

**95a. MANAGING LOCAL CONFLICTS OVER WATER RESOURCES:  
A CASE STUDY FROM NEPAL**

**Bishnu Raj Upreti**

**95b. KUMPULAN INFORMASI TEKNIS: A PROCESS AND  
TOOL TO OBTAIN, BUILD ON AND DISSEMINATE  
LOCAL TECHNICAL KNOWLEDGE**

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**Abstract**

*Both of these papers highlight the role of local institutions and knowledge in the development process. The first paper examines the many on-going debates in Nepal between GOs, NGOs, donors and other stakeholders over how to achieve more efficient, productive and equitable use of water resources. Attempts to coordinate stakeholder solutions at the macro-level have made little progress. This has led to an increased emphasis on finding locally relevant solutions to these issues, initiated at the micro-level. People have their own mechanisms and procedures to deal with decision-making as well as to manage conflict. However, these initiatives have hitherto received little attention. This paper presents an analysis of the strategies and mechanisms that local people use to manage conflicts over water resources. It begins by introducing some theoretical concepts, which are useful in understanding the nature of conflict and the negotiation process. A case study describing how individuals and institutions tackled problems relating to access to spring water in Dolakha district in central Nepal is then presented. It concludes that with appropriate facilitation, local people are able to create a common forum to resolve their own conflicts and establish win-win solutions to internal disputes over resource use. Both of these papers highlight the role of local institutions and knowledge in the development process.*

*The second paper looks at Kumpulan Informasi Teknis (KIT – compilation of technical information) an extension tool and process that uses local knowledge to facilitate agricultural technology development in Indonesia. Local extension and research institutions assemble local-specific technological information KITS for the predominant farming systems in an agro-ecological region. KITS are based on research information and farmers' local knowledge. Each KIT consists of single-page sub-topics that are printed on heavy-stock, coloured paper and kept in a loose-leaf folder for easy updating. Field extension workers (FEWs) use KITS to support their own training sessions and in their meetings with farmer groups. KITS contain a selection of alternative technical recommendations and decision-making criteria to support sustainable farming. While sharing this information with farmers, FEWs will inevitably uncover more details regarding farmer's knowledge that can be used to improve the KIT. This local knowledge is then disseminated to other FEWs and farmers and is used to update the KIT. A key positive observation of the project has been the acknowledgement of and openness to the value of farmers knowledge on the part of extension institutions, and a willingness of extension agents to use local knowledge when developing recommendations. Nevertheless, various challenges still lie ahead if the potential of the KIT process is to be fully exploited.*

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**95b. Kumpulan Informasi Teknis: A process and tool to obtain, build on and disseminate local technical knowledge**  
— T.S. Dierolf, E. Krain, E. Kramer, M.S. Tarmudji, and A. Nasution

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**Acronyms**

AARD	Agency for Agricultural Research and Development (national level)
AEC	Agricultural Extension Centre (sub-district level)
AEIC	Agriculture Extension and Information Centre (district level)
AIAT	Assessment Institute for Agricultural Technology (provincial level)
CPR	common property resource
DWSO	District Water Supply Office
ENAP	Environment and Population Awareness Programme
FEWs	field extension workers
GOs	government organisations
GOI	Government of Indonesia
GTZ	German government bilateral aid agency
I/LK	indigenous/local knowledge
KIT	Indonesian translation for Technical Information Compilation
KUF	Kalimantan Upland Farming System Development Project (GTZ/GOI project)
NGOs	non government organisations
ProRLK	Area Development for the Rehabilitation of Critical Land and the Protection of Natural Resources and Environment Project (GTZ/GOI)
SFDP	Social Forestry Development Project (GTZ/GOI project)
SFMP	Promotion of Sustainable Forest Management Systems Project (GTZ/GOI project)
T&V	training and visit
VDC	Village Development Committee

# **95a. MANAGING LOCAL CONFLICTS OVER WATER RESOURCES: A CASE STUDY FROM NEPAL**

## **Bishnu Raj Upreti**

### **1 INTRODUCTION**

Water resource management has been an important issue for donors, governmental organisations and NGOs in the last decade in Nepal. However, coordination among government organisations (GOs), NGOs, donors and other stakeholders is weak: little progress has been made on these issues and conflicts of interest are deepening. Local people independently regulate water resources, and negotiations over access and use of water are a feature of everyday life. This paper explores these issues in theory and in practice. The case study presented below, describes how individuals and institutions tackled problems relating to access to spring water in Dolakha district in central Nepal.

It addresses three issues:

- The factors responsible for the creation of the conflict over water use;
- The way people dealt with the conflict, focusing on the community negotiation process;
- Ways in which people learnt from the conflict resolution process.

### **2 SOME USEFUL CONCEPTS**

#### **Property rights**

The issue of property rights is central to the debate over access to water in Nepal. Theoretically, four basic 'property' models can be identified: collective; open access; private; and state. In practice, the distinction between these categories is blurred and natural resource property ownership can be more usefully viewed as a bundle of rights held by different people at different times with respect to different aspects of land and resources (Riddell et al., 1983). Franz and Keebert von Benda-Beckmann (1996), further analyse the shortcomings of conventional ways of conceptualising and analysing property rights: 'the standard categories of private individual ownership, common (communal) ownership, state ownership and open access resources which dominate contemporary debates are too crude a framework to allow for a more succinct understanding of the wide variety of construction of property which are encountered in different societies ... the problematic relationship between ideological notions of property, the legal regulations and institutional framework, concrete property relationships and actual behaviour is rarely discussed'. This is certainly true for the case of water management in Nepal, where questions arise over the extent to which water is a private or common

resource. Whereas, cultural norms and religious values in Nepalese society define water as a public good for use by all, State law allows private ownership of water resources. In reality, the traditional notion of an individual's right to water is stronger than that defined by state regulations (Khanal and Khanal, 1996).

Local management of common property involves the continuation, resurrection or devolution of local property rights, adherence to group-based rules and norms, and in certain cases, the establishment of new institutions. These packages of property rights and management arrangements are referred to as the common property resource (CPR) regime. Shanmugaratnam (1996) defines CPR regimes as having a 'clearly defined physical boundary ... owned or controlled by an identifiable group with its individual members holding rights to use the resource by virtue of their membership of the group and in accordance with its rules and norms of appropriation and management of the resource'. A critical distinction is made between the overlying property rights (in this case who owns the spring) and the attendant management arrangements (how the water is managed and exploited, and how conflicts are resolved).

