

Networking for innovation

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A participatory actor-oriented methodology

M.L. Salomon
P.G.H. Engel

Royal Tropical Institute
The Netherlands

Royal Tropical Institute
KIT Press
P.O. Box 95001
1090 HA Amsterdam
The Netherlands
Telephone: +31 (0)20-5688272
Telefax: +31 (0)20-5688286
e-mail: kitpress@kit.nl

Royal Tropical Institute (KIT) interest in the RAAKS methodology stems from a long-time commitment to the development of ways to increase the real participation of those who are the focal point of rural development – typically farmers and other villagers – and to increase the potential for others, including governments (from local to national level), donors and the broad variety of other ‘development workers’ to make a meaningful contribution.

The materials in the resource box have been revised and edited for the current edition with the assistance of Rosemary W. Gunn.

ACP-EU Technical Centre for Agricultural and
Technical Cooperation (CTA)
Agro Business Park 2
6708 PW Wageningen
The Netherlands
Telephone: +31 (0)317-467100
Telefax: +31 (0)317-460067
e-mail: cta@cta.nl

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Stoas
P.O. Box 78
6700 AB Wageningen
The Netherlands
Telephone: +31 (0)317-472711
Telefax: +31 (0)317-424770
e-mail: LaV@stoas.nl

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Monique L. Salomon

Paul G.H. Engel

Introduction

Many major issues today – whether sustainable development, waste disposal, negotiations about resource use, rural conflict resolution, natural resource management, clean water supply, food distribution or others – have neither clear problem definitions nor readily available solutions. Each issue affects innumerable competing interest groups, who may or may not even recognize each other, much less work together. Each calls for innovative solutions; yesterday's approaches no longer seem to work. In agriculture for example, extension specialists have typically acted as 'brokers': go-betweens who transmitted information between members of a target group and specialists or researchers. The focus has been primarily on one interface, that of the farmer/specialist – or patient/health worker, public/environmental agency, and so forth. Today, however, specialist/end-user interfaces are no more relevant than those among other stakeholders, such as national policymakers, traders, industrialists and retailers, local organizations, non-governmental organizations, action groups or municipal governments, or among the members within any of these categories. New technologies also do not seem to be the answer; even existing technologies may not be well used.

It looks as if we need ways to understand and facilitate simultaneous multiple-interface interactions. That is, we need new ways of working together – new concepts of social organization – far more than we need new technologies! How can images, knowledge and information be efficiently exchanged among a variety of parties? How can the widely diverse stakeholders involved join together in seeking solutions to complex social issues? And, once there is a decision to approach each other, how can different actors communicate, much less organize themselves to make the best use of the information available, learn new practices, and improve their capacity to innovate? And how can innovation processes be aligned with broader, even more complex societal objectives?

RAAKS is a participatory action-research methodology that attempts to provide ways for those involved in such complex situations to begin to find answers for themselves. It does not give any answers directly, but does furnish an approach to forming a team and beginning to examine the social organization of the system in which you find yourselves. It is meant for use in a situation where working together can be expected to promote positive change, and offers instruments (windows and tools) for gathering, organizing and interpreting information in a participatory manner: specialists working with others as co-researchers and facilitators. That is, RAAKS can be used to focus on the present and potential social organization of actors (groups or individuals) in a situation where innovation is desirable. It encourages the team to think about the system you are in, what you want from it, what it achieves and does not, and what is needed for improvement. The interplay among actors with different world views, combined with the varied analytical perspectives stimulated by RAAKS, acts as a motor for the learning process as a team seeks an understanding of their problem that is inclusive enough to deal adequately with its many facets.

Using this method increases awareness and understanding and helps to develop a shared sense of purpose. The interactions involved in carrying out joint inquiry help to transform a diverse set of people and organizations with an ill-defined sense of purpose into a group with a shared perspective, whose members have agreed upon a number of

tasks and responsibilities and have learned to respect each other. That is, RAAKS promotes the development of a *shared conceptual framework* that can facilitate the exchange of ideas, experiences, and knowledge. Moreover, this establishes a basis for implementation: because people work together in the process, they tend to emerge with a joint commitment to change. They have identified their shared concerns and the networks that are most relevant, and can explore possible new alliances and begin to formulate action proposals that are realistic and implementable.

The RAAKS resource box

The RAAKS resource box provides theory, an introduction to the method, and tools and ‘windows’ (analytical perspectives) for team use. The book, *The social organization of innovation*, details RAAKS’ foundation in scientific theory and development practice, detailed case studies, and an account of its development. This manual addresses the method itself and gives a brief introduction to building a RAAKS team. The laminated cards in the binder include a series of ‘windows’ – guides that literally help to ‘open up’ new perspectives on the analysis – and ‘tools’ to help in gathering and processing information. Together, the manual and cards provide a group of field-tested methodological elements (windows, step-wise phases, tools, and exercises) for teams to use in their explorations.

It is not necessary to read any of the elements in the RAAKS resource box from A to Z, and they do not contain any commandments. Rather, these materials are a sort of ‘menu’ from which users can choose what seems most relevant to their own particular situation. It contains suggestions, it offers criteria to use in weighing alternative options, and it provides examples. RAAKS is the product of practical experience, gained in numerous studies of networking among farmers and others involved in agriculture: how they cooperate and communicate, and what helps them to learn or evolve new practices faster. Instead of singling out one way to explore such questions, this approach encourages a team that is implementing RAAKS to seize the opportunity to construct their own study. That is, it provides a starting point consisting of a number of elements that have proved useful in the past, so that a team need not start ‘from scratch’.

The first chapter of this manual introduces the reader briefly to the problems addressed, the theoretical approach chosen and the key concepts used. Chapter 2 covers the design of a RAAKS study and gives examples of the use of the process, in the form of elements from two case studies. Chapter 3 presents a number of factors involved in getting organized and carrying out a study. Appendix 1 outlines workshops that can be used in preparatory training and team building, while Appendix 2 consists of exercises a team can use to help in organizing its work and carrying out an analysis. References and other resources are listed in Appendix 3, and Appendix 4 provides a glossary of key concepts.

The manual thus focuses on the steps you can take to design a participatory, action-oriented analysis of the way people communicate and organize themselves to share information and promote innovation. Reading it will also increase your awareness of ways to develop criteria for evaluating innovative performance in a particular situation.

We very much hope you will be an ‘active reader’, making your own plan for becoming familiar with RAAKS. The first three chapters of this manual provide a brief overview, but working your way through the windows and tools on the cards is a necessary part of learning how the method works. Windows and tools also help to make concepts and definitions clearer; the tools in particular also contain additional definitions and

explanations. The glossary too can be used early on to become familiar with concepts as well as for later reference. You may find it worthwhile to skim quickly through the glossary and manual, read the cards, and then re-read the manual; to get into the details, reading a window together with its associated tools can help to understand the perspectives it offers, and to think about whether additional tools are needed for your study.

The social organization of innovation provides more detailed explanations of the concepts and their theoretical underpinning, as well as the development of the methodology and greater detail on many of the case studies mentioned. In the book, look to Chapter 9 for a quick overview of the concepts, and Chapters 1 and 6 for more detailed theoretical background. Chapters 2 and 3 in particular include case study material, but also see Chapters 4, 5 and 8.

1 Changing approaches to knowledge and information

Extension systems are under pressure. Those involved – the individuals (such as a farmer or extension agent), organizations (a farmers' union or fertilizer company) or institutions (an extension service or research institute) – are becoming more diverse. Current economic trends including liberalization and privatization are stimulating the development of new industries and the participation of new actors, such as NGOs and private firms, in rural development. All of this means that the roles played by extension and research in agricultural development are changing very fast. We are not always able to gauge exactly how these changes take place, nor to know how we should assess the effectiveness of our responses. As a consequence, all whose interests are involved (including extension and research services, but certainly not limited to these organizations) need to review the scope of their activities, reconsider their policies, and build new partnerships. For example, to ensure both sustainability and food security, extension and research will increasingly need to rely on locally available human and natural resources. As discussed below, they will need to create effective linkages with others. Moreover, in designing new strategies and approaches, it will be necessary to thoroughly understand past experience, to judge this in the light of new requirements and developments, and to use this understanding as a foundation for the new design.

During the past two decades, many efforts have been directed towards improving the impact of extension and rural development programmes. The training and visit system (T&V) supported by the World Bank has been used extensively in many countries. In recent years, the T&V system has been critically assessed by national extension institutions (as well as by the World Bank itself), and meanwhile other extension approaches have been developed by governmental and non-governmental organizations (NGOs). It has become apparent that a uniform extension system, 'fed' regularly with pre-packaged technical information, cannot respond to the demands of richly differentiated target groups of women and men farmers operating under highly variable agroecological and market conditions.

RAAKS, the methodology described in this manual, grew out of attempts to evolve a new vision of agricultural extension. However, the rapidly changing environment and need for innovation described above characterizes many fields today. Thus RAAKS has also begun to be used in other areas.

Innovativeness as a social competence

The focus in this manual is on 'innovation', broadly defined. While many of the examples are related to agricultural extension, they are put in a different perspective. Farmers and others are seen as actively seeking relationships that will allow them to learn and to make changes in their practices. This is what we call *networking*. Such networking may result in either developing new methods and materials themselves, or adapting ideas, practices and things developed by others. Taking this viewpoint shifts the focus of extension from 'transferring technology to a passive farmer' to a new concept: extension as *facilitating networking for innovation*. The key to innovation – including the dissemination and use

of innovations originated by others – lies in the quality of the interaction among farmers, businesses, donors and governments. That is, widespread innovation is not brought about by one or two stakeholders in agricultural development. Instead, there are multiple stakeholders (all whose interests are involved), who are mutually interdependent. Each stakeholder may have his or her particular view of what agricultural development should look like, but none of them could ‘go it alone’. In most cases, before innovation can actually become widespread, the current practices of many actors must change. The introduction of chemical fertilizer was one such instance (see example).

As a result, innovativeness cannot be seen as an individual competence, or even as the sum of a number of individual competencies. Instead, it must be seen as a *social* competence – something shared among all those individuals, institutions and organizations that have a stake in rural development. In other words, we see innovation as a social process, rather than simply discovery and dissemination of new technical possibilities by individuals. The challenge is to learn to create the conditions needed for such innovation to occur – conditions that enable people not only to develop new ideas, but also to learn and make use of each other’s ideas.

Transformation of many practices – not just farming – was required to introduce chemical fertilizers. Regardless of one’s attitude to their use, the worldwide introduction of chemical fertilizers in agriculture over the last five decades has clearly illustrated this point: successfully introducing change requires a considerable transformation in a large variety of practices. This went far beyond farmers’ learning how to buy and spread handfuls of chemicals. In the end, achieving widespread use of fertilizers depended upon enormous shifts in agricultural, commercial, industrial, financial and political practices. Infrastructural and marketing arrangements were needed as well, to provide reliable and timely deliveries of fertilizer. Where the volume available was limited and/or when subsidies were involved, reaching this point may have called for dramatic shifts in practices related to deliveries. Further, the market had to adapt to channel the increased production volume. In general, seasonal credits were needed to allow the use of fertilizer by smaller producers. Banking practices thus had to change, for example by introducing special interest rates. Since fertilizer use had to correspond to local conditions, technical recommendations also had to be adapted. Consequently, national and international research programmes had to be financed, or even established, to produce such recommendations. Sometimes farmers had to learn to adjust long-held beliefs that had guided them through difficult times for many years, such as the ‘law of the limited good’, which suggests that structural increases in production by one farmer will cause suffering and decrease the production of others. To introduce fertilizer use into farming practice, enormous investments in extension, as well as more efficient extension practices, were required. Moreover, politicians had to accommodate to the fact that, as a result of introducing fertilizer use, a large part of the country’s foreign exchange was to be dedicated to buying this input on the international market every year, even though the expected agricultural products were not, or not yet, intended for export. This list of transformations could be extended almost indefinitely. Apparently the availability of technical innovations at farm level is a necessary, but not sufficient, condition for widespread innovation processes to occur (Engel, 1996).

Understanding the social organization of innovation

If we accept that innovation is the outcome of social interaction among many stakeholders – who are interdependent, and yet pursue their own strategic objectives – it becomes clear that it is not a straightforward, technical process. Rather, it is a diffuse, social process, involving both individual and collective searches for ideas, information and options for decision making. The *social organization of innovation* may then be characterized as the way in which actors organize themselves to carry out this search.

But what do actors (individuals, groups, organizations or networks) actually do in searching for ideas and information to change their practices? They experiment of course, but how do they obtain new ideas, new options? What they do in practice is what we call *networking*. To gain access to a range of options and insights, actors actively engage in building and managing interactive relationships with others – people they consider relevant to their concerns. In the book accompanying this manual (*The social organization of innovation*) this networking is characterized by, first, the creation of joint learning opportunities; second, mutual probing of relevant ideas, options and contexts; and finally, by a pooling of energies and often other resources, to implement particular innovation strategies.

How do the great variety of actors involved ‘get their act together’? How do they get organized? Many things they do are not planned or even premeditated. This is seen in everyday experience: we all know how important informal contacts, happy coincidences and unexpected events can be in any kind of interaction. On the other hand, social organization intended to lead to agricultural innovation may be planned and premeditated in the extreme, as for example with the T&V system for extension. In looking at a knowledge and information system, the challenge is therefore to take both informal and formal elements into account when attempting to describe the process of organization for innovation. On the basis of extensive case study evidence, *The social organization of innovation* suggests this can be done by looking at:

- relevant actors and their practices; and
- the patterns of social organization, or ‘social forms’, that emerge as a result of networking among these actors.

The relevance of an actor (researcher or research institute, extension staff, farmer, NGO, trader, and so forth) or a practice (research, extension, farming, trade, etc.), however, is in the eyes of the beholder. Actors build networks with those *they* consider relevant to their cause: for example, with respect to innovation, those they think for one reason or other may help them to learn something new and useful. Therefore, to select relevant actors and practices for study, our first question is who the various stakeholders themselves consider relevant to achieving what is, in their view, a desirable agricultural development. From a relative outsiders’ point of view, we can also ask who we, as students of innovation, think might be relevant, and why.

