident is captured by Pretty (1995). She argued that local success based on community planning usually remains local that they do not spread. Therefore, involvement of local government as policy maker and other NGOs is necessary to draw public attention into it that can result in greater empowerment of the poor. This is in line with this project experience.

***Farmer Empowerment Through Adult Learning Process.*** This project attempted to empower farmers through capacity building. Hence, training was the chosen method to improve partner farmers' capacity. In the implementation level, thematic training was designed to match adult ability to absorb and internalize new information and then transform it into practice. The project was aware that adult learners like most partner farmers could not absorb, digest and practice too much information at once. Therefore, the project divided training themes into more doable portions. This principle was also suggested by Stanfield (1997) in his adult learning principles. These include assisting adult to learn their interest, creating conducive learning environment, involving and valuing their experiences, encouraging them to plan, act, reflect and draw conclusion. The result was significant from this project, partner farmers gained not only knowledge but also self-confident to act as resource person. This can contribute greatly to spread the technology practice because farmers were prepared and ready as the extension of project team.

***Participatory Communication Mechanism.*** The pilot project put significant effort to establish communication among stakeholders. The AIAT team initiated building informal communication that later become one of the determinant factors is gluing the various stakeholders with varying interest and operation mechanism to work collaboratively in one project. The communication mechanism in this project improved the conventional one flow mechanism when sender send a message through media to a receiver to act as massage received (Servaes, 1996). Rather, the mechanism in this project allows feedback flows and interaction between senders and receivers. Researchers in the project team did not tell farmers what to do; rather they discussed the issues, allowing feedback from farmers to identify the best bet practice. The result was obvious that farmers establish ownership of the decision and treat it as their decision that they have responsibility to implement it.

## CONCLUSIONS

This study found that the approach and methodology of collaborative agricultural R&D projects can contribute significantly to project effectiveness. Participatory approach reflected on active involvement of stakeholders and provision of opportunity to make decision have shown as determinant factors for an effective project. This is supported by participatory communication that enables knowledge and information exchange among stakeholder that can lead to establishment of ownership. Departing from this sense of ownership, stakeholders then are bond with commitment to contribute achieving project objectives.

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