#### **Legal pluralism**

Property rights can be either formal or informal. Resource tenure, for example, may be codified as legally enacted written law (*de jure* rights) or part of the unwritten but commonly understood rules of a particular society (*de facto* rights). Legal pluralism refers to the different types of laws that govern the behaviour of individuals and institutions towards a resource. These include state law, folk law, customary law, indigenous laws and religious laws. The notion of legal pluralism is important in the context of water rights as the construction of water rights and property holding units may differ under these various legal systems. This provides the potential for conflict. The notion of legal pluralism, on the one hand pertains to the existence and reproduction of legal systems in the meaning of assumed bounded bodies of normative conceptions within one major political unit (for example, the use of state law, customary law, religious law, etc., within a nation state). However, it also refers to the complex network of the legal environment that local actors are confronted with in every day life (Benda-Beckmann et al., 1996).

### Local/indigenous knowledge

Local/indigenous knowledge (I/LK) is a rich, and often untapped, source of information specific to a given locality (Posely, 1985). In the context of water use, I/LK is the knowledge possessed by local people relating to the sustainable management and utilisation of local water resources. I/LK encompasses a broad spectrum covering knowledge of the physical characteristics, qualities and availability of water as well as its associated management practices.

### Conflict and negotiation

Conflicts arise from opposing interests such as competition over scarce resources, differences in perceptions and attitudes of water use, increasing interdependence among users and so on. The word conflict generally carries negative connotations, being perceived as the opposite of peace and cooperation, and commonly associated with violence or the threat of violence (Warner and Jones, 1998). However conflict in some instances can be a positive force for social change, encouraging creative thinking and motivating people to solve their problems. The important issue is to manage the conflict, rather than suppress it or allow it to escalate out of control.

A negotiation situation arises when there is a conflict of interests and the parties involved are motivated to search for a solution. It takes place between parties (which may comprise individuals, groups or organisations), with a view to resolving incompatible goals. In practice, negotiation is a voluntary process in which conflicting parties meet to reach a mutually acceptable decision. Negotiation can be divided into two distinct forms: distributive and integrative. Distributive negotiations focus on resource distribution issues, creating a win-lose outcome. The attitude of negotiating parties is to focus on their own interests, ignoring the fact that there may be far reaching consequences of a lose-lose outcome. In contrast, integrative negotiations seek to create a win-win outcome. Here negotiating parties are open to alternatives and pay attention to the interests of the other party through a problem solving approach. It can lead to collective decision making and commitment by both parties to achieve an optimal, collective solution. Box 1 highlights the options that exist within a negotiation process.

<b>Box 1</b> Categorisation of options in conflict management	
<b>Force</b>	– A distributive approach when one party has the means and inclination to win regardless of the consequences for the other.
<b>Withdrawal</b>	– Avoidance – Opting out. The desire to avoid confrontation outweighs the goals the parties are trying to achieve.
<b>Compromise</b>	– At least one party perceives it has to give something up – the ‘tradeoff’ approach.
<b>Accommodating</b>	– Maintaining relationships based on goodwill.
<b>Consensus</b>	– An Integrative approach. The synergy of collaborative negotiations is used to widen the basis for decision making – collaborating to achieve a win-win outcome.
<i>Source:</i> Warner and Jones, 1998	

At first sight, the likelihood of achieving a win-win outcome – the consensus approach – may appear remote. Conflicting parties often have entrenched positions and may be hostile to one other. Furthermore as the conflict escalates, people’s capacity for rational judgement declines. Consensual negotiation seeks to transform these perceptions and increasing demands by steering the parties:

- away from negotiating over immediate positions towards underlying needs;
- away from thinking about one solution towards a wider and more creative range of options;
- away from personalised and often exaggerated demands towards clarity in describing underlying needs and the range of proposed options.

The following case study applies the above concepts to issues relating to ownership, water rights and conflict resolution processes in relation to drinking water resources in Nepal.

### 3 CASE STUDY: NEGOTIATION OVER THE USE OF A SPRING FOR DRINKING WATER

The subject of the case study is the conflict surrounding the use of spring water from a source known as Bhoteko Dhara, located in the village of Pawoti in Dolakha district, Nepal. By Nepalese standards, the population of the region is socio-economically uniform, comprising Brahmin, Chhetri and Tamang groups. It is, however, relatively densely populated, with only a few springs to provide drinking water for more than 70 households. The Bhoteko Dhara spring is located on the land of one individual and, despite being one of the larger sources of water in the area, it provides drinking water for only seven households and irrigation for two households (see Box 2). Meanwhile, households lower down the valley, in a more affluent area of the village, suffer from drinking water shortages.

The first attempt by people of the lower hamlet to use the spring came around 1970. Two wealthy villagers successfully negotiated with the owner of the spring regarding the supply of water to the lower hamlet. The arrangement did not, however, become permanent due to the costs involved in transporting

<b>Box 2</b> Overview of the spring water source	
<b>Location</b>	Ward 7
<b>Permanent users</b>	7 households
<b>New potential users</b>	13 households
<b>First notice of conflict</b>	1989
<b>Ownership of source</b>	Individual
<b>Type of conflict</b>	Ownership versus rights of access
<b>External support</b>	NGO/DWSO/Panchayat
<b>Leadership style</b>	Group
<b>Negotiation initiated</b>	1996
<b>Role of women</b>	Significant

water to the lower hamlet. A second round of negotiations occurred in 1989, when all the households of the lower hamlet explored the possibility of bringing water down from the spring. After discussions with the owner and the other permanent users of the spring, it was agreed that some of the water should be diverted for use in the lower hamlet. The location of tap stands was agreed upon and the appropriate materials were obtained to set up the supply.

The owner of the spring subsequently reneged on the agreement and refused to allow water to be supplied to the lower hamlet. This change in attitude arose because the owner perceived that the affluent people of the lower hamlet had treated him badly in the past, due to his lower social status. Furthermore, the other established users claimed that there was not enough water to go around. The conflict amongst the villagers was exacerbated by political differences, and the dispute escalated into threats of physical violence towards the spring owner. According to villagers not involved in the dispute, there was sufficient water being produced by the spring to satisfy the drinking water and irrigation requirements of both the parties involved. Lack of water was not therefore the true reason for the conflict; the root cause was jealousy over the increasing economic status of the villagers in the lower hamlet.

Fetching water is mainly the responsibility of women who collect on average 200–400 litres for their households daily, taking up a considerable amount of their time. The water resource problem was therefore a primary concern for women of the lower hamlet, who started to negotiate informally with the wives of the spring owner and the permanent users, encouraging them to put pressure on their husbands to resolve the issue. Several institutions/individuals were contacted to help resolve the conflict. Firstly, the *Purohit*<sup>1</sup> was asked to mediate on the behalf of the lower hamlet. The Ward Chairman was also asked to negotiate with the owner and permanent

users of the water on behalf of the villagers wishing to use the spring. Thirdly, an NGO with experience of facilitating activities in other areas of the Village Development Committee – The Environment and Population Awareness Programme (ENAP)<sup>2</sup> – was asked to assist in the negotiating process. ENAP organised a variety of training sessions on water source conservation, sanitation, community participation and conflict resolution and arranged formal and informal meetings and discussions. With the help of ENAP, the villagers successfully formed a Mediation Group from within the community to moderate between the conflicting parties. The Mediation Group enlisted the help of a representative from the District Water Supply Office (DWSO) to measure the capacity of the water source in order to prove that the supply was sufficient to satisfy both groups. The suggestions developed by the Mediation Group to resolve the conflict are shown in Box 3.