After a preliminary assessment of the relative relevance of the actors involved, we can address the question of the degree and kind of social organization that exists (or could exist) among them. *The social organization of innovation* suggests that networking tends to lead to the emergence of three social forms: convergences, resource coalitions and communication networks. These merit particular attention when studying innovation; they represent macrostructures, with dynamics of their own. ‘Macrostructures are in part the result of the unintended consequences of numerous social acts and interactions, which ... become the enabling and constraining conditions of social action...’ (Long, 1989: 229).

Convergences

Convergences emerge as actors narrow down the scope of their searches, along with the range of issues and alternatives they consider relevant to innovation. That is, as some actors make similar choices, coming to define problems and solutions in similar ways, a 'school of thought' may emerge. Even so, as mentioned above, full consensus among all stakeholders involved in any type of development is very rare. In practical situations, a number of schools of thought normally coexist, such as 'low-external-input' versus 'high-external-input' thinkers with respect to agriculture. When they hold very different views of what agriculture and agricultural development are and should be, actors from different convergences may find it difficult to cooperate or even communicate effectively. However, strong convergence may also be a disadvantage: when actors agree on many issues, it becomes easier to ignore useful information that points in another direction.

Resource coalitions

When actors decide to pool their resources for a joint performance, a resource coalition emerges. Leading actors may enrol others in their 'projects'. As a result, effective leadership patterns may develop – but constraints to coordination and widespread searches for information can also occur. More than one coalition may arise, or cooperation in some but not all areas. Classical examples of the latter can be found in countries where donor agencies compete with each other for the use of local staff, and separately approach target groups in the same area with similar programmes. Studying coalitions will require an analysis of the instruments of power and influence used to forge alliances and/or to impose one's approach upon others.

Communication networks

These emerge as a direct consequence of actors' decisions to make use of available information (newspapers, journals, extension information and so forth) or to exchange ideas, experiences, knowledge and information among themselves. As a result, particular communication practices are adopted (such as meetings, newsletters, workshops, journals, conferences or courses). A diverse range of communication media may be used, ranging from interpersonal contacts to mass media, and from formal to informal channels. In studying innovation, the role of informal channels of communication must not be underestimated, as has often been the case in traditional studies in this area. Communications networks among farmers – especially women farmers – are often very informal, yet quite effective.

Innovation configurations

Actors in agricultural innovation have long recognized the need to divide tasks among themselves. As a result, various types of organizations have been set up: advisory and extension agencies, research institutions, policymaking bureaus, research and development units, auctions, agricultural information bureaus, liaison units, farmer organizations and the like. Over time, networking or the lack of it among these units may lead to a pattern of more or less durable relationships.

We call the particular combinations of convergences, communication networks and resource coalitions that result from networking 'innovation configurations'. Innovation configurations encompass the views, procedures and ground rules for collective behaviour with respect to innovation (or perhaps a particular type of innovation) that are accepted within a network. Success in innovation requires a degree of strategic consensus. If a network is to succeed, its participants must be aligned to a considerable degree; this is

reflected in the configuration – the convergences, resource coalitions and communication networks – that we observe. At the roots of such consensus lies a common concern and strategy shared among a number of relevant and powerful social and/or institutional actors.

Generally, a lot of casual, unintentional problem solving (as well as ‘divergent’ institutional behaviour – actions not obviously related to the apparent objectives) remains, even within a strong and successful configuration. In fact, many authors argue that ‘opportunity grasping’ and divergent behaviour may be important elements in explaining successful innovation. Also, some actors within a configuration may not want to express their agreement with others explicitly. For example, a Colombian–Netherlands agricultural development project had to navigate carefully so as not to be seen as ‘fully absorbed’ into the World Bank sponsored national rural development programme. Its own identity had to be stated clearly and repeatedly for the other parties involved, to ensure the continuation of independent funding (Engel, 1996).

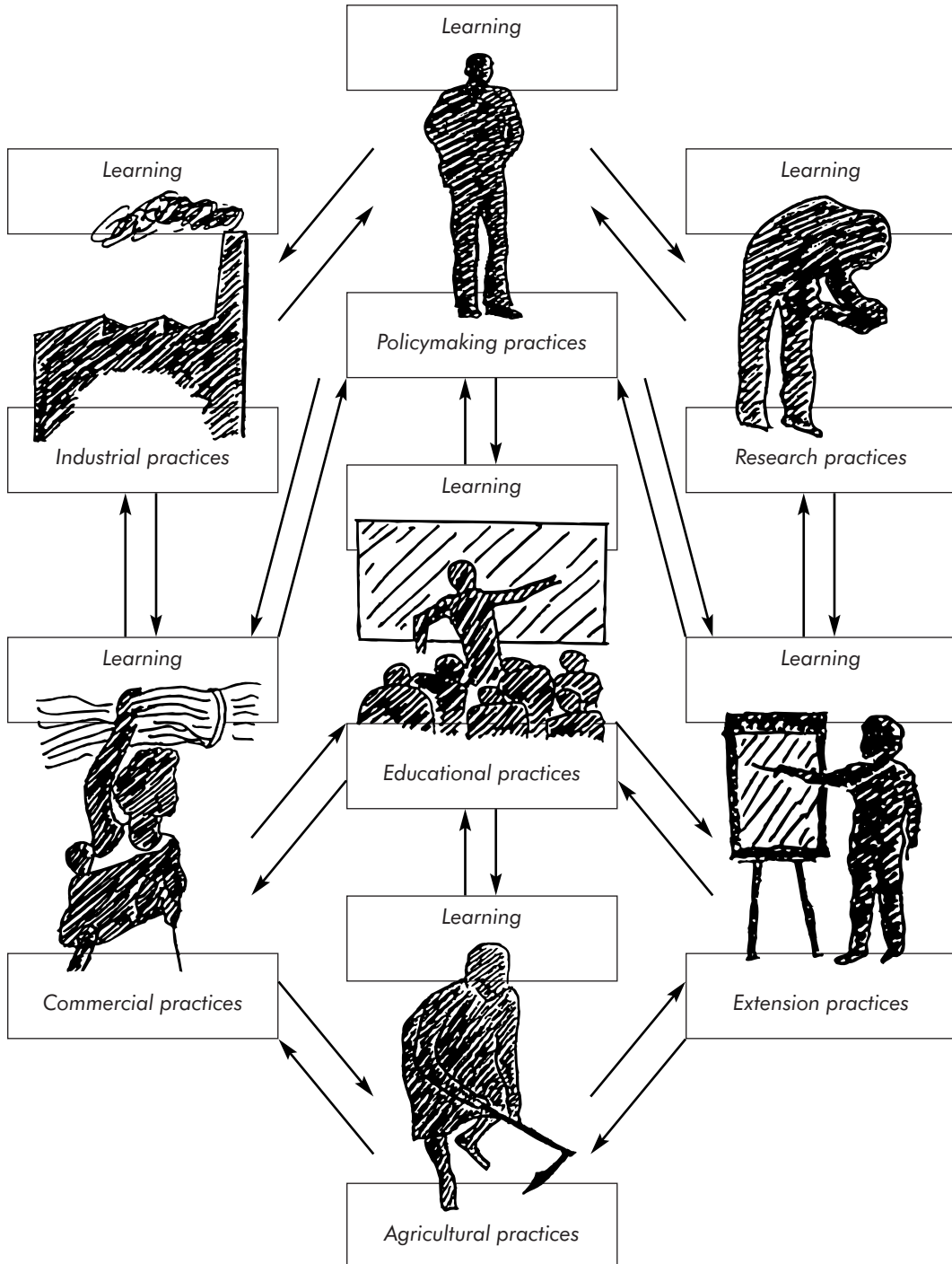
The AKIS perspective

No one group, whether farmers, scientists or technicians, is alone responsible for innovation in agriculture. Rather, the interdependent activities of a whole set of actors – including farmers, school teachers, traders, producers of inputs and services, processing industries, policymakers, planners, researchers, technicians and extension services – stimulate or, alternatively, frustrate innovation processes. Looked at in this way, innovation can be seen as the outcome of a mutual learning process taking place among a large number of autonomous actors.

The agricultural knowledge and information systems (AKIS) perspective (Röling and Engel, 1992; for a comprehensive introduction see Chapter 1 in *The social organization of innovation*) provides a way of looking at the social organization of innovation. A pivotal idea in the AKIS perspective is its recognition of the level of mutual interdependence among the actors on the agricultural development scene. This idea can be made visible by drawing a picture representing actors and their practices. Begin with the agricultural practices of the farmer, and then add other actors whose practices are or might be linked to this in the situation that concerns you. Research, extension and commercial practices are apt to be there, of course, but also policymaking and industrial practices, and educational practices may be related to all the rest. Figure 1 is an example of an attempt to picture all of these practices. In reality, each picture represents a variety of actors. For example, the farmer stands for individual women and men who work their land, but also for farm families, farmer organizations and farm labourers. The arrows suggest what building a knowledge system – a collective competence for innovation – can mean. Each of the separate figures shows a person or organization that is learning; however, we are often absorbed in the practices and priorities of our own tasks or discipline. When the arrows appear, learning and practices become linked, so that we can begin to understand and learn from each other; when practices become interconnected, it becomes possible to make decisions on a broader, more realistic basis. Thus, the more arrows the more tightly the actors are joined together in a learning system.

In fact, we can define any knowledge and information system (KIS) as a *linked set* of actors – individuals, organizations or institutions – that emerges (or is strengthened) as a result of networking for innovation. Such a set of actors (or network) can be expected to work synergistically to effectively support learning for innovation; indeed, a network can be managed – in a sense – to achieve this aim (Engel and van der Bor, 1995; see also Windows C1, C2 and C3, and the related tools).

Figure 1
Agricultural knowledge and information systems



Using an AKIS perspective can help people like extension staff and researchers to focus on those actors within an agricultural system whose knowledge and information contribute the most to agricultural innovation. The AKIS perspective assumes that the more effective and efficient networking is among the stakeholders in agricultural development, the better the chances for innovation. However, to look at networking, and to take into account the many types of actors who may be relevant to the network, it is necessary to look beyond the boundaries of conventional extension. The AKIS perspective can help to carry out such a comprehensive analysis, and to provide a practical contribution to knowledge management and policy (Röling and Engel, 1992). Research carried out over the past few years indicates that the performance of the system involved in an AKIS depends heavily on:

- cooperation among the various actors involved
- effective internal and external communications
- transparency and agreement among different actors with respect to interests and objectives
- the degree to which tasks are divided and coordinated within the system, so that relevant knowledge networks are activated and people acquire a shared sense of direction.

Key concepts in knowledge and information systems

When we use the AKIS perspective, a number of concepts play a pivotal role in the analysis. In the first place, *systems* are seen as constructs. That is, they are products of our imagination, but we can use them to understand the world and to act in it. A knowledge and information 'system' does not exist: it is just a way of thinking that helps us understand the social organization of innovation in agriculture better. What does exist is a large variety of people (as seen in the example on the greenhouse sector) who are stakeholders in agricultural development, such as farmers, policymakers, traders, researchers, extension staff, teachers or people who sell inputs.

The Dutch greenhouse sector, seen as a knowledge and information system, consists of a variety of different actors: extension agents, managers of various extension agencies, private consultants, commercial firms, agricultural schools, growers' associations, rural women's groups, banks and research stations.

All of these actors manage, generate, transform, transmit, store, retrieve, integrate, diffuse and use knowledge and information within a specific area of human activity: horticulture. They are all stakeholders in agricultural development – therefore we consider them part of an *agricultural* knowledge and information system. The knowledge systems perspective can also be applied to other areas, such as health care, traffic and transport, education, and so forth.

The *boundary* of an AKIS – the definition of the problem and the line between actors who are seen as part of the system and those who are not – is established arbitrarily. In using the RAAKS methodology, it is the task of the team, together with some or all of the stakeholders, to determine which actors are relevant to innovation in a particular situation (this decision is then periodically re-evaluated). Boundaries may be based on geographical or physical aspects, or defined on the basis of a problem. Thus examples of boundaries include actors 'in the horticultural sector', or involved with issues related to a particular watershed, or problems of declining soil fertility. Some actors may be quite relevant even though this is not obvious at first sight; therefore, careful thought is needed before

deciding to exclude groups or individuals. Diversity is an important breeding ground for innovation, so a team should not shy away from including new or hitherto unrecognized actors. For example, a failure to seriously consider environmental activists as actors in the Dutch agricultural knowledge system has cost the sector dearly. However, practical considerations are always involved. Criteria to use in establishing the boundaries of an AKIS may be derived from the purpose of the diagnosis, the time available, and the relative importance of the actors vis-à-vis the type of agricultural development that is intended.

Linkages among actors, and the related linkage mechanisms, are a quite significant part of a knowledge and information system: they show how actors communicate and work together. Linkages enable actors to exchange resources such as information, money, labour and other materials; or immaterial assets, such as power, status and 'goodwill'. *Linkage mechanisms* are arrangements that facilitate communication (such as meetings among farmers or with extension staff, or liaison offices), coordination (e.g. mutual adjustment of activities, or water distribution) or resource transfers (perhaps credit, salary payments, or sharing labour). Some linkages are of a more formal character, such as administrative links between a project and its donor(s). Others are more informal, as the links that often exist between extension staff and researchers at a personal level.

Within an AKIS, actors often perform specialized tasks: policymakers formulate agricultural policies and plans, researchers do research, teachers educate, farmers farm and donors finance programmes. On the other hand, it is important not to overemphasize specialization. Conflict may arise with respect to agricultural development, for example, when researchers define 'research' as limited to analysis based on formal, academic procedures. If they then see themselves as the only ones qualified to carry out such work, it becomes easy to forget that farmers have been innovators for centuries, based on their own on-farm experimentation. Acknowledging farmers' expertise, involving them in setting the research agenda and/or as partners in research, can lead to additional forms of learning and innovation. This is true overall: different actors have access to different ideas, knowledge, information and experiences. As a result they learn different things, but also they are apt to learn in different ways. This makes some form of coordination essential.