The proposal was discussed in detail by all parties involved, and an agreement was made whereby both groups could use the water source provided they follow the conditions outlined in Box 3.

### Factors underlying the conflict

This case study provides an example of a successful community level negotiation process, initiated by local people, which resulted in a win-win outcome. Important factors underlying the conflict included:

- the need for drinking water in the lower hamlet;
- the lack of clear ownership and access rights to water;
- issues relating to cultural norms, values and beliefs.

### Drinking water requirements of the villagers

One of the major factors behind the conflict, and the driving force behind the solution, was the need for drinking water in the lower hamlet. The villagers therefore mobilised the *Purohit*, relatives, wives and community leaders to reason with the spring owner and the permanent users and also invited ENAP to facilitate the negotiation process. Without such determined efforts, the dispute would not have been resolved. The saying ‘necessity is the mother of invention’ is clearly reflected in this case.

### Rights of ownership and access

Confusion over who ‘owned’ the spring was one of the main causes of conflict. As the water source was located on private land, the owner claimed controlling rights to it; his primary concern being that, if the water was shared, his supply would be insufficient for irrigating his crops. The issue was therefore whether there should be common access to the water, or whether the owner had the right to control who used the resource. The cultural norms and religious values in Nepalese society define water as a public good for

#### Box 3 Resolving the conflict

The spring owner should sell the spring to the villagers of the lower hamlet on condition that the water is accessible to both groups of users.

Alternatively the spring owner should allow the water to be taken under the following conditions:

- The villagers of the lower hamlet should construct a reservoir tank close to the source to collect water.
- Water should be collected in the reservoir tank at night time.
- Water should not be collected from the reservoir tank at times when it is in short supply for rice transplanting.
- New users should take responsibility for conservation of the water source.
- The source owner and the permanent users should inform the villagers of the lower hamlet and the Mediation Group before stopping the water for use in rice transplanting.
- Both groups should apologise for antagonism in the past
- The Mediation Group must be informed if further misunderstandings occur.

use by all, whereas state law allows private ownership. Therefore in this case traditional norms and cultural practices questioned the spring owner's selfish attitude. Eventually, despite having good relations with the spring owner, the permanent users were in favour of sharing the water with the villagers of the lower hamlet. This put the owner in a weaker negotiating position. The use of power and positions in the creation and/or resolution of conflict were also witnessed in the case study and it is important to look at the position and power structures within the community.

### **Cultural norms, values and beliefs**

Norms, values and beliefs were central to the conflict. In the study area, not to provide drinking water was considered a sin. As a norm, ownership of a water source should not be an issue, and the use of water for drinking should take priority over its use for irrigation. The belief promoted by the *Purohit* that those who prevent others from taking drinking water shall go to hell after death had a significant influence on the outcome of the dispute. Belief in the power of their ancestors was also important. Villagers used a saying that '*Desko Deuta Bhandha Gaon ko Bhut Kamlagchha*' (the ghost of your own village is more useful than a god in the distance). Consequently, villagers made every effort to negotiate locally to achieve a win-win solution.

### **Individuals, institutions and the negotiation process**

#### *The Mediation Group*

The Mediation Group consisted of four male and three female members of the community, selected to mediate on this particular conflict issue. All members were socially respected and were chosen on the grounds of their neutrality, persuasiveness and willingness. From the outset, the Mediation Group

made several attempts to convince the spring owner and permanent users to allow villagers of the lower hamlet access to the water source. It also contacted the DWSO and brought in a technician to measure the capacity of the water source. The Group organised discussion meetings, developed and forwarded different problem solving proposals, established norms and co-ordinated the implementation of the project. ENAP strategically supported the Mediation Group in performing these activities.

#### *The Purohit*

The *Purohit* is a culturally and socially recognised person, who performs religious ceremonies and acts as an intermediary for communication between villagers. He convinced permanent users of the need to share water, by highlighting the religious importance of giving drinking water to others. Owing to the frequent house to house visits made during the course of his work, the *Purohit* had an established relationship with the community. This strongly influenced the villagers who did not wish to contradict his arguments. The assistance of the *Purohit* therefore made the work of ENAP and the Mediation Group much easier.

### **Involvement of women**

Women from the lower hamlet were central to the negotiation process. In their different forums, such as *Mela-parma*, *Pani-pandhero*, *Ghans-daura janda*, *Hatbazaar*, and *Bibaha-bratabandha* these women discussed the drinking water problem with women from the permanent users group. By doing this they were ultimately able to create the conditions whereby water could be shared (Box 4).

Some women attended training courses organised by ENAP, whilst others played an important role within the Mediation Group. The older, married women tended to be more cooperative and assertive in resolving local level conflicts because of their ability to understand different perspectives. Even the spring owner's wife was in favour of sharing the water with the lower hamlet, rather than using it to irrigate her land. This is a clear reflection of the priority that women attach to water for drinking, in contrast to men who stress its importance for irrigation.

### **Role of ENAP and the DWSO technician**

ENAP played an important role in resolving the conflict through the organisation of awareness raising activities, meetings and conflict resolution training. In addition, the support they gave to the Mediation Group appears was crucial. The DWSO technician helped to undermine the spring owner's argument by demonstrating that there was sufficient water for

#### **Box 4 Informal forums for women's discussions**

The following forums provided space for women to exchange views on the water conflict:

*Mela-parma* – An exchange of labour in the village to perform main agricultural activities such as transplanting of rice, harvesting of crops etc. People from all households participate in such activities on a rotational basis.

*Pani-pandhero* – Women gather every morning and evening at a water source to collect water.

*Ghans daura janda* – It is common practice for groups of villagers to collect firewood and grass in the forest.

*Hatbazaar* – An informal forum where people gather weekly or fortnightly to sell or buy goods and to settle practical issues.

*Bibaha-bratabandha* – These are religious ceremonies, which represent the marriage (*Bibaha*), and sacred thread (*Bratabandha*) given to the males to make them eligible for marriage. Women work together to prepare materials in advance for these occasions.



everyone. This helped to pacify the permanent users, and when further pressure to negotiate was exerted on the spring owner by the villagers, an agreement was eventually reached.

### **Local political institutions**

The Ward Chairman, as an elected local political leader of higher social status than some members of the lower hamlet, exerted psychological pressure on the spring owner and permanent users to negotiate. Politicisation of the conflict was also evident in its early stages – affected by a local power struggle between political parties. However, following the efforts of people from the lower hamlet, the political parties involved in the conflict were gradually pacified and withdrew.

## **4 COMMUNICATION AND FACILITATION**

The dialogue created between users, women, friends, the *Purohit*, the Mediation Group and staff from development organisations is an example of the extensive communication network which not only facilitated the resolution of the conflict in this case, but also promoted a greater awareness of water resource management issues. Facilitation brought conflicting parties together in a common forum – the Mediation Group – to discuss the issue. The negotiation process was guided by the perception of two dimensions of conflict, i.e. how important or unimportant it is to satisfy people's own (individual's) needs and how important or unimportant it is to satisfy other people's (society's) needs. Facilitation in this case promoted participatory processes of conflict resolution by involving all stakeholders in the discussions, norms setting and agreement in water use and provided the basis for a consensual (integrative) agreement on water use.

Local cultural and religious institutions, such as the *Purohit* and those shown in Box 2, provided important platforms for discussing the problem and shaped the course of action for negotiation. The belief that 'to provide drinking water is to pave the path the heaven and to deny water will lead to hell' was a crucial psychological factor in bringing people to the negotiation table. This was used by both the *Purohit* and the Mediation Group to convince the permanent users group that they should provide water for the lower hamlet. By discussing the drinking water problem at different forums, favourable conditions for conflict resolution were created. Working together for a common purpose promoted learning and appreciation of indigenous knowledge and skills, as well as the sharing of aspirations.

### **Learning processes**

Villagers taught themselves new ways to resolve conflicts, through mediating and negotiating between individual and collective interests. This case exemplifies that people learn from the process itself – i.e. that conflict was necessary to highlight an unacceptable situation and force it to change. In this setting the conflict itself became a positive force for social change. The collective action process promoted long term cooperation among the people of two hamlets. Having learned from this successful negotiation case, people of the surrounding villages have started to follow a similar approach to resolving conflict. A similar process is being followed in a dispute between two villages over the access to and use of a Community Forest located in the same Village Development Committee (VDC). The VDC is also adopting a similar approach to the resolution of other village level land and irrigation related conflicts.

## **5 CONCLUSION**

This case study illustrates that given appropriate facilitation by independent development organisations (such as an NGO) and the opportunity to create a common forum rather than to involve outside organisations in the conflict, stakeholders themselves are able to learn to resolve disputes. Different factors and participants played important roles in resolving the conflict, and the resulting win-win outcome. Although not always recognised as such, local people are the principal managers of the local natural resources in Nepal (Rhoades, 1997). They are not only active negotiators and mediators of conflict, but also active managers and networkers. Local people seek relationships with different individuals in order to exchange knowledge, information and experiences and to build alliances to develop and implement new ways of managing conflicts. Instead of going to the court to resolve the water use dispute, they successfully negotiated the conflict locally in an acceptable way.

The potential for indigenous institutions to resolve water use conflicts at community level was clearly observed, with various local institutions providing effective forums to discuss the problems and explore alternatives. The indigenous management system was one of the unique strengths of community level water resource management in the study area. Customary laws, rules and indigenous institutions prevalent in the study area have strong religious, cultural, historical and social roots and are based on moral values and ethics. This suggests that the mobilisation of local institutions and experiences is a key strategy in local level water resource management.

The existing social networks were effectively mobilised to bring conflicting parties to the negotiation table. The facilitation role of the NGO proved to be crucial in resolving the conflicting interests of different people. The neutrality of the facilitator and mediator was important; ENAP and the DWSO technician supported the initiative taken by the local people, and with the assistance of these organisations the resolution of the conflict was achieved more rapidly.

Local people are not only active negotiators and mediators but also active managers. They deliberately seek relationships with people from different levels of the social hierarchy to exchange knowledge, information and experiences and to build alliances to develop and implement new ways of managing resources. It was found that techniques and innovations of others were learnt and adapted by the local people in their water resource management process. In the study area, farmer-to-farmer exchange of knowledge and experiences has proven to be a very useful learning strategy for the local level water resource management.

One of the lessons from this case study is the positive aspects of conflict. Conflicts are usually interpreted as harmful and leading to disorder in social relations. Conflicts do not however only create harmful situations they can also play a positive role in changing existing power structures and social relations. This case study supports Warner and Jones' (1998) observation that carefully managed conflict management strategies can bring disenfranchised stakeholders into equitable and collaborative negotiations with more powerful stakeholders, so helping to resist the capture of resources by élites and promote pro-poor solutions to disputes.

## ENDNOTES

- 1 Brahmin Priest. He generally has a strong influence over the villagers (*Jajamans*)
- 2 ENAP is a district based non governmental organisation working since 1993 on issues relating to the environment, population and community development. This NGO had been working in this VDC since its inception in the environmental issues with the support of IUCN-Nepal.

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**95b. KUMPULAN INFORMASI TEKNIS: A PROCESS AND TOOL TO OBTAIN, BUILD ON AND DISSEMINATE LOCAL TECHNICAL KNOWLEDGE**  
**T.S. Dierolf, E. Krain, E. Kramer, M.S. Tarmudji, and A. Nasution**

## **1 INTRODUCTION**

Indonesia, with a population of 204 million, is a land of great cultural and physical diversity. Consisting of over 13,500 islands, of which about 1,000 are permanently inhabited, the total land area covers 192 million hectares, while the total sea area is 790 million hectares. Administratively, Indonesia consists of 27 provinces, which are further subdivided into 305 districts, 3,844 sub-districts, and 65,852 villages (BPS, 1995). Although united by the national language Bahasa Indonesia, there are over 300 ethnic groups, representing 17 major ethno-linguistic groups and over 200 minor language groups. Climatic diversity is significant: some areas receive year-round rainfall of over 4,000 mm/year, while other areas have dry periods lasting six or more months and receive less than 1,000 mm/year. Ecosystems range from permanently snow-capped mountains to tropical rainforests. Agricultural systems are usually determined by water availability and are generally divided into *lowlands*, which are usually stable, irrigated rice systems, and the *uplands*, which rely on rainfall and include a wide range of more fragile, diverse farming systems.

To address this diversity, Indonesia is undergoing a decentralisation process that has affected the agricultural research and extension institutions. Decentralisation places greater responsibilities on local institutions and, although further straining their already limited resources, also creates opportunities to serve local needs. Recognising and using local farmer knowledge and experience has a large part to play in this regard, especially in the uplands, which have been relatively neglected by the research and extension institutions.

In this paper we outline our experience of developing a process for assembling and using a written information tool (KIT) that can support and facilitate field extension workers (FEWs) use of local knowledge for the development of sustainable upland farming systems in Indonesia. The experiences come from three Indonesian provinces (West Sumatra and West and South Kalimantan) The process assumes (i) that local knowledge and experience is abundant, appropriate, and dynamic; and (ii) that regularly gathering and sharing local knowledge will facilitate the adoption of appropriate technologies.