The importance of linkages and coordination does not mean there are no conflicts among system actors. On the contrary, consensus is the exception. More often, because actors may perceive agricultural development in many different ways, and because they each play their own roles in this development, consensus is hard to achieve. Nevertheless, for the smooth 'performance' of an AKIS, it is necessary to build a degree of strategic consensus among at least the main actors who are involved. External factors (and actors) are influential as well. Unstable market prices for their products may cause actors to become reluctant to invest in innovation. Or low interest rates or favourable policies may stimulate more systematic investment in the development of knowledge and know-how. Moreover, access (or lack of it) to international donors can play an important role. Influential external actors or combinations of actors may create specific types of problems, constraints and opportunities for the performance of the system (see 'Basic configurations' – Tool B6, and Chapter 4 in *The social organization of innovation*.)

Key concepts are summed up in the Glossary (Appendix 4) for quick reference as you work through the RAAKS materials.

RAAKS: Participatory action research

RAAKS is a methodology that has been designed and tested to help stakeholders gain a better understanding of their performance as innovators. The acronym stands for rapid (or relaxed) appraisal of agricultural knowledge systems. RAAKS provides a way to improve the generation, exchange and utilization of knowledge and information for innovation. Men or women villagers, researchers, policymakers, extension workers, consumers, producers of inputs or services, industrialists and/or traders, guided by a team of specialists, can all be involved in a RAAKS study.

Central elements of RAAKS are team work, focused collection of information, qualitative analysis, and strategic decision making. RAAKS uses a variety of windows, as mentioned in the Introduction, to achieve a fundamental analysis, a transparent problem definition and recommendations for action. The important issues addressed in RAAKS include forms of cooperation between actors, actors' objectives and their conflicting and/or shared interests, integration and coordination of activities, relevant knowledge and information networks, and the division of tasks (research, experimentation, training, farming and so forth).

Although RAAKS has been developed for use in agricultural and rural development situations, it has been applied to non-rural problem situations as well, such as the management of services for the elderly and the introduction of solar energy in the Netherlands. In what the West tends to call 'developing countries' its application has generally been directed at bottom-up policy formulation and planning, and at the organization and evaluation of agricultural research and extension. In this manual and the accompanying materials, we present examples from a variety of different situations. We have included some from the Netherlands; these show that even though there are differences, the basic principles are the same in all countries. As a result, the method can be widely used to describe situations and generate the recommendations needed for planning purposes.

RAAKS, women and other stakeholders

As a participatory methodology, the use of RAAKS immediately suggests the inclusion of women and other groups of stakeholders who are often forgotten – depending on the local situation, this might also include newer immigrants, young people, the elderly, or landless farmers. While not every RAAKS tool includes a reminder about these groups, they definitely need to be considered. In many knowledge and information systems it is important not only to understand their role as actors, but also to seek ways to build them into the information system – supplying as well as receiving information. If they have been defined as target groups, this is essential!

Many of the readings in Appendix 3 can be useful here. See in particular the sections on gender analysis and on participatory methodologies.

For whom is RAAKS useful?

RAAKS is first of all useful to organizations or institutions who feel pressed to improve their performance with respect to innovation. As innovation processes grow and change more and more quickly, the need to align them with broader, more complex societal objectives becomes more urgent. This increases the pressure on governmental, non-governmental and private organizations – such as extension, research or development agencies, exporters of agricultural products, agro-industries or national or international

policymaking bodies – to improve their own capacity to innovate and to make use of innovations. RAAKS provides a way to evaluate the functioning of their knowledge and information systems, and to see ways to make improvements. Therefore RAAKS may help such organizations to develop a more adequate response to the pressures they feel.

Second, some organizations or institutions take it upon themselves to intervene on behalf of particular developments and hence to guide innovation in a particular direction. This is the case, for example, when a government decides to subsidize research and development programmes, the use of clean energy sources, low-external-input agriculture, sustainable farm practices, and so forth. Assuming such a leadership role requires an understanding of the impact of technology upon development, but also an appreciation of the role the organizations, institutions and companies involved play in continuously obtaining, developing, redeveloping and putting to use relevant knowledge, information and technologies. Such actors may find that RAAKS can help them to develop a thorough understanding of the social and organizational issues involved in innovation, to formulate concrete proposals for action in a participatory manner, and to assure that they understand the positions of others before moving ahead.

Typically, managers of agricultural development programmes, extension managers, researchers or, more generally, development professionals are the ones who implement RAAKS. They may find RAAKS useful as a participatory approach: it is a way of facilitating inquiry into the constraints and opportunities that affect networking, cooperation and communication for innovation; moreover, this approach can aid in formulating strategies to overcome problems that have been identified in a specific situation. Some of the ways RAAKS can be used are summarized in Box 1.

<i>Box 1</i>	
Ways to use RAAKS	
Field workers	As a field worker, you can use this method to chart out the knowledge and information networks in which you operate, and design ways to improve your performance.
Trainers	As a trainer, you can use RAAKS to encourage trainees to take a comprehensive, critical look at their performance as facilitators of innovation in agriculture.
Managers	As a manager, you can encourage teamwork, self-monitoring and the generation of ideas on how to improve collective performance related to innovation, with built-in feedback and followup.
Researchers	As a researcher, you can use this method to develop an understanding of the social organization of innovation, based on input from those who are involved; this can be used as a basis for proposals for action and/or further analysis.
Consultants	As a consultant, you can use RAAKS to facilitate a shared understanding among stakeholders, to define what can be done and by whom, and to improve the way stakeholders function together.

2 Designing RAAKS action research

Because RAAKS is a participatory approach, much thought must be given to the role of relevant stakeholders (farmers, extension staff, researchers, policymakers, traders and so forth). The degree of participation of stakeholders in the RAAKS study, and in the formulation of solutions and recommendations, are critical elements. In fact, decisions in this area are probably the most important (and have the most implications) of any that must be taken by a RAAKS team when designing the particular form in which they will use the methodology.

This chapter should allow you to become familiar with the issues and steps involved in designing such action research. The intentions involved in the use of RAAKS, its underlying principles and its procedural and analytical design are covered. Again, RAAKS is not a ready-made solution; rather it offers a 'menu' made up of a number of field-tested methodological elements (windows, step-wise phases, tools, and exercises). A RAAKS team can choose among these, deciding to leave out certain ingredients or add new ones, fitting their approach to local circumstance or to the problem situation at hand.

Appendix 3 lists further readings on related topics including research, RAAKS and participatory methodologies.

What is RAAKS?

RAAKS is based upon what has been called a 'soft systems' methodology (Checkland and Scholes, 1990). If innovative performance is to improve, the various stakeholders themselves have to decide to do something about it. Therefore, at the core of RAAKS lie the *appreciations* – the perceptions, preoccupations, judgements and understanding – of the principal stakeholders. That is, they (like all of us) filter incoming information and construct a reality that makes sense to them. (See Chapters 1 and 6 in *The social organization of innovation*.) The RAAKS process helps to make these appreciations explicit by encouraging stakeholders to assess and re-assess their understanding of the problem situation and their own role in it. It also offers ways to address specific issues in a transparent manner, using methods that have been validated and can be agreed upon in advance by those who are taking part. This method thus makes it easier for people with diverse interests to begin to work together. It also helps identify possible constraints and opportunities, and allows the participants to design strategies to define measures to improve their current interaction. They can also make adjustments to better fit trends and changes in their environment – for instance, increasingly stringent regulations concerning the preservation of natural resources, changing developmental objectives, or new developments in the international market. Directly involving those additional actors responsible for policy formulation and implementation helps to move beyond the identification of opportunities, constraints and clues for action, and toward finding a point of departure for future cooperation and change.

RAAKS and other participatory methods

We see RAAKS as part of an emerging family of 'alternative systems of inquiry'. All of these have several points in common (Pretty, 1994; see Chapter 8 in *The social organization of innovation*):

- a defined methodology and built-in learning process,
- the use of multiple perspectives,
- an insistence upon group inquiry,
- context-specific methodological design,
- facilitation of participation by both experts and other stakeholders, and
- a focus on designing and implementing sustained action.

Well-known examples are PRA (participatory rapid appraisal – Chambers, 1992) and PTD (participatory technology development – Jiggins and de Zeeuw, 1992). RAAKS is distinguished by its focus on the *social organization* of innovation: the way actors (individuals and organizations) build and maintain relationships with each other to foster innovation. The ways actors organize themselves to learn, how they network, cooperate and communicate for innovation, what hampers their capacity to learn and what helps them to learn new practices faster, are central research questions. PRA focuses more on analysing local farming and livelihood systems and general conditions enabling and/or constraining their development; PTD helps to create a process of creative interaction between local community members and outside facilitators, to experiment with and develop technologies for improving the local agroecological system and to increase the capacity of the local community to sustain the technology development process. All three methods use techniques (visualization, for example) that are especially useful in working participatively with people who cannot read; these techniques also tend to stimulate action. Thus RAAKS complements both PRA and PTD. In practice, RAAKS teams often combine techniques from these and/or other participatory approaches. (See also Exercise 5 in Appendix 2.)

Objectives

Generally, a RAAKS study has three objectives, as shown in Box 2. The second objective is particularly important. Careful preparations are needed to guarantee close collaboration. The RAAKS team may include representatives of actors familiar with the situation as well as members familiar with the RAAKS methodology. As noted earlier in this chapter, decisions about stakeholder participation in a RAAKS study are vital ones. Relationships with stakeholders (individuals and representatives) and their participation must be carefully prepared and managed. A preparatory workshop may be held so that team members can get to know each other and become familiar with the methodology. (See also the section on ‘Preparation’ in Chapter 3, and the exercises and workshop planning materials in Appendixes 1 and 2.)

Designing a RAAKS study

RAAKS action research may be characterized along three dimensions. The first is concerned with *intentions*, with what one hopes to achieve when using this method. Why is the study thought to be necessary? And what implications does this have for the design and implementation of the study? For example, the problem may seem to be that farmers do not participate actively enough in extension programmes; the intention is therefore to suggest ways to increase their participation. Or the problem seems to be of a more institutional sort, such as a lack of coordination between research and extension; this could make improved cooperation desirable, to avoid duplication of effort and a waste of government funds. Questioning the initial wording of the statement of the problem is a part of the process, which helps to refine the statement and make it more useful. Nevertheless, the initial intentions of the various actors provide a starting point.

Objectives in using RAAKS

- To identify opportunities to improve a knowledge and information system – that is, to better the organization, decision making and exchange of information among actors, with the aim of improving the potential for learning and innovation.
- To create awareness among relevant actors (such as target groups or constituencies, managers, policymakers, producers, traders, researchers and extension workers) with respect to the opportunities and constraints that affect their performance as innovators.
- To identify actors and potential actors who do or could act effectively to remove constraints and take advantage of opportunities to improve innovative performance and to encourage their commitment to such changes.

Analytical concerns come next. What issues should be addressed to clarify the problem, identify potential solutions, and create commitment among actors to implement solutions? What aspects of the knowledge system are we to study? How can we reach an understanding of a complex situation without ‘running around in circles’ all the time? Answering these and similar questions is not easy. The choices made must be relevant to the intentions, and practical within the scope of the resources allocated to the team. It will not be possible to study everything; the team will have to limit itself to the most relevant issues and variables within the knowledge system. However, the ‘windows’ provided by the RAAKS method itself are helpful, as will be discussed below. Also, RAAKS allows for making changes and focusing in more closely in the course of the study, as the problem situation becomes clearer.

Third, an agreed *procedure* is needed. What will the team do first, what next? How intensively will each of the stakeholders be encouraged to take part in the study? How many individual or group interviews will be done, and during which phases of RAAKS? And how many workshops will there be where stakeholders will meet? The answers to such questions are related to the choices made about intentions. If more participation from farmers in extension is desired, farmers should take a very active part in the RAAKS process so that their views and knowledge are adequately represented in discussions and in decision making. If, on the other hand, the relationship or lack of a relationship between researchers and extension managers is seen as the problem, our first concern might be with getting those parties actively involved.

Designing a RAAKS study requires taking decisions related to all three of these dimensions: intentions must be clarified, a design for the analysis made, and procedures agreed upon. Together these make up the design for the RAAKS study. While in reality these three dimensions are not entirely separate, in the following paragraphs we elaborate on them and present a number of related issues that you may want to consider when designing your own RAAKS study.

Intentions and underlying principles

RAAKS directs attention first to helping actors to study the ways they have organized themselves for innovation, rather than immediately focusing on specific solutions. *Strategic diagnosis* – an appraisal of constraints and opportunities, leading to a joint definition of useful strategies for improvement – is emphasized. A very important characteristic of the approach is that men and women farmers, other rural people, consumers or other target groups are considered stakeholders and sources of relevant knowledge and information. As suggested by the objectives listed above, RAAKS aims at three types of outcomes: a more comprehensive understanding of the social organization of innovation in a particular situation, suggestions for improvement, and interest on the part of some or all of the relevant actors in implementing these. To produce these outcomes, three different yet intertwined learning processes (see Figure 4, Chapter 8, in *The social organization of innovation*) are combined:

- joint inquiry, involving both the team and other stakeholders in exploring a shared concern with respect to innovation-related performance;
- contrasting results obtained by using different ‘windows’; this creates a useful tension among different, but equally relevant and valid, interpretations of the same situation;
- a task-oriented path that leads participants from analysis and interpretation of the problematical situation to designing and committing themselves to potentially useful actions.

Joint inquiry into the social organization of innovation

RAAKS focuses on the performance of actors, as those who are responsible for making innovations in their own practices. RAAKS helps actors to work together to identify relevant networks – and appreciate the role and relevance of these networks with respect to effective innovation in their own situations. It helps to draw attention to relevant issues and shared concerns within the knowledge system, offering instruments (windows and tools) for gathering, organizing and interpreting information on relevant ideas and events as well as exercises that provide guidelines and techniques to support interactive learning. Using different windows and tools and contrasting the results makes a profound analysis possible, while the use of exercises helps team members to design their own learning path and implement the analysis in a participatory manner.

Task-oriented learning: organizing for effective innovation

RAAKS revolves around understanding and diagnosing the problem at hand. This makes it possible to reach the point of suggesting measures to improve the social organization of innovation. That is, studying the social organization of innovation is not enough: something has to be done about it. This lies behind the design of RAAKS as a participatory action-research methodology. The interaction between stakeholders and team members has the explicit purpose of arriving at suggestions for improvement. Establishing an agreed procedure among team members helps to assure that such suggestions will have been thoroughly discussed beforehand.