## **2 BACKGROUND**

### **Decentralisation of agricultural research and extension**

A recent restructuring of the public sector in Indonesia has created two new institutions that are closely involved with agricultural technological information: the provincial-level Assessment Institute for Agricultural Technology (AIAT), which was formed in 1995 (MoA, 1994) and the district-level Agriculture Extension and Information Centre (AEIC), which was established in 1996 (MoHA and MoA, 1996). The provincial-level AIATs come under the national-level Agency for Agricultural Research and Development (AARD). Each AIAT was formed by merging provincial-level institutions that were previously either concerned with conducting research or with disseminating research information. The major tasks of the AIAT are to (i) conduct location-specific, on-farm agricultural commodity research; (ii) test and assemble research-developed agricultural technologies; and (iii) assemble, test, and provide technology packages as agricultural extension materials.

Two major effects on technical information flow are that the AIAT must respond to local needs and that it must focus on all agricultural and livestock commodities, rather than a specific commodity group as was done by the AIAT predecessor. Thus, the AIAT is mandated to a local, integrated agricultural development approach.

Technical information flow in agricultural extension has been most affected by the creation of the AEIC, which is positioned at the district level and is directly responsible to the Head of the District Government. Tasks of the AEIC that are related to technical information flow are to (i) provide technical services (e.g., information, equipment/supplies, skills) to FEWs, farmer groups, and other agricultural field workers, (ii) develop a library capable of providing information needs and extension materials, and (iii) carry out agricultural technology assessment and on-farm trials in consultation with the AIAT.

The district-level extension programme is arranged by the local government under the coordination of the AEIC. The AEIC coordinates the various extension activities of the four agricultural sub-sector line

agencies (food crops, estate crops<sup>1</sup>, livestock, and fisheries) that provide programmes and technical support. The sub-district level Agricultural Extension Centre (AEC) is directly under the AEIC, as are the 10–20 FEWs assigned to each AEC. During the first stages of decentralisation, each AEC was administratively responsible to the district government, but operationally responsible to one of the sub-sector line agencies. Because of coordination difficulties the AEIC was created to improve coordination at and below the district level (Figure 1).

The restructuring has made interaction between farmers, researchers, and extensionists within the provinces more possible. Previously, research and extension institutions in a province could be physically adjacent to each other, but the results from the research institution would first go to the national-level AARD, be passed over to a national level sub-sector line agency, and then finally it was relayed to the provincial or district level sub-sector line agency.

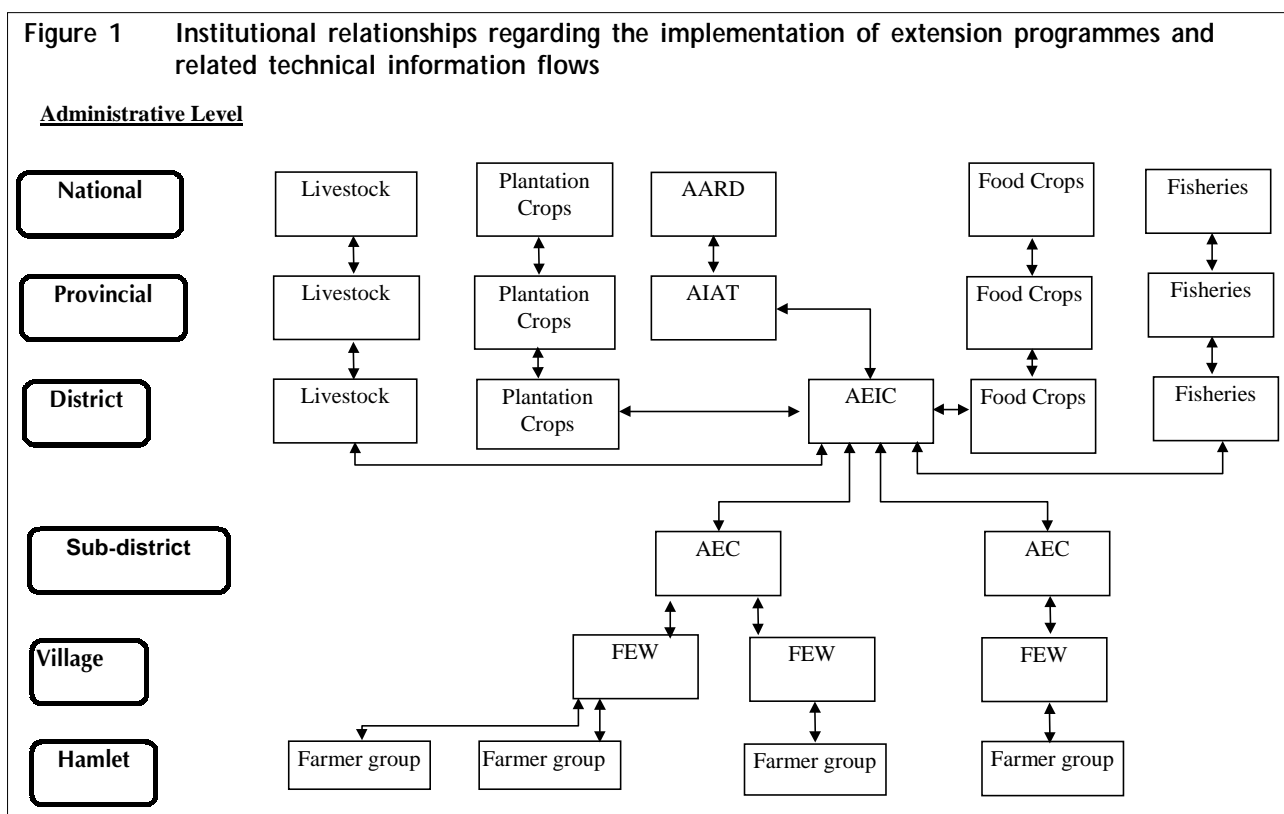
### Availability, use, and usefulness of technical information for upland farming

The written technical information for upland farming systems – using rubber-based systems as an example – was evaluated in the province of West Sumatra according to three criteria: the availability of written information to FEWs, the usefulness of written information for FEWs, and the use of written information by FEWs. The major conclusions were that (i) a large amount of written technical information was available, (ii) there was a limited distribution to

FEWs, (iii) much of the information was of little relevance to a particular location, and (iv) there was no evidence that the written information available was taken to the field by FEWs during routine extension activities (Dierolf, 1997). Additionally, the information concentrated on agronomic and technical aspects, while basically ignoring the economic and social feasibility of technologies. To address these problems it was recommended that the usefulness of the written technical information could be improved by (i) making it more systems-oriented, (ii) making it more specific to the particular region, and (iii) providing more low- and medium-input alternatives to the high input systems that were usually promoted.

### 3 THE KIT: A TOOL AND PROCESS FOR UTILISING KNOWLEDGE

A process was developed by four Government of Indonesia/GTZ projects (KUF, ProRLK, SFDP, and SFMP) to produce locally-specific, systems-oriented, extension materials to address some of the problems associated with the availability, usefulness, and use of technical information for the uplands of Indonesia. The product – called the KIT – contains technical information on a selected farming system component within an agro-ecological zone. A pilot KIT for rubber-based systems was developed for districts in the three provinces. The pilot KIT was commodity-based, and focused on the primary commodities of a farming system. KITs can also be systems-based, by focusing on major interventions for a system. For example, the AIAT in South Kalimantan proposed a home garden KIT. Because home gardens can contain



dozens of species, the KIT did not contain detailed information on each species but on principals behind the home garden approach such as the importance of increasing protein sources grown in the home garden or using kitchen compost.

Only commodity-based KITs have however been produced so far, with rubber as the main crop. Intercrops used in the rubber-based KITs included maize, upland rice, peanut, watermelon, soybean, chilli pepper. They also contain information on the control of the grass, *alang-alang* (*Imperata cylindrica*). The choice of intercrops to be included in each KIT depended on the local farming system. In addition to the home garden KIT planned for South Kalimantan, KITs on *Acacia mangium* (a tree used for pulp) and citrus-based systems are currently being developed.

The KIT process is divided into *KIT assembly* and *KIT use*. *KIT assembly* is basically the process of establishing the general knowledge base. *KIT use* focuses on both using and updating the knowledge base.

In the KIT assembly process, published top-down information (i.e., based on formal research) was modified and supplemented to make it appropriate for local conditions, and then made available to FEWs. The pilot KITs were assembled by a team selected from district, sub-district, and village-level FEWs and provincial-level research-extension linkage institutions. This combination provided technical information that was both locally-specific and also included the latest research results. The KIT was designed to supplement the training of FEWs and provide them with take-home reference materials to use in farmer group meetings. KITs are used both to support FEWs training and subsequently by FEWs during their interactions with farmers. An important part of *KIT use* is the process of obtaining farmers' knowledge to update information contained in the KIT.

### **The KIT product**

As an example, the KIT for Pasaman district in West Sumatra contains 40 pages printed on both sides of heavy-weight coloured paper. One technical aspect of the rubber and food intercrop system (e.g. land preparation, rubber planting, disease control of groundnuts) is covered on each page. Technical details focus on providing alternatives, explaining the reasons for a practice and listing advantages and disadvantages of each recommended practice. Simple line drawings are also included to be used to facilitate discussions with farmers. The pages are kept in a loose-leaf folder, which allows easy updating of each KIT as information becomes available from farmers. Depending on the quality of the folder, a rubber KIT for Pasaman costs \$4–6 per copy.

### *KIT assembly*

The organisational steps involved in the process of KIT assembly have been reported in detail elsewhere (Dierolf, 1997; Juniati, 1998). Initially, we envisioned that the AIAT and the AEIC would be the main institutions assembling the KITs because this: (i) combines institutions with access to new research information with those with an extension mandate; (ii) brings together provincial and district-level institutions to facilitate information flow within a province; (iii) supports the mandate of both institutions to address integrated farming systems; and (iv) spreads the demand for technical and physical resources among institutions. However, in reality the AIAT took the lead in South Kalimantan, whereas the AEIC took most of the initiative in both West Kalimantan and West Sumatra. The AIAT in the latter two provinces did not prioritise the KIT activity, even though it would have fulfilled one of their mandates. They seemed more interested in activities that were more oriented to local assessment of national-level research station-developed technologies.

### *Leading role of district-level institutions in KIT assembly*

In general, the AEICs showed greater interest than the AIATs in assembling the rubber-based KITs, not surprising given that AEICs are the main users of the information. The lack of involvement of the provincial-level AIATs in KIT assembly creates difficulties due to the limited human and computer resources which hinder the capability of district-level institutions to produce a KIT.

The spread of the KIT concept to other districts was initiated by demand from both AEICs and sub-sector line agencies. Although the initial KITs were project-supported, some sub-sector line agencies are now funding KITs to support their commodity-based programmes. The AEIC, according to its mandate, should be in charge of making extension materials and using the KIT. However, the AEIC has limited funds to do this and must currently rely on the sub-sector line agencies for funding. Additionally, the role distinction between the newer AEIC and older sub-sector line agencies is often not clear as they are still coming to terms with their new roles. Thus, although the process for assembling KITs was initiated by the need for district-level institutions to have locally-specific technological information, the AEICs do not always take the lead role in KIT assembly.

A consequence of having the sub-sector line agencies lead the KIT assembly process is that integration among the various components is less likely. The sub-sector line agencies each have their individual programmes, e.g. the intensification of hybrid maize cultivation that may require technical

support materials. Instead of simply producing materials on one commodity, e.g. hybrid maize (which may be the focus of the food crops line agency that is funding the production of the extension materials) the AEIC mandate is broader, and thus their involvement ensures that a KIT includes other aspects of the upland farming system that the maize is being grown under.

### Teamwork

Working teams were formed to develop each KIT. In South Kalimantan, the provincial-level AIAT took the lead and seems to want to continue in this role. In West Sumatra and West Kalimantan, the district-level AEIC was in charge of the team (why this difference?). Teams consisted of specialists for the commodities to be included in the KIT (e.g. staff from the AIAT, agricultural sub-sector line agencies or AEIC) and persons familiar with the field situation of the area for which the KIT is intended (e.g. FEWs, contact farmers). Ideally, team members should represent both extension and research institutions to strengthen the research-extension linkage, although transportation difficulties between institutions may limit this. Most teams comprised four to six active members, consisting of about three to four commodity specialists and one to two persons familiar with the geographic area, with some members assuming both roles.

### Assemble the KIT

The main steps which were common to the assembling of all of the pilot KITs were:

- The team identified the required components and compiled published information to create a draft KIT.
- The team conducted a 1–3 day field-check to verify that the suggested systems exist and to obtain selected primary information to support the KIT (primary data collection should be kept to a minimum; this is not the time to be looking for specific farmer innovations, but to verify some of the information in the draft KIT.)