The task-oriented design of RAAKS is aimed at creating consensus, whether general or partial, among relevant actors. This increases the potential for taking decisions, as well as the potential for commitment to implementation of recommendations. This line of inquiry is necessarily more conclusive than the other two. Therefore, RAAKS offers specific windows (A5, B8 and C3; windows are discussed in more detail in the last section of this chapter) to help achieve a synthesis of the problem situation and of the existing social organization of innovation.

It is important to note that in many development situations it takes time for actors to come to understand each other and the mutuality of their interests, work together, agree, arrive at sound plans, consult others within their several organizations and commit themselves to action. 'Taking time,' however, generally pays off nicely in the end!

Design and analysis using multiple perspectives: a choice of windows and tools

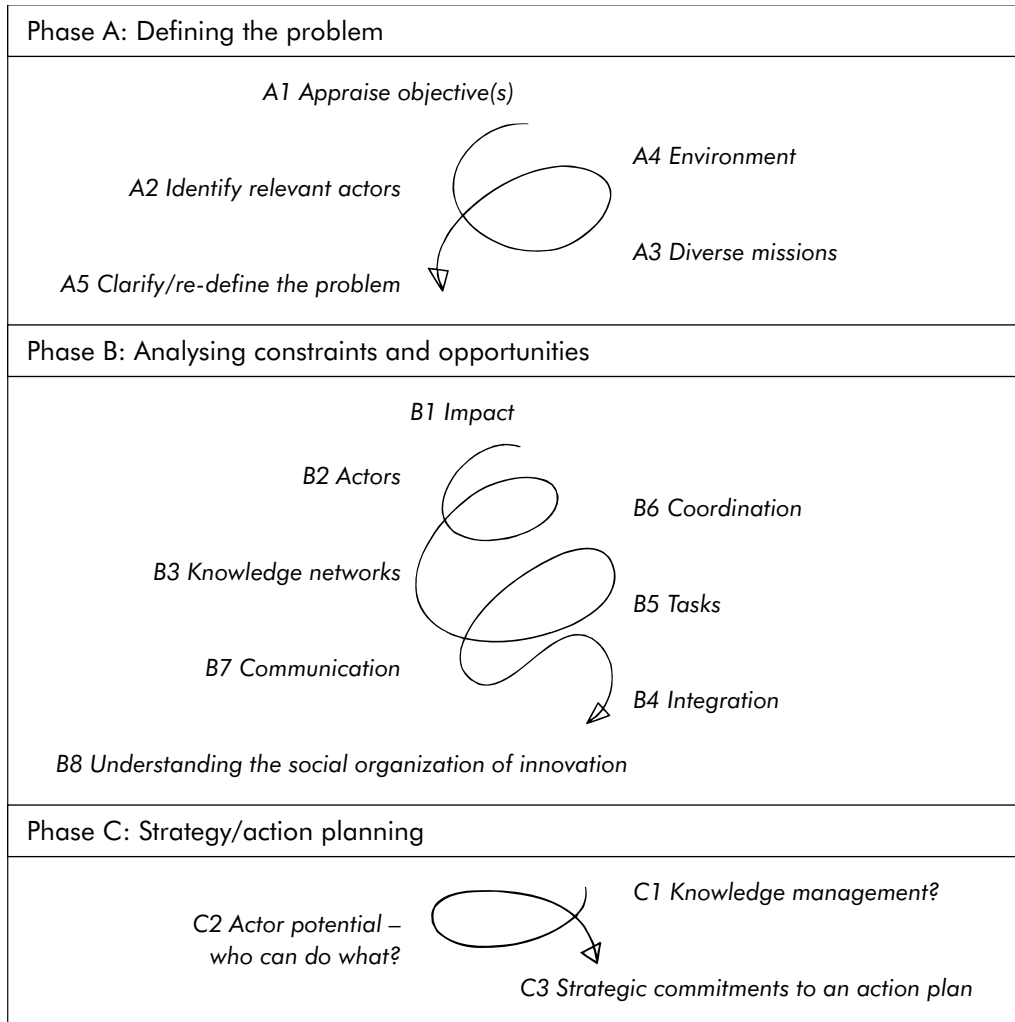
In reading some of the questions listed earlier, like 'what issues should be addressed' or 'how can we reach an understanding of a complex situation without running around in circles' you may have wondered how teams can come up with answers. The windows and tools included on the laminated cards in this resource box can provide part of the answer; building a good team – and hard work! – will do the rest. The social organization of innovation can be studied in many ways. Looking at a problem from different angles, or perspectives, can help. The *windows* are meant to 'open up' these possibilities, guiding a RAAKS team to seek information effectively and make sense of their observations. Figure 2 gives an overview of RAAKS windows. Each window draws attention to particular issues and relationships, and all have been developed and tested in field research, by others and/or ourselves. We have chosen and designed or redesigned them in the form presented here to fit an action-oriented methodology. As has been mentioned earlier, the windows, tools and exercises offered here are by no means the only ones possible. On the contrary, since this is a participatory action-research methodology, the team serve not only as researchers, but also as facilitators. They encourage actors to participate in producing modified or additional windows and designing new tools. However, extensive field research suggests these particular windows do provide a RAAKS team with a useful starting point.

A window helps the RAAKS team focus attention on particular issues that have proved to be relevant in other studies. Using a window brings particular ideas, actors, activities and relationships forward. Each window therefore provides a different view of the situation we are studying. This does not mean that all windows are mutually exclusive; overlap has been carefully built in. Within a RAAKS study, it is not necessarily inefficient to arrive at similar insights via different routes. For example, the barriers that generally prevent the sharing of knowledge between peasant farmers and industrial producers will become apparent whether we observe their linkages, the types of knowledge they exchange, or the way they communicate. However, each of these angles may tell us something different about why such a situation has developed and how we might be able to do something about it. Contrasting the results of various windows often provides additional important information.

When the intention for a RAAKS study is a comprehensive analysis of a situation, a new team should use all of the windows in the first and last phases (A and C, described below). During the second phase, the actual study of the social organization of innovation, a selection can be made. The choice of windows and tools depends on the situation, the capacities of the team and the issues and problems identified in the first phase. The windows may be used as they are, or teams may decide to adapt and/or extend them to address particularly relevant issues in their situation.

Even though field testing has helped to assure that all windows can be considered valid and applicable, this alone cannot guarantee the quality of RAAKS action research. The windows help, but they cannot replace individual and group skills. Applying RAAKS and its windows requires analytical as well as communications skills on the part of both

Figure 2
Juggling with perspectives



team and stakeholders. As noted, the appendixes give some suggestions on how a team can build such skills. However, the use of these windows also requires creativity. None of the windows provides an unequivocal recipe for analysis. On the contrary, each must be studied, discussed and, if necessary, re-designed before it can be used in the field. Moreover, specific plans must be made on how to collect, consolidate and interpret relevant information, and how to make cross references between different windows.

To provide a quick reference when choosing the windows to be used in a RAAKS study, all windows are listed in Table 1, where they are related to the main issues discussed in the first chapter (see the section on ‘Understanding the social organization of innovation’). In reading the table, look for example at Window A3. This window explores – analyses – the degree of convergence (or divergence) among stakeholders with respect to innovation. Therefore an ‘A’ is seen in the ‘convergence’ column. Window B3 on the other hand addresses the analysis of networking practices with emphasis on thematic convergences, communication networks and innovation configurations; Window B8

Table 1
**Issues of social organization for innovation
addressed by each RAAKS window^a**

Window	Focus	Problem definition	Relevant practices	Networking practices	Convergences	Resource coalitions	Communication networks	Innovation configurations	Defining actions
A1: Redefining objective/problem		A							
A2: Identifying relevant actors			A						
A3: Tracing mission statements					A				
A4: Environmental diagnosis		A							
A5: Synthesis/problem situation		S/D	S/D		S				
B1: Impact analysis		A							A
B2: Actor analysis			A		A				
B3: Knowledge network analysis				A	A		A	A	
B4: Integration analysis				A		A	A		
B5: Task analysis			A						
B6: Coordination analysis				A		A		A	
B7: Communication analysis					A		A		
B8: Synthesis/social organization		S	S	S	S	S	S	S	A
C1: Knowledge management		S/D		D	D		D	D	D
C2: Actor potential analysis						D	D		D
C3: Strategic commitments			D						D

^a Each letter in the table relates to one of these activities:

A = analysis/appraisal

S = synthesis

D = design/choice

facilitates the synthesis of relevant issues of social organization and the analysis of relevant action proposals; and so on. (Detailed RAAKS windows are included as one section among the laminated cards in the binder.)

Each of the windows is equipped with one or more *tools*. Windows can be seen as opening up a vista, a way of looking at a situation, while tools supply practical ways to begin gathering and organizing the relevant information. Tools provide a means for the actors involved in RAAKS to do a 'quick scan' from various angles. A tool helps the team to gather information systematically and to process it. In a way, a RAAKS tool represents a straightforward way to address all or part of a particular window. However, because it involves a choice with respect to which questions will be addressed and how, a tool is generally more limited than the corresponding window.

Studies of the social organization of innovation have produced a number of specific tools: we have collected 23 of them here. Each of these tools has proved itself in various

RAAKS studies. They are not the only useful possibilities, but they provide a good start for a RAAKS team that is designing a study. However, we expect teams to critically assess the strengths and limitations of each tool in view of their own purposes, and to adapt or even replace them before going into the field. In practice, this means that RAAKS teams often start by using the tools provided; but after they become more familiar with the approach and methodology, they start adapting the tools or developing some of their own, adjusting them more closely to the situation they are studying. (RAAKS tools are included as one section among the laminated cards in the binder. Tools bear the number of the related window. If a tool is numbered, for example, 'A5/B6' it applies to both windows – A5 and B6.)

Even though you may not use all of the windows and tools at once, it is a good idea to read through all of them in combination with these chapters of the manual. You might for example take a quick look now, a closer look after reading the following material on the three phases of RAAKS action research, and then read and consider them in more detail after you have completed Chapters 1–3. This may also be a good point for a quick review of the Glossary.

A step-wise design for procedures

After a preparatory phase – team building, getting acquainted with the methodology and building relationships with relevant stakeholders – a RAAKS study consists of three phases:

- Phase A: defining the relevant system and its problems;
- Phase B: analysing constraints and opportunities;
- Phase C: articulating policy and strategy/planning for action.

Specific research objectives are pursued during each phase; these correspond roughly to the operational objectives of RAAKS. To reach these objectives, the windows are used to help in gathering, organizing and interpreting information and in the presentation of results. As mentioned above, in Phase B the combination of windows used may be different for each RAAKS study. Teams can decide to modify windows or construct their own, to adapt the analysis to the specific issues and the situation at hand. At the end of each phase, a *workshop* is organized with stakeholders and/or their representatives. The purpose of the workshops is to feed information back to the stakeholders. Both the process of producing the reports and the resulting discussions enable people to debate, complement and/or amend the research findings and to participate actively in the learning process. *Field reports* are made as a way of sharing and discuss ideas and information among team members; *discussion reports* are made to share ideas with stakeholders during the workshops. These are not intended to be lengthy descriptive reports – instead, for example, use can be made of drawings, tables and brief statements. (Workshops and reports are discussed further in Chapter 3.)

The phases cannot be strictly separated. Sometimes elements are brought forward, and considered in an earlier phase; sometimes an analysis from an earlier phase is repeated in greater detail in the next. The phases are meant to be taken as a point of departure, not as a blueprint. Nevertheless, we will briefly sketch the general contents of each of the three phases below. They have some factors in common, in that the following tasks need to be planned and implemented during each one:

- debate, specify and agree upon the research objectives;
- debate and choose relevant windows, further operationalize them to make them fit the situation (that is, state specifically what aspects are most relevant, what information will be needed and how to obtain it) and/or add new windows;
- use these windows to gather relevant information through individual or group

- interviews and from secondary sources;
- produce field reports;
- use group discussions to integrate ideas, issues and information;
- produce a discussion report that reflects important issues, information gaps and tentative conclusions.

Figure 2, above, is a graphic reminder that teams make a choice of windows to be used; it also emphasizes that RAAKS is not a process that takes place in a straight line. Instead, it is interactive, bouncing forward and backward. It evolves as teams work to achieve their goals: teams choose the sequence in which they will use the tools. Often they are used in 1, 2, 3 order, but this is not required.

Phase A: Defining the relevant system and its problems

The broad objective of the first phase of the diagnosis is to identify opportunities to improve a knowledge and information system. Therefore, one of the tasks in this phase is to establish the boundaries of the system that is to be studied – including a definition of the problem, and the stakeholders to be included in the study. Secondary information, brainstorming and field data can all be used to define and further specify the problem. The fact that different stakeholders will have different ideas about the problem definition is a key element in a RAAKS study. The team's picture of the underlying problem may change over time. Various windows can be used to make a preliminary inventory of relevant actors, to study the problem definitions embraced by different actors at the start of the process, to review different actors' views about what is desirable, or to analyse environmental constraints. At the end of this phase, the result is a first approximation to a picture of the knowledge system and the ways relevant actors currently act and interact in their search for ideas and information that can lead to innovation in their practices. The discussion on the use of bio-ethanol as transport fuel provides an example. Laminated cards for the windows in this phase are numbered A1 to A5. When a comprehensive analysis is desired, it is recommended that all of these windows be used. They provide a means for the team to identify the elements in the knowledge and information system that are relevant to coping with their problem situation.

Facilitators often work through Phase A in the form of a desk study, to get a quick overview of the knowledge system and make a first appraisal of the problems at hand. They read relevant documents and literature and talk with a resource person who knows the study area or topic. The results from the desk study are then used to formulate a proposal for involving a team in RAAKS action research.