- The team integrated and adapted the components of the draft KIT to the local conditions (the experience of those familiar with the field situation (e.g. FEWs) is crucial here).
- The draft KIT was presented for review and/or approval to a forum consisting of agricultural experts familiar with the agriculture of the particular area (This was a bureaucratic step carried out to promote the pilot KITs and will probably not be necessary in the future. In cases where the AIAT is not involved in KIT assembly, this step should be used to let the AIAT review the KIT to allow them to add research-based results or information).
- The team revised the draft KIT.
- The final KIT was produced by the AEIC; presented for official approval (this was a bureaucratic step done again to further promote the pilot KITs and will not always be required).
- Mass production of the KITs was organised by the AEIC, and distributed to FEWs

### Integration of local knowledge into KIT assembly

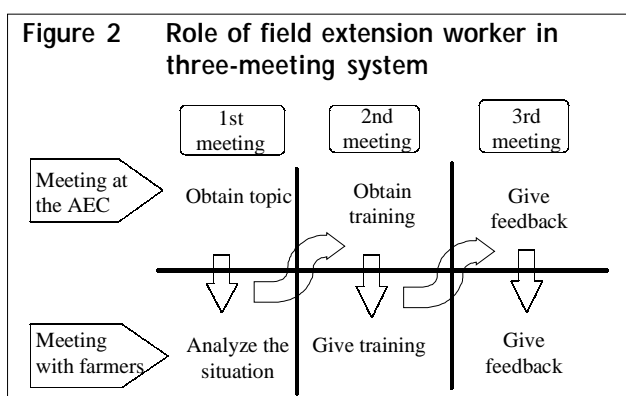
During the assembly process two types of local knowledge are included in the KIT. First, *commonly available local knowledge*, for instance of what grows together well is included. Farmers in one district may grow groundnut, chilli pepper, and upland rice, whereas in another district they may grow maize, soybean, and upland rice as rubber intercrops. The rubber-based KITs for each district reflected this difference. Secondly, some *specific local knowledge* is also incorporated during the assembly process, e.g. on natural pest control measures. These practices may only be known to some of the KIT assembly team.

### KIT use

The use of the KIT has met with many challenges.

### Integration of local knowledge into KIT use

The KIT has been used by FEWs as a basis for investigating and using *specific local knowledge* to improve the KIT knowledge base. The KIT has supported various extension approaches that actively involve farmers. Field extension workers are challenged to examine what farmers are doing and seek out innovations that can be shared with other farmers within the village or in another village. During KIT use, some lesser known technologies are 'discovered' by FEWs in their visits and discussions with farmers. For example, in West Sumatra, a farmer used fresh papaya leaves to draw ants away from a chilli pepper nursery bed, a method which was not yet in the KIT. This alternative to chemical control was shared in a sub-district level Agricultural Extension Centre (AEC) meeting with other FEWs.



*Using the KIT in routine farmer group meetings*

West Kalimantan and West Sumatra use an extension system based on the training and visit (T&V) system. Extension workers have regular once- or twice-monthly training at the AEC, and regular meetings with farmer groups. An AEC training includes topics chosen by either or both the AEC and the AEIC. A major assumption is that the topics in a KIT would be appropriate for training in a particular AEC, because a rubber-based KIT, for example, would only be handed out to FEWs attached to an AEC where rubber is a predominant crop.

The three-meeting system shown in Figure 2 was developed in West Sumatra and West Kalimantan to see if it was compatible with the regular T&V system.

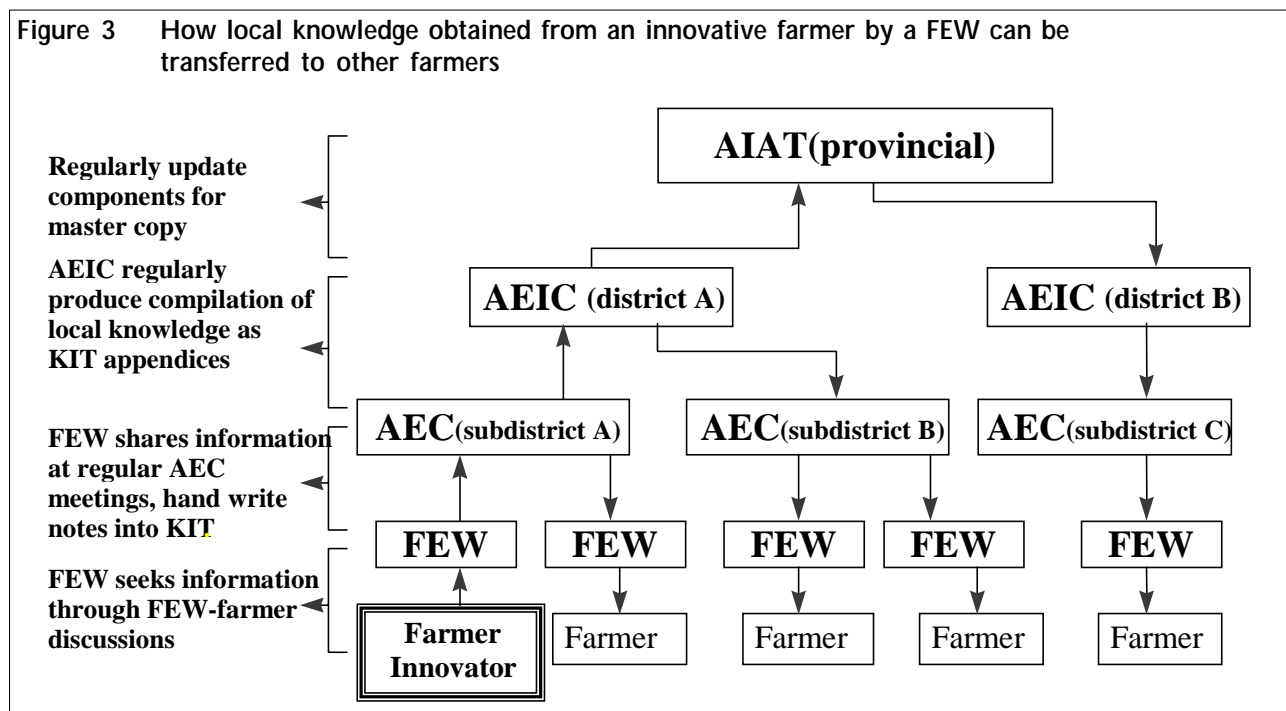
The three major aspects of each training session are : (i) following-up on topics from previous training; (ii) participation in the current training; and (iii) preparation for the next training session. By knowing in advance the topic to be covered in the next meeting, FEWs can conduct a simple assessment of that topic before the next meeting and be better prepared to participate in the training and ask relevant questions. In subsequent training they return to the topic, reporting back on the results of their discussions with farmers. In particular, they share any local knowledge obtained that supports, contradicts, or improves upon the information they originally shared with the farmer groups.

Regular meetings between FEWs and farmers are one entry point for bringing in and discussing relevant KIT topics. Discussions should not just be limited to KIT topics, but should be centred around the information needed by farmers. The FEWs should

help both male and female farmers to actively discuss and reflect on the technical issues discussed. The FEWs also contribute to the discussions according to their background and information obtained at previous training sessions or meetings with farmers. Together they try to find ways to solve problems using the experiences of all participants. Any major problems that can not be resolved are brought by the FEWs to the next AEC training for discussion. Similarly, the FEWs should note any significant farmer innovations that are not already in the KIT. Some of this can be shared at the next AEC meeting which should also be attended by backstopping staff from the AEIC.

The AEIC is responsible for bringing unresolved problems from the AEC meeting to the district-level. Similarly, they also bring promising farmer innovations to the district-level. This local knowledge can also be shared with other AECs at their regular training sessions and can occasionally be distributed as one-page updates to the KIT, thereby earning credit points<sup>2</sup> for the FEWs that shared the local knowledge and wrote the update. This sheet can be distributed to appropriate AECs and if possible, each FEW should receive one to put into their KIT. Figure 3 summarises this process and shows how FEWs can identify local knowledge to be shared later with farmers in other sub-districts.

The most successful aspect of this approach remains the movement of information from researchers to the farmer – the traditional top-down – transfer of technology – approach. The feedback mechanisms have not yet been formally evaluated, however they remain the weakest aspect of this system. Although,





there was some sharing by FEWs of local knowledge during the AEC training, there is probably very little sharing of this information by other FEWs with farmer groups, or with the AEIC. Some AEIC staff commented that the current infrequency of AEC and FEW-farmer group meetings (usually limited to once-monthly) makes for too long a turn-around time to respond to questions from the field.

#### *Using the KIT in on-farm demonstrations*

In South Kalimantan the KIT on rubber-based cropping systems contained information on upland rice, maize, groundnut, watermelon, and mungbean as intercrops. In some villages, farmers were interested to test innovations in maize and groundnut cultivation in on-farm demonstrations. The KIT served as a tool to discuss with farmers various technical options for the design of on-farm demonstrations (it contains a sample of technologies that can be tested and/or compared). A new cultivation practice was compared with a local practice in each demonstration. The new practice contained various 'improved' technologies (e.g. new varieties, soil conservation practices – comparing rock phosphate to superphosphate). The local practice represented the way most farmers within the village were cultivating the crop. The demonstrations were jointly monitored by staff of the AIAT and FEWs from the AEIC and AEC. Farmer field schools were held during the crop growing season to exchange information on cultivation practices and to inform other farmer groups about the demonstrations. Farmer field days were held near crop harvest, when leaders of farmer groups visited most demonstrations and discussed technology options. The findings from these demonstrations were used to update the respective sections of the KIT, particularly on maize and groundnut cultivation.

## **4 CHALLENGES AND AREAS NEEDING IMPROVEMENT**

The five major areas that need to be addressed in order to improve the KIT process are:

1. clarification of the role of the AIAT;
2. improvement in collaboration among the district-level technical line agencies and the AEIC;
3. implementing appropriate feedback mechanisms to update and modify technical information;
4. development of sustainable farmer groups;
5. improvement in the quality of extension and farmer training sessions.

Firstly, we anticipated a larger role for the AIAT in both assembling and storing master copies of KIT for use by other districts. For example, the rubber KIT for West Sumatra was used as a basis for the rubber KIT in another province on another island in West Kalimantan. The idea was that the AEIC would simply

have to contact the provincial-level AIAT, ask for the necessary KIT components, and then modify them to suit local conditions. This would eliminate the duplication of efforts by each of the resource-strained AEICs. Except for South Kalimantan, however, none of the AIATs wanted to assume responsibility for assembling and storing KITS despite the fact that they were involved in the process from the beginning. Apparently, as a new institution, they feel they can not address all of their tasks with the same intensity. Thus, we now envisage a larger role for the AEIC, with the AIAT serving more as a technical backstop to check the draft KIT for additions or changes.

The AEIC and some of the sub-sector line agencies, on the other hand, responded favourably in each of the three provinces. Indeed some wanted to make additional KITS, without major involvement by the AIAT. Despite the great enthusiasm, however, we question the current ability of the AEIC to make the KITS, because of limitations in both technical skills and the availability of human resources and computer equipment. The quality of the KIT also still needs to be improved: much of the writing still tends to be very prescriptive and more explanations need to be included.

Second, collaboration among the AEIC and district-level technical line agencies needs to be improved. The restructuring of extension institutions means that the sub-sector line agencies must work through the AEIC in order to have their programmes implemented by FEWs, whereas previously they had direct control over a proportionate share of the FEWs. The sub-sector line agencies often still directly contact FEWs to implement a field activity without going through the proper channels, namely through the AEIC. The AEIC in Pasaman district in West Sumatra is using the KIT activity as a means to improve the collaboration between the AEIC and the sub-sector line agencies. The ability of local institutions to respond to technological problems identified in the field is also limited. For example, acetic acid is recommended to coagulate rubber latex in the tapping cup, but is not locally available. Farmers in Pasaman, West Sumatra use a variety of substitutes such as a phosphate fertiliser or a local tuber. The question is, are any of these alternative practices acceptable and can the AEIC or the private sector respond to this need either by promoting low-cost alternative practices or making acetic acid more available in the area?

Thirdly, one of the most important – but weakest aspects – of the KIT process is effective feedback mechanisms. This requires a certain level of organisation on the part of both individuals and institutions that has not yet been attained. One suggestion put forth by an AEIC – which still needs to be tested – has been to designate one or two

people at each AEC and AEIC to be responsible for obtaining, documenting, filtering, and sharing information on the major technologies and innovations.

Fourth, although the Government of Indonesia supports working with farmer groups, these are usually formed to obtain materials for a particular project, and usually do not last more than a year. Thus, it is hard to find farmer groups to work with over a longer time span. They are less likely to meet if inputs are not distributed or if meetings only serve simply to exchange information. The KIT can only function as an effective information tool as long as FEWs are regularly meeting with farmers. This is a complex problem and is beyond the scope of the KIT process to address.

Fifth, the quality of the training at the AEC and farmer group meetings needs to be improved. Training at both levels is still mainly perceived as teacher-pupil interactions. Whereas, for the KIT approach to work, training sessions need to be dialogues rather than monologues. Again, this problem is complex and outside of the scope of the KIT activities.

In summary, we have collected a lot of experience on the *KIT assembly* process, but are still looking for ways to effectively use the KIT. Recently, the Task Force discussed experiences with *KIT use* and each province is currently evaluating the results to propose a systematic approach to making better use of the wealth of local knowledge and experience. In fact, one of the main positive observations was the acknowledgement and openness to building on local farmer knowledge by the extension institutions, and their willingness to use these for making recommendations. Nevertheless, challenges still lie ahead to successfully adapt the KIT process.

## ENDNOTES

- 1 At the national level, the estates crops line agency was recently moved into the Ministry of Forestry.
- 2 Credit points pertains to the Indonesian incentive system within the agricultural extension system.

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