Phase A results – reopening the discussion on the use of bio-ethanol as transport fuel: In the Netherlands, a complex discussion on the advantages and disadvantages of the use of bio-ethanol has stagnated and become polarized. The Scientific Council for Government Policy produced a balanced report on the situation, recommending an experimental project on a practical scale. Then nothing happened for some time. One of the industrial stakeholders decided to ask Wageningen Agricultural University to apply the RAAKS methodology, to try to reopen the discussion and develop ideas for specific followup activities. Rather than addressing the national level debate, a choice was made to focus upon the north of the country, where the problem of developing alternative farming activities is most severely felt. The research team included an actor of regional importance: the Van Hall Institute for higher agricultural and environmental education, in Groningen. The team focused on the discussion process. In Phase A, key actors were interviewed and hot topics, communication practices and relationships

were identified. Over 20 stakeholders participated in the first workshop (following Phase A), including farmers, industrialists, environmental activists and specialists from various government departments. In this workshop, the team proposed that the search for viable alternatives like bio-ethanol had stagnated because of first, the lack of communication between three different sets of actors, each focusing on different priorities; second, the fact that the discussion had been dominated by experts, rather than social stakeholders; and third, a certain competitiveness among actors, each trying to convince others that their own solution is best. The workshop recognized the worth of these reasons, and suggested additional political and technical causes that also help to explain the situation. It became apparent at this workshop that support could be mustered to initiate action that would move towards establishing a collaborative experimental project for testing and evaluating the production and use of bio-ethanol on a practical scale. Further action research as to the most effective way to do this was proposed (van Weperen et al., 1994).

Phase B: Analysis of constraints and opportunities

During the second phase, team members go into the field to more systematically gather information on the social organization of innovation. A RAAKS study generally means interviewing 'key informants' (people chosen for interviews because their views are apt to reflect those of relevant actors). Windows are available to study impact, actor characteristics and linkages, knowledge networks, task performance, and coordination and communication among actors. Windows for Phase B (also to be found on the laminated cards) are numbered B1 to B8. The team's choice of windows depends upon the problem situation and the priorities expressed during the first phase. Phase B results in a more detailed picture of how different networks of actors interact, the issues that dominate their debates, and the way they coordinate their activities or fail to do so. This can be seen in the example from the horse husbandry sector.

Phase B results – the horse husbandry sector: The first comprehensive application of RAAKS was in 1990, and was related to the horse husbandry sector in the Netherlands. The then recently formed Knowledge and Information Reference Centre of the Ministry of Agriculture, Nature and Fisheries was interested in a diagnosis covering the way in which knowledge and information are generated, exchanged and used in the horse sector. The aim was to be better able to define or redefine the role of the Centre in facilitating effective knowledge management. A general conclusion, recognized by all actors interviewed in Phase B, was that in fact no 'horse husbandry sector' exists in the Netherlands. There are three quite separate clusters of actors: one cluster is dedicated to horse racing, one to horse breeding for export and one to facilitating recreational horseback riding. For obvious reasons, actors in these three clusters formulate the mission statements for their innovation activities quite differently. Interconnectedness, sharing of knowledge and information, and other communications are much stronger within clusters than between them. It became clear that the recreational cluster, though it had the greatest number of entrepreneurs and beneficiaries, had only a marginal influence on the agendas related to breeding, research and extension; it could benefit from organizing itself better and building stronger alliances. On the other hand, those involved in breeding had very strong linkages with research, but could benefit from stronger ties with both extension and education. Knowledge management within the sector was found to be weak, particularly with regard to farm management economics and marketing. Even though a great deal of knowledge was available within the sector

(held mostly by the horse racing and export actors), other entrepreneurs had difficulty gaining access to it. It was recommended that the Reference Centre should adopt the improvement of this situation as a goal. Another observation was that, due to the lack of a direct relationship between research and the various groups of clients and/or beneficiaries of the horse sector, economic support for and feedback to research was weak (Engel et al., 1990).

Phase C: Articulating policy and strategy/planning for action

During the third phase, propositions for policy and strategy, and/or plans for action are formulated and debated. Three windows provide support in analysing the potential of different actors to carry out specific strategies. Here too, a comprehensive analysis can best be carried out by using all three of the Phase C windows, which appear on cards C1 to C3. The constraints and opportunities identified in earlier phases provide a basis for preparing realistic action proposals. The involvement of some or all stakeholders or their representatives in all of the phases of the study helps to stimulate their commitment to putting recommendations into practice. Phase C results are illustrated by the example on basic grain production in Central America.

Phase C results – basic grain production in Central America: The European Union-sponsored Basic Grains Programme (PRIAG), covering six countries of Central America, is intended to improve the relevance and impact of research and extension, especially for small grain producers. RAAKS was used as an instrument to generate recommendations for action. Teams were selected and trained to carry out RAAKS in selected grain growing regions of their own countries. In the analysis, the importance of understanding the diversity of social organization for innovation was clear. Often two entirely different subsystems were seen to exist: one whose beneficiaries are subsistence farmers (we will call this group A), and one (group B) whose beneficiaries are farmers who, in addition to producing for their families, also sell part of their produce. The problems faced by these two subcategories of producers are very different, as are the ways they acquire and share their agricultural knowledge. In fact, group A have not generally been considered to be beneficiaries of research and extension programmes at all. As a consequence, technical packages have never been developed to fit their needs; most often information reaches them indirectly, through contacts with B farmers or sometimes via local traders. Traders and group B farmers in turn receive most of their information through the representatives of private multinational companies who sell inputs and/or services. Public institutions often play a secondary role in providing technical recommendations to grain farmers. Particularly in category A, farmers' basic knowledge of fundamental issues is relatively poor – for example, regarding improved varieties and their adaptation, integrated pest management and cultivation methods. Similarly, they are not very familiar with the practices and circumstances of researchers and extension staff. However, category B farmers also have problems. Their adoption of improved technologies is often partial, due to lack of credit, difficulties in access to marketing channels, and so forth. Another feature frequently noticed by the teams, and recognized by the various stakeholders, was the lack of coordination or even disarticulation: in attending to the information needs of grain producers, public, private and non-governmental institutions were not sufficiently coordinated. Recommendations stemming from the RAAKS study ranged from re-orientating research and extension policies, to establishing documentation and information centres, to activating or re-activating a number of inter-institutional

coordinating mechanisms and stimulating the organization of farmer study clubs. A notable feature of the studies in the six countries was that each analysis exhibited specific characteristics related to the social situation in the particular region and country: for example, the active involvement of elected municipal authorities in Nicaragua, the recommendation to reinforce institutional intervention and coordination in Honduras, and a discussion of the possibilities for agro-tourism in Costa Rica (PRIAG MSICA Workshop II, September–October 1992).

RAAKS followup

RAAKS emphasizes developing a shared understanding and appreciation of the problem, carrying out a diagnosis, and articulating strategies and strategic commitments. Thus RAAKS can encourage change processes. And, while at present the methodology does not include preparation and implementation of activities to follow up on the commitments made, it does help to establish a sound foundation. Further, some of the same techniques can be applied. RAAKS teams are increasingly being called in for followup sessions, to stimulate and monitor this part of the process; these experiences are being used to develop the methodology in this area.

Implementing RAAKS: examples

To give a practical example of the use of windows and tools, two cases are given here. You may want to return to these examples again later, after reading through the cards that describe the windows and tools.

Case 1

Joint reflection on irrigation practices in Senegal: Ile à Morphile

This first case presents results from a full-fledged participatory RAAKS study in Senegal.¹ It shows the design and procedures used in this real-life study, and is particularly interesting because of the involvement of a large number of farmers as a part of the team.

The context

Traditional floodland agriculture is dominant in Ile à Morphile. Irrigation was introduced 17 years ago. At village level, small-scale irrigation projects were created where rice, sorghum and maize are grown. Each plot is managed by a group of villagers. These village groups are organized as a union, which is part of a federation. Farmer's groups are supported by technical advisors, animators and extension workers from the project. A Mechanics Section is responsible for maintaining the irrigation pumps. The Training Section has been charged with organizing lectures and giving instruction.

At first, project activities focused on food security and income generation. Later, the mission shifted towards organizing farmers and improving the position of women. In the near future, however, the Senegalese government and the Dutch donor will withdraw their support. Thus, improving self-management of the irrigation system is

1. This complete RAAKS analysis was facilitated by Annemarie Groot and Sjoerd Bakker, Department of Communication and Innovation Studies, Wageningen Agricultural University, Wageningen, the Netherlands.

the project's current major concern. It is necessary to formulate a new project to guide the process of phasing out external support. Farmer's organizations will play a pivotal role in the new project. Federation, union and village groups will become responsible for building and managing irrigation plots, supply of inputs, credit and marketing. All units will come under the authority of the Federation, which is now part of the interim management, along with the Senegalese and Dutch project staff. In the future, maintenance of irrigation plots will be privatized. Marketing tasks have to be transferred from the Union to a special unit. To be effective, the new project will also have to take other organizations that work in the area into account.

The RAAKS team

Two Dutch consultants were asked to prepare a more detailed plan for the new project. They decided to use RAAKS. From September to December 1994 the relevant individuals and organizations were involved in a joint learning process. They reflected together on the performance of the irrigation system at that time and decided how tasks, responsibilities and institutional arrangements should be redesigned.

In the future, trainers and technical advisors will have to play an important role in strengthening farmer's organizations. Therefore they were invited to facilitate the learning process, together with the consultants. In a five-day preparatory workshop these facilitators were introduced to RAAKS, made a work plan for the coming period and identified relevant parties to be involved during the process.

The procedural design

Project staff, farmers, input suppliers, researchers, policymakers, NGOs and merchants were invited to a subsequent workshop for 'actors'. During the five-day workshop, participants discussed the workplan and its objectives. They prepared and carried out field studies in which they evaluated the performance of the then-current irrigation practices. A second workshop was then organized for actors. Over four days participants elaborated, presented and discussed the preliminary field results. They wrote action plans for the various sections of the project. A third workshop was organized, at which the different action plans were presented and analysed. All parties contributed in one way or the other to all or parts of the action plans. A number of consultant missions were planned for 1995.

A 'feedback' day was later held for people who did not have the opportunity to participate in the workshops, plus relevant governmental and non-governmental organizations from Dakar. During this meeting, those who had participated earlier were encouraged to mobilize the support and commitment of the 'newcomers' for the action plans that had been made.

The analytical design

During the field studies much attention was paid to present and future tasks, linkages, knowledge and skills. This process showed that shifts in tasks and responsibilities would need to be discussed and clarified among the parties involved. Further, new tasks would require new knowledge and skills. Extension workers, animators and technical advisors needed to be able to support farmers in their decision making on organizational and technical issues: thus they would have to change from acting as advisors and teachers, and become facilitators. Too, expertise was needed to build a credit and savings system to enable farmers to pay for maintenance of irrigation canals. The studies carried out also made clear that linkages needed to be improved. Farmers, village groups, union and federation were core actors, so strong linkages among them

would become important. The role of extension was also discussed and clarified by village groups and farmers. External linkages needed to be strengthened and collaboration sought with both governmental and non-governmental organizations.

The action plans

During the second workshop participants expressed a need for training to help in carrying out their new tasks. The training section made an inventory of learning needs and started formulating training programmes. Trainers themselves acknowledged a need for training in participatory methodologies and formulated a request for external expertise. To help in synchronizing development approaches and activities, a mechanism was installed to link the project to other NGOs working in the area. Staff from the training section and the governmental research department formulated an action plan for collaboration on applied research and development. A request was also made for an external expert who could help establish a credit and savings systems.

In February 1995, one of the consultants returned to Ile à Morphile for 8 weeks. Her task was threefold: 1) to support the work of an external expert on management and technical matters (for the Mechanics Section), and an expert on credit, 2) to organize training in participatory methods and 3) to monitor the action plans formulated during the workshops. A lot remains to be done, but the people of Ile à Morphile are well under way towards preparing for their future responsibilities.

Case 2

The coconut system in Tanzania: examples from a RAAKS seminar

This second case is from a short classroom exercise carried out as part of a seminar at Wageningen Agricultural University, to allow students to gain experience.² A limited number of windows and tools were used. This example shows the results of their work in some key areas.

The case began as follows: coconut palms are widely grown in Tanzania. In the 1960s the country produced enough coconuts to satisfy both its fresh nut and copra markets. By the late 1970s, the coconut industry was in very serious decline. It was generally agreed that the decline of the industry was due to a number of factors: an overage palm population, a lethal disease of palms (in some areas), lack of improved planting materials, poor crop husbandry, poor pricing, lack of research efforts, ineffective marketing channels, and lack of a government unit responsible for development and policy. The Tanzanian government decided to take steps to rectify the situation. In 1979 the National Coconut Development Programme (NCDP) was created, based on cooperation between the Tanzanian Ministry of Agriculture and Livestock Development (MALD), the Coconut Extension Service (CES), the International Development Agency of the World Bank (IDA) and the German Technical Development Cooperation (GTZ). This established a new linkage mechanism for research and extension in the coconut sector.

Diagnostic objectives

(Window A1/Tool A1)

In this situation, the following alternatives were identified (using Tool A1) by the student team as possible diagnostic objectives:

- To identify the factors limiting coconut production in Tanzania.

2. Lupanga, 1989a, 1989b

- To formulate recommendations intended to speed up the development of improved technologies to be used by coconut farmers.
- To discover what constraints limit the ability of resource-poor farmers to grow coconuts, and what can be done about these constraints.

In practice, the students focused on the second objective: increasing coconut production by developing improved technologies, beginning with the identification of actors involved in research and development.

Actor objectives

(Windows A2 and A3/Tools A2 and A3)

Several key actors, including farmers, were identified (Tool A2). They had somewhat different objectives (Tool A3):

- | | |
|---------|--|
| IDA | to provide financial means that would allow the government of Tanzania to stimulate economic development |
| GTZ | to provide financial and technical support to the government of Tanzania for development |
| MALD | to re-evaluate the agricultural sector, revive the coconut sector and increase coconut production |
| NCDP | to increase coconut production; to increase the number of coconut farmers; and to provide farmers with improved technologies |
| CES | to increase the number of coconut farmers and increase their adoption of improved technologies |
| Farmers | to generate income by growing coconuts. |

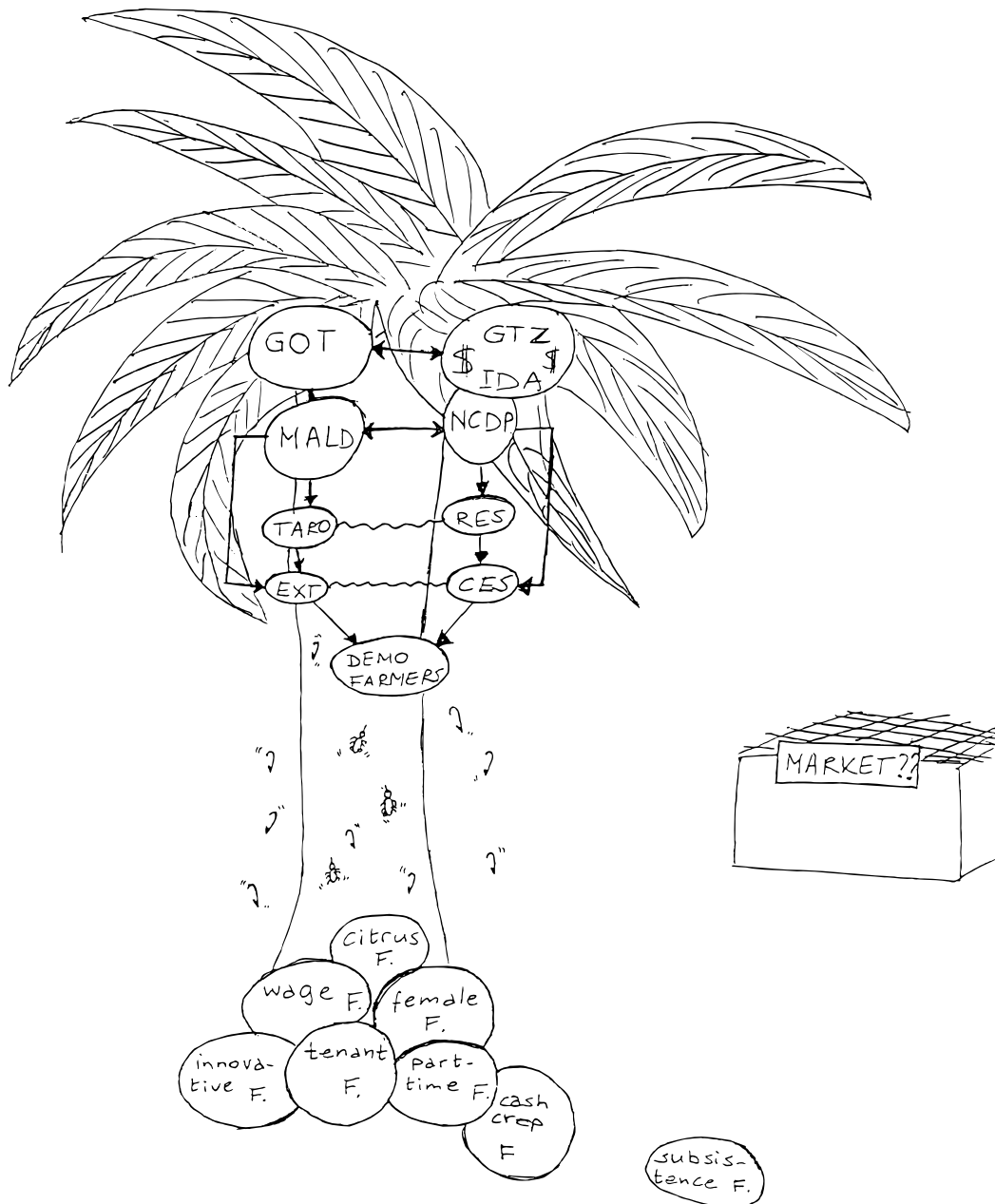
Approximation exercise I

(Window B8/Tool A5/B8)

Drawing a figure (an 'approximation model') such as the one below is a way for a team to work as a group to sum up the way they visualize the system they are working to understand: the tasks being carried out, the hierarchy within which this happens and the 'power relationships' within the system. This makes it easier to decide what elements of the current situation make a positive contribution to meeting the objectives of the system, and which do not. Drawing such a picture can make a real contribution to the team's shared understanding of the problem situation. Getting away from words and looking for a visual metaphor moves away from a focus on 'what are the problems'; it can stimulate thinking in terms of the *connections* between these problems. Thus it can lead the team toward a more adequate definition of the problem situation. Drawings can also be used as input in actor workshops (see Chapter 3).

The figure below pictures the actors in the coconut knowledge and information system (KIS) and their relationships. The coconuts are there, along with straight lines indicating linkages. (The thickness of these lines shows the strength of the linkages; a wavy line means a weak linkage; and the ? after 'market' indicates the *lack* of a linkage between the coconut KIS and the market: the focus is on production, without too much thought of the market.) The picture also illustrates the fact that with respect to power relationships, this is a top-down system. Money and messages too flow from top to bottom – little or no information flows from bottom to top, so it is quite possible that decision makers will know little about the realities of the situation at the 'bottom'. 'Demonstration farmers' are reached by the project, but in general citrus farmers are not: the falling beetles and hooks (see following text) represent the only aspect of the project, the hooks, that reaches them. Subsistence farmers are not reached at all.

Figure 3
The coconut KIS in Tanzania



Source: Drawn by RAAKS seminar participants, Wageningen Agricultural University, 1993

Task analysis

(Window B5/Tool B5)

In carrying out a task analysis (Tool B5) the student team found that the coconut knowledge and information system was made up of a central core of key players – NCDP, MALD, GTZ and IDA. There was also a peripheral ring of institutions – the Tanzania Agricultural Research Organization (TARO), Tropical Pesticide Research Institute (TPRI), Tanga Integrated Rural Development Project (TIRDEP) and the Cashew Nut Improvement Project (CIP). A clear division of tasks could be distinguished among the core institutions. IDA and GTZ provided institutional linkages for financing and managing the programme. GTZ also financed consultancies for evaluation. MALD provided and managed financial, research and extension manpower to NCDP and CES. NCDP, as the implementing agency, was responsible for the day-to-day implementation of the programme. CES was in charge of carrying out field extension.

Further, the activities of the collaborative National Coconut Development Programme were directed at improving tree husbandry, controlling plant pests and diseases and increasing production of good quality seedlings. NCDP had developed and improved a package of technologies which was being transferred to farmers through the CES extension workers. This package included messages about weeding, mulching, spacing (in intercropping) and fire prevention. Nitrogen and phosphorus fertilizers were provided, as well as small hooks to be used to combat the rhinoceros beetle, and hybrid *mawa* nuts. These technologies were explained to farmers during field days for farmers. Reference farmers were selected on a competitive basis to run demonstration plots. A system of incentives was used to stimulate extension workers to promote the six-point package. (The matrix that was used to sum up this part of the exercise is shown on the card for Tool B5, Task analysis.)

By 1989 about 54,000 beetle hooks had been fabricated and 50,000 had been distributed to farmers. Between 1986 and 1988, more than 200,000 hybrid *mawa* nuts had been planted in NCDP nurseries and more than 400,000 were distributed. Small entrepreneurs selling coconut seedlings had appeared in the city of Dar es Salaam, which was evidence of a growing market for coconut production. Apart from technology related to fertilizer application, the available technologies in production were quite relevant and affordable even for resource-poor farmers. Nevertheless, constraints remained:

- a lack of adequate feeder roads, limiting access to some villages
- an inefficient marketing system, which increased prices and affected the availability of some inputs, such as fertilizers and pesticides, and
- the attitude of peasant farmers, who believed that full-grown coconut palms do not need to be tended.

Technology development, production and delivery were well implemented. But the consolidation and evaluation of technology left much to be desired. With regard to the use of the hooks, hybrid *mawa*, spacing and application of fertilizer, testing was done well. Other consolidation activities, however, such as verification tests in farmers' fields, large-scale pilot testing, and tests for profitability and farmer acceptance varied from technology to technology. Assessment of the adoption rates for the technologies, categorization of users of technologies (by, for example, income, education, and size of the farm), was yet to be done. An attempt was therefore made to get feedback from farmers about the NCDP in general, rather than in relation to specific technologies.

Several external factors influenced the performance of the NCDP. These included a national policy related to the revival of agriculture; a World Bank reorganization of

research and extension in Tanzania; the result-orientated stance of GTZ and IDA; the rapid growth in demand of elite farmers for advice and inputs; the diversity of ethnic groups and systems of land ownership and tenure in the country; and the complexity and diversity of the environment.

The case study on which this exercise was based included many uncertainties concerning the influence of external actors and factors. This included the restructuring of research and extension by the World Bank and the possibility of future withdrawal by the North American and German donors. Also, the sustainability of the technologies offered by NCDP could not be clarified by the exercise; this would only become clear in the future.

Coordination analysis

(Window B6/Tool B6)

An analysis of coordination within the KIS identified the dominant basic configurations (Tool B6 explains this term). Figure 3 shows the system model drawn by the team. This model too identifies the actors, their relationships and influence, but puts the emphasis on leadership and coordination. The coconut knowledge and information system is seen as a policy and donor driven configuration, in which the government of Tanzania and the foreign donors GTZ and IDA are dominant actors. They exercise direct supervision of the other actors through MALD and NCDP. Again, it is clear that only the demonstration farmers are fully part of the system; others may benefit to some extent by purchasing beetle hooks, but subsistence farmers – and people related to the market as well – are completely unrepresented within the system.

Conclusion

This RAAKS exercise explicitly demonstrates the necessity of identifying the varied groups involved. Clearly, in this situation it would be a great mistake to address coconut farmers as one homogeneous group. Such an exercise could serve as background for a RAAKS study; it could also lead to a second exercise, focusing on the newly identified target groups and the networks in which they play a part.

3 Preparing and carrying out RAAKS action research

In a participatory action-research methodology like RAAKS, the quality of communication, team work, actor participation and the consolidation of results assume great importance. Managing these areas is never easy; since RAAKS brings together a very heterogeneous group of actors, often from more than one culture, thoughtful preparations are especially necessary. This chapter provides suggestions to help in dealing with these issues.

Use of *communication skills* is an essential part of a RAAKS study. Ways to build in communication both within the team and involving other actors will therefore be found throughout the rest of this chapter. (See also Appendix 3.) Using RAAKS involves actors in working together to make sense out of their collective learning experiences. This makes good communication essential: teamwork, focused collection of information, qualitative analysis, reaching agreement on strategic decision making and following through on recommendations all play a central role.

A very important characteristic of RAAKS is the active participation of all actors involved. A great many different actors may take part in diagnosis, problem definition and action planning. Men and women farmers, other rural people and consumers are involved as sources of relevant knowledge. In traditional methodologies, these target groups have often been seen as users or receivers of knowledge; this leaves out the very important role of local knowledge networks in innovation. And, for example, if rural banking, commerce and industry are key actors or stakeholders, they too ought to be part of the process. The need to incorporate this broad variety of actors means that the team must play the roles of both researcher – defining the problem and gathering, analysing and synthesizing information – and facilitator – helping people to listen to each other, to work together, and to make the most of their learning experiences. This puts high demands on communication skills!

Preparation

The team and supporting groups

A RAAKS study can be facilitated by an individual or a team, by insiders and/or outsiders, by professionals or students, or any combination of these categories. Different objectives may require different expertise on the part of facilitators. Facilitating a process of participatory planning requires conflict handling skills; these are not likely to be required in carrying out a desk study to design a communication strategy for a firm. When RAAKS is used for training purposes, a need for expertise on learning styles and creating open learning situations is evident. (Appendix 3 lists relevant literature to help in gaining these and other needed skills.)

In the irrigation project in Senegal presented as Case 1 in Chapter 2, the RAAKS team was made up of 30 people. Because farmers were expected to take over general responsibility for irrigation management, a number of farmers (plus project staff and trainers) made up the team. In other cases, the team has consisted of three researchers, a steering committee and a consultation board (see below). In general, however, RAAKS has been carried out by an interdisciplinary team, generally made up of not more than four or

five people. Ideally, such a team will include both actors familiar with the area and the situation, plus members who have had experience in applying RAAKS. Achieving a degree of balance among team members is an important consideration: not only should the mixture of disciplines included match the potentially relevant aspects of the situation, but also it is often extremely important to include stakeholder representatives, women, people who can speak local languages, and so forth.

As a support to the team, it is often helpful to establish a steering committee made up of relevant stakeholders. In some cases a 'consultation board' has been installed as well, to provide comments on the actors' proposed actions and their likely effect on the outcomes of the study. Such supporting groups help to ensure the active participation of relevant actors and increase the chances of achieving some convergence in their viewpoints. (The selection of the members for such a committee is of course a very sensitive matter.) While this can take place in various ways, in a RAAKS study planning for the inclusion and meaningful participation of farmers or others who have typically been called 'beneficiaries' or 'target groups' is essential.

Preparing the team

Team activities generate a great deal of information – together with opinions and observations. Aided by the materials given in this manual (including the windows and tools), plus issues and questions that the team itself develops, its members interview key actors, observe and discuss events, and develop an idea of what the situation is with respect to linkages, interaction and so forth among the actors concerned. Careful preparations are needed to assure close collaboration within the team carrying out the study. The process that will be used to involve relevant actors also needs to be carefully discussed and planned. Team members are not 'objective outsiders'. Their task is not only to facilitate the learning process, but also to be actively involved and to participate in it. Therefore team quality and interaction become very important. Team members must work together effectively and efficiently. They must be aware of each others' background and capabilities, be able to work as a team, and come to share a general understanding of RAAKS. Moreover, they must be able to establish acceptable work procedures, and to argue for their preferences or choices without becoming mired down in endless procedural debates.

A preparatory workshop should be held to allow team members to get to know each other and become familiar with the methodology. (One possible outline for a workshop is given in Appendix 1. Also see the readings on group dynamics in Appendix 3; for example, Pretty et al. offer information and exercises on this and on team building.) Such a preparatory workshop has multiple objectives. These include getting to know each other, getting to know the methodology, designing a work plan and time schedule, and designing a framework for monitoring and evaluating teamwork, as well as preliminary and final results.

When teams study the social organization of innovation in agriculture, differences in points of view (whether among team members or between team members and other stakeholders) are frequent. This should not be seen as negative: differences can be essential to a community's capacity to achieve innovation in its practices, and they may provide clues to essential points a teams and other actors need to understand the network. Rather than being suppressed, therefore, differences should be recognized and put to use in the debate on useful interpretations, interventions and accommodations among stakeholders. The windows and tools in this resource box are intended to

encourage recognizing the broad variety of opinions held by relevant stakeholders, and constructively exploring their differences.

In designing a work plan and a time schedule the following factors (at a minimum) should be taken into account:

- the scope and transparency – the clarity of the process and the field of inquiry – of the work defined for and given to the team as a starting point (perhaps in the form of terms of reference for the group);
- the extent to which team members have had previous experience with knowledge systems research, as well as the degree of ‘inside knowledge’ they have about the system to be studied and its context;
- the need to build up the team and to develop working relationships;
- the extent to which secondary data is available for use;
- the travel and other time that will be involved in gaining access to key actors, as well as other aspects of gathering information in the field.

In addition, the team must decide how to consolidate its own learning process, how to share the main findings with key actors during interviews and, even more importantly, how to share the main findings with these key actors during the workshops or seminars to be held at the conclusion of each phase. If team members keep a diary or journal of their reflections, this may be helpful in guiding the research process. Further, flip charts can be used to summarize the preliminary results. When hung on the walls of the workroom, these also help to make the process visible and to guide the team in its research. Drawings, tables and matrixes may be used to sum up the preliminary and final results and to stimulate debate.

The material in the following sections of the manual can be used to aid in the development of the team, including team building, communication and joint learning among team members, and in planning and managing workshops. Sometimes prospective team members and stakeholders can be trained as a group. In some current projects, training workshops in RAAKS have been facilitated by two consultants. In ten days, 20 to 30 local people are introduced to the methodology and carry out brief work in the field. These trainees then work on RAAKS activities for two to three months. The results are presented and discussed in meetings co-facilitated by the RAAKS consultants.

The interview as a method of inquiry

An interview is a social event with a purpose: a person or a team carries out an interview to obtain relatively specific information from another person or group. Interviews are never isolated events; although the interview is a key element in the process of gathering information, it does not stand alone. Both formal and informal conversations with key actors, personal observations, secondary sources (such as a description of the region), and participation in social events (including markets, church activities and festivals) can provide important information.

Before beginning an interview, it is important to have a good idea of what information is really needed and whether an interview is the best way to obtain it. Often the information needed can be gathered without taking up someone’s time – a precious resource for each of us, and for some villagers, one of the most limited. When an interview is needed, do not try for perfection; there is no such thing as the perfect interview, nor the perfect technique. Designing an interview requires making choices. The setting in which the interview will take place can make a difference: a comfortable and

secure environment will increase the chance of success. The questions asked must be clear to the person being interviewed, and should not be 'slanted' to suggest a particular answer. Any more sensitive questions should be asked toward the end of the interview, when contact has been well established. It is wise to have a 'trial run', with team members interviewing one or two actors and then discussing the results. Clearly interviewing is not just a matter of asking the right questions in a friendly voice. Interviewing is about communicating, and becoming partners in a conversation. For the interviewer, this requires skills in listening and asking followup questions when more detail is needed, rather than speaking.

The visualization techniques (see Appendix 3) used in participatory rapid appraisal have proved quite useful for use with both individuals and groups. For instance, a season-by-season analysis can elicit information about the crops grown by individual farmers. Alternately, ranking can be done during a community meeting to identify and discuss priority problems.

Box 3 summarizes some of the choices to be made in planning interviews. The place and timing may depend not only on the comfort of the interviewee(s), but also their time constraints, the relevance of place and time to the discussion and so forth. 'Why' and 'what' refer to decisions about the reasons and the information to be collected. 'Who' decisions are not only about the people to be interviewed, but also about how they will be selected – whether this will be done randomly or not, and what the criteria for choice will be. (If all or most individual actors are known, random sampling can be a way to try and assure that all sorts of farmers are represented; however, in many cases it is necessary to select key informants, to assure representation and participation, including that of the often forgotten groups discussed in Chapter 1.) Finally, the mechanics of the interview must be decided, including whether it will be structured (that is, based on a written list of questions, decided in advance and used similarly by all interviewers) or semi-structured (based primarily on a list of questions).

RAAKS interviews are often semi-structured. It is important to have a list of topics that need to be covered, and to assure that the interview does not take too long (one to one and a half hours should be the maximum). It is not practical to carry out separate interviews for each of the tools. Instead, the team needs to decide what information it needs before carrying out the interviews. Combined interviews might be carried out for Phases A and B, or these may be separated. In the latter case, the same people are generally interviewed in each phase; however, before the second round of interviews the team should decide if additional people need to be included (or if some do need not be interviewed a second time). To prepare a list of topics, the team needs to get an overview of the information needed, rather than trying to ask separate questions for each tool. Russell Bernard and Pretty et al. (see Appendix 3) give more information on interviewing.

During the study

Reports

Taking a 'pause' at the end of each of the phases in a RAAKS study is an essential element. This can stimulate *reflection* within the team as well as among other key actors or their representatives; it can also provide a crucial *cross check* of the ideas the team, working with these actors, has developed. This process helps to sharpen the focus of the process and paves the way for the next phase. (Tools A5, B8/b, and C3/a suggest ways to consider and summarize the material collected at the end of the successive phases; the material

Six decisions in preparing an interview

Where:	Home/field/office/other
When:	Time of day/season of the year
Why:	Explore special knowledge of the interviewee; test hypotheses and inquire about topics of interest
What:	Life histories Representative information Community interactions
Who:	Selection (specific/random) Key informants (individual/group) Criteria (sex, age, wealth, occupation, etc.)
How:	Semi-structured/structured Appointment/chance encounter Tape recording/notes/both

below on field reports and actor workshops can also contribute.) This is the time to look at the hypotheses of the team and ask if they hold up, making use of the contrasting information provided by different windows and tools. Sometimes you may discover that vital information is missing! At that point the team must decide what to do about the gaps. Can you do without it, making estimates based on what you do have? Should additional windows and/or tools belonging to the just-completed phase be used? Or can the missing information be collected in another way (perhaps in discussions during a workshop, or an extra interview)? In addition to looking back, the team also looks forward. Do the plans made for the following phase need to be amended? And, for example at the end of Phase B, it is not too early to think about preliminary ideas for recommendations based on the RAAKS study. This process of summing up is good background for the actor workshops (described below). Preparing a report is an important part of the process: it can be seen as a tentative attempt at making sense out of the information, opinions and observations gathered so far. (An outline for a report can be found in Appendix 1.)

Field reports are made as a way of sharing, discussing and debating ideas and information among team members. The field report – after it has been discussed with other key actors who are not a part of the team, and if necessary after it has been modified – also provides a basis for preparing a *discussion report*. Discussion reports are used to share ideas with stakeholders at subsequent actor workshops (see below). They are not meant to be lengthy descriptive reports – instead, for example, use can be made of drawings, tables and brief statements. At the end of a RAAKS process, the team produces a *synthesis report*, describing the process and outcomes of the action research. This provides a basis for implementation, monitoring and evaluation.

System drawings

System drawings are a graphic way to develop a better understanding of the interactions among actors. They provide a sort of model – a way of representing social organization on paper. Since social organization is typically complex, many different models may fit to some extent, but also different actors may perceive the situation very differently. Figure 4

suggests some of the basic building blocks for a system drawing: types of actors and the various sorts of linkages among them. (In this case, three types of institutional leadership co-exist in one system.) The different types of actors relevant to the system are shown by using cards or drawing images to represent them. Such a drawing makes it possible to create a visual impression of the dominant patterns of interaction among the actors. These models provide a visible object for debate with and among the actors. Of course, the team will have to carefully define the meaning it attaches to the various categories of actors and the linkages among them. More importantly, the actors need to have a chance to say whether the results represent *their* reality, and to begin to think about the steps to take next. System drawings encourage actors to consider and discuss how they feel the system is working, and how they feel it should work in the future.

Such 'linkage models' are not the only type of models of the system that can be created during a RAAKS study. In fact, each window represents a different way of modelling the system: for example, by looking at the actors from an actor perspective (actor analysis, Window B2), from a network perspective (integration analysis, Window B4), from a functional perspective (task analysis, Window B5), or from an organizational perspective (coordination analysis, Window B6), to name just a few. (See the window cards in the binder.) However, the modelling of linkages suggested in Figure 4 has been chosen as a central axis for RAAKS. It has proven its usefulness in many studies. Moreover, it provides an overall picture that connects directly with the main issues that come up in studies of this type: who is important to the functioning of the system? Are they internal or external actors? How important are they? Which relationships are important, very important, or vital? Which patterns of relationships are predominant among the relevant actors? Can we speak of one 'system' or do, in fact, various fundamentally different systems or subsystems coexist in the situation we are studying? These are the kinds of questions addressed by the windows and tools.

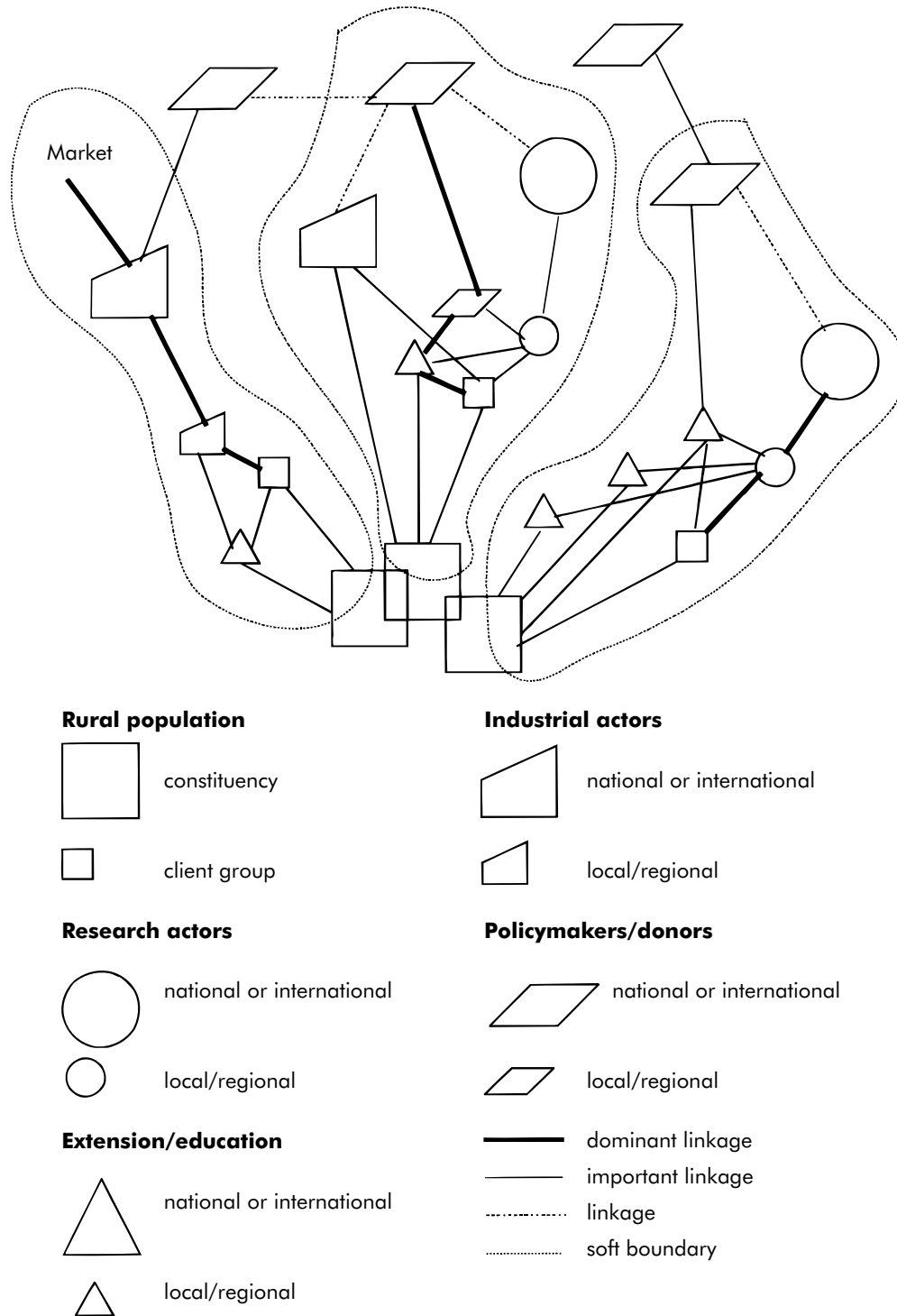
Actor workshops

Question: Why do people have two ears and only one mouth?

Answer: Because listening is so much more difficult than talking.

This old Asian riddle touches on the essence of communication. Listening requires sitting back in a sense, but still actively listening to and understanding what is being said. It is about stimulating people to exchange views by asking appropriate questions and refraining from immediately giving our own opinions. Using traditional methods, the people interviewed are often seen as passive informants. In RAAKS field interviews, however, the active involvement of key actors and perhaps others – not just providing information, but really being involved in the process – is essential. This can be organized in different ways, depending on the local situation. Workshops are one way of inviting key actors to 'sit at the table' together with team members to discuss the problem situation. Although some actors may have met before, listening to and especially learning from each other may be a new experience. Keeping people interested and involved may require creativity on the part of the team members, but more often – when the topic is clearly relevant to them and they know their opinion is valued – people are quite willing to spend time in discussion. A striking instance of creative action, which comes from a gender workshop organized by an Indian NGO, is given in the example.

Figure 4
A system drawing can make relationship patterns and dominant issues visible



...There was one man in the group who strongly dominated the discussions and yet insisted that women had an equal say in decision taking. Finally (and on the spur of the moment) one female participant said 'for the next five minutes, I will play the wife and you be my husband'. She developed a situation in which the 'wife' had sold off a bag of grain to get herself a nose-ring that she had been asking her husband to buy for her for the last two years. Within five minutes the situation culminated in the 'wife' being beaten by the 'husband'! The action was spontaneous; another person in the group almost joined in, and the others who were watching agreed that such reactions are not uncommon in the community (MYRADA PRA-PALM Series 7, 1993).

The fact that workshops bring actors together to discuss what the team has observed and to negotiate about what the problems are (and according to whom), and who can do what and how, is essential. They are designed to adjust and refine the 'images' constructed based on material collected in the field, and to check again for missing or misunderstood information. With each subsequent workshop, the ideas and analysis expressed in the field report become clearer. The conclusions, reflected in a modified report prepared at the end of each successive workshop, serve as a starting point for the following phase. The quality of participation in these workshops has a great impact on the outcome of the RAAKS process. Seeing how key actors react gives the team a fresh look at the situation, plus a chance to discuss and adjust the results. This helps to assure that the work of the team will be relevant to the situation; it also greatly increases the chance that key actors will support the results, and that action will result after the RAAKS study is over.

As a part of any RAAKS study, at least one actor workshop involving actors or key actors should be organized; preferably, however, there would be three – one at the conclusion of each of the RAAKS phases described above. The number of workshops depends on the objectives set out for a particular study, the level of analysis required to identify opportunities for action, and the time period and person hours available. The systems drawings described above, or the models suggested by several of the tools (see the example in Case 2 at the end of Chapter 2, under 'Approximation exercise' can be used as input into actor workshops. This is one way of presenting the material from the team's field reports (see above) while maintaining a lively atmosphere. The techniques mentioned in Case 2, in which the team presents the pictures it has drawn and asks for discussion, can be an extremely fruitful part of a workshop: the team asks to what extent is this picture an accurate portrayal? Can participants suggest changes or other metaphors that would be more accurate? Care should be taken to avoid suggesting that the drawings or other models show 'how the situation is'; if instead the team suggests 'this is how we see it – what do you think?' the models become a useful way of bringing out the various viewpoints of the actors present.

The team will need group dynamics skills to handle such occasions adequately, and will need to spend a considerable amount of time and energy preparing and implementing the seminars in a way that helps all relevant actors to participate actively. Especially when there are traditional barriers to participation in meetings – as is often the case for women, for example – team members will have to put all their skills to work. (*Participatory learning and action*, Pretty et al., provides a great deal of relevant information; see Appendix 3.) It can also be hard to create common ground and room for joint action among actors who simply don't like each other, have hidden agendas or who feel too threatened to say what is in their hearts. Therefore, in facilitating actor workshops, establishing a positive atmosphere, seating arrangements, listening and encouraging others to listen, trust, valuing the contributions of participants, looking for common ground, decision making, and the role of the facilitator are all relevant issues.

The facilitator

Some of the requirements for those playing a facilitator role include:

- being aware of and able to work within his/her own limitations;
- having the ability to encourage actors to communicate explicitly but in socially acceptable ways;
- knowing how to act as an intermediary, or broker, helping those with different views to see their common interests;
- having no need to be the 'big chief' who provides solutions, and instead stimulating others to find their own;
- helping participants to define possible ways to end problems and conflicts;
- group dynamics skills – understanding how groups work, how to be sure that all have a chance to speak (without offending those who are very talkative), being able to sum up the attitude of the group and check this with participants, and so forth;
- awareness of his/her management and communication styles;
- an ability to experience problems as challenges for learning;
- an ability to be a part of the learning process, and to stimulate others to do the same.

The resource list in Appendix 3 includes a section on facilitation skills; the readings listed cover both acquiring these skills and putting them into practice.

Appendix 1 Training for RAAKS

The success of RAAKS very much depends upon the skills of the team. Therefore a great deal of emphasis needs to be given to preparation and training. Such training, of course, should be designed in accordance with both the personal and professional qualities of the team members and the situation at hand. This chapter describes a number of training modules that could serve as a starting point for designing RAAKS training. However, these examples (and the material in Chapter 3, including the section on team composition and the characteristics needed by a facilitator) can be incorporated as you see fit: they illustrate some possibilities, but are not intended to prescribe the way training must occur. The modules given here all make the assumption that participants will have had a chance to read the manual and cards ahead of time, so that the RAAKS vocabulary is not new to them. (More information on specific skills and techniques, such as those listed under 'reading' in Table A1, can be found in the materials listed in Appendix 3.)

RAAKS training workshop

The outlines below can be used as part of a general capacity building workshop for employees of governmental and non-governmental development organizations, and/or for students or a team preparing for a RAAKS study. Some of the elements found here, such as the field report form, are also useful in the study itself. Specific objectives include:

- familiarizing participants with the RAAKS methodology
- carrying out a first network analysis in the field
- formulating action plans for RAAKS studies.

As a result of such a workshop, participants can be expected to know the principles and framework of RAAKS; to be able to undertake a RAAKS study; and to be aware of the constraints and opportunities offered by working with RAAKS. The products might include a report on constraints and opportunities within a given problem situation that has been examined during the workshop, with suggestions for improvement; and action plans for carrying out RAAKS studies.

Such a workshop gives participants a framework for RAAKS or for working together in other ways, using exercises, a short field exercise and lectures. The emphasis is on learning by doing, reflection, and discussion of the possibilities and constraints of RAAKS and/or the situation at hand. The proposed workshop programme, which as given in Table A1 covers two weeks, is flexible; in practice, the programme used must be in line with participants' needs.

Table A1
Workshop programme

Day	Topics	Reading^a
1	Introduction Exercises 2 and 5 (Appendix 2) Division into groups	Introduction to RAAKS Knowledge and information systems
2, 3	Preparation for field exercise Contents/teamwork	Guidelines Working/learning as a group
4, 5, 6, 7, 8	Field exercise and presentation Interviews Group discussions Report writing Presentation/discussion	Terms of reference for field exercise, documentation and information
9, 10	Evaluation of teamwork Introduction to RAAKS: relevance and applicability	Innovation Facilitation
11	Quality criteria for 'alternative systems of inquiry'	Alternative systems of inquiry Criticism of RAAKS
12, 13, 14	Preparation for field exercise	Terms of reference for field exercise, documentation and information

^a Sources of background reading include the earlier chapters of this manual, plus the example of a field exercise below and the glossary (Appendix 4); The social organization of innovation (Chapter 9, for an overview; the Introduction, on changing approaches; Chapter 1, on innovation, knowledge and information systems, 'soft-systems' thinking and related criticism; and Chapter 8, on alternative systems of inquiry); and the readings listed in Appendix 3 (in particular, see Pretty et al. on adult learning, facilitation, group dynamics and teambuilding, participatory learning and action, organizing workshops, and for more exercises and games). For teams focusing on related issues, Røling 1995 is quite relevant to the changing role of agricultural extension.

Planning a RAAKS workshop including a field exercise

A three week RAAKS workshop including a more detailed field exercise, to help participants learn more about working with RAAKS, is outlined below. A sample schedule (Table A2) and related materials follow, including some to help in preparation for the field exercise. The objectives and expected results are the same as those outlined for the RAAKS workshop, above. Sources of background reading can be found in Table A1, note a.

Table A2
Sample schedule for workshop including a field exercise

Monday	Tuesday	Wednesday	Thursday	Friday
Week I				
Keynote address	Teambuilding	Teambuilding	The changing role of extension	
Getting to know each other	Teambuilding	Teambuilding	Agricultural knowledge Systems	How to use the information collected
Week II				
Preparation for field exercise	Field exercise	Field exercise	Field exercise	Field exercise
Field exercise	Field exercise	Field exercise	Field exercise	Feedback to the field
Week III				
Identification of windows to be used	New perspectives on analysis	Individual problem definition	Identification of actors and networks	Process of information gathering
Choice of windows/design new ones	Field reports revisited	Continue problem Definition	Identification of windows	Presentation of action plans

Learning objectives

In planning this schedule, it is useful to outline the specific learning objectives per day and per week, using a format such as the one shown in Table A3. This also helps participants to think about what they can expect to get out of the programme. Learning objectives can be outlined by a facilitator, or participants can outline their own objectives. These can also be used in evaluating the results of the workshop.

Table A3
Format for outline of learning objectives

Monday	Tuesday	Wednesday	Thursday	Friday
Week I				
Week II				
Week III				

Plan for group exercises

A simple format such as that shown in Table A4 can be used to make a plan for the group exercises to be used during the workshop to achieve the stated objectives.

Table A4
Format for planning group exercises

Monday	Tuesday	Wednesday	Thursday	Friday
Week I				
Week II				
Week III				

Example of a field exercise

Any field exercise, even though it is done for practice, requires specific preparation. The case below includes examples of a problem statement, terms of reference (TOR) and division into working groups, which suggest some of the preparation involved in an ICRE (International Course for Rural Extension) classroom exercise at the International Agricultural Centre in Wageningen, the Netherlands. The objectives that evolved are also included. This example also demonstrates the use of a real-life current problem in a classroom exercise.

Problem statement

In Limburg, the Netherlands, considerable efforts were being undertaken in 1994 by the government, farmers' organizations, research establishments, extension services and other relevant parties to reduce the impact of agro-chemicals on the environment. Policy measures – such as a multi-annual crop protection plan and a law regulating the use of manure – had imposed restrictions on previous practices. In many cases, farmers saw themselves as being confronted with a need to make new investments and to adjust their farming systems.

A proposed new law intended to reduce the pollution of surface water was much discussed, particularly among producers and related parties in the greenhouse sector in which such pollution is a common problem. By the year 2000, according to this law, greenhouse growers would be required to take measures allowing them to produce almost exclusively within 'closed systems' (recirculation of water, water applied in carefully calculated dosages, minimization of run-off water from e.g. cleaning activities, re-use – insofar possible – of agro-chemicals, and so forth).

Two farming systems could be distinguished: a) culture on soil and b) culture on a substrate (artificial soil). The authorities' aim was to achieve a situation in which the substrate method becomes the predominant method by the year 2000. In such systems, flows of water and chemicals can be much better managed than in method (a).

Terms of reference

The agencies within the AKIS network in the example were doing their utmost to create programmes of activities that were expected to enable farmers to come to grips with the new regulations and their consequences. The Limburg Farmers' and Growers' Organization (LLTB), an agency representing the interests of its farmer members, found itself in the forefront of these efforts. This organization agreed to the use of their problem situation in a RAAKS study concerning the AKIS network, to be carried by 1994 ICRE participants, and was interested in knowing the results.

The terms of reference given to the ICRE students included the background information given in the example, and a requirement that the study should result in one or more recommendations (an 'advice') as to how actors within the AKIS network could best approach the problems of keeping farmers and growers informed about the rapidly changing situation, keeping in touch with farmers' information needs, and establishing linkages that will make a positive contribution in these areas.

Among the questions in the terms of reference were:

- To what extent are the problems related to the proposed law on surface water pollution known in the region? How great are the differences among the various actors within the AKIS (agencies, farmers and other relevant actors) with respect to their

degree of knowledge? What are their opinions and attitudes toward the proposed measures? How do they see the implementability and consequences of the law?

- Which actors are involved in producing and distributing information about the proposed law? What types of information are available?
- How is information being exchanged among the various actors involved (quality, quantity, methods, frequency etc.)?
- Given the information obtained in answer to the above questions, can measures be suggested that might contribute to improvements in the knowledge system? If so, which measures? Which actors (research, extension, LLTB, farmers, clubs (including study clubs) and so forth, would need to be involved in which measures? Who is apt to benefit from such improvements?
- Can recommendations be formulated specifically for the benefit of the LLTB, which would enable the organization to optimally carry out its role as a representative of farmers and growers?

Objectives

Based on the terms of reference above, the following objectives were defined:

- to gain insight into the use of a methodology for analysing an agricultural knowledge and information system
- to create a background of common experience and a common frame of reference
- to make a constraints–opportunities analysis of innovation processes within an AKIS
- to study the possible role of a specific organization in improving the performance of an AKIS
- to reflect on the usefulness of the methodology.

Division into groups during field exercise

To optimize exchange of information during the ICRE field exercise, each of the participants took part in two different subgroups: one subgroup for interviewing (interview groups) and one for analysis of the information that was collected (window groups). Table A5 gives an example.

Table A5
Example of division into groups

Window groups		Interview groups
Names	Windows	Names
John Lena Bernard	W1, W2, W8	John Maria Sonia
Maria Ahmed Pedro	W3, W4, W6	Lena Ahmed Arif
Sonia Arif Myra	W5, W10	Bernard Pedro Myra

Field report

When the field exercise has been completed, the group prepares a report. One possible outline to use in assembling this material is given below. (See also the section on 'Field and synthesis reports' in Chapter 3, regarding the purposes and use of this report.)

Summary An overview of the contents of the report. This should include a short description of the problem studied, the methods used by the field team during its work, and the major findings.

Introduction A short description of the problem studied, why it is important for the farmers who are affected by it and the approach used in collecting, processing and analysing data.

The agricultural knowledge system and related information

The AKIS should be described, including the people and organizations who play important roles in the problem; the activities of these people and groups; and their objectives, opinions, attitudes and interests. Further, the information and knowledge they produce or have access to should be covered, along with their view of the problem and suggestions for solving it.

Annexes

Maps

Graphs

Terms of reference

Teambuilding workshop (two days)

The teambuilding workshop is meant as additional preparation for a RAAKS study. It follows on from a RAAKS training workshop, as further preparation for a team. Alternately, such a workshop can serve as a 'crash course' before beginning action research. Its elements focus on getting to know each other, setting working rules and designing a work plan. Such a workshop can be facilitated by either an external RAAKS consultant or by the team itself. In the latter case, at least one person should have basic knowledge of RAAKS and experience in using the method.

Objective

To establish comfortable working relationships, so that team members can work together intensively during the diagnosis.

Expected results

- Team members with insight into each others' backgrounds, work experience and opinions.
- A shared idea of how knowledge systems can be examined, and how to recognize the potential for change in a system and its actors.
- A choice of methods for working together, plus agreements on how to do this (how to

- divide tasks, how to process results, how to discuss and analyse the results together).
- A choice of methods for collecting information, plus agreements on how to do this (how to interview, how to collect secondary data).
 - A choice of methods to stimulate the active participation of the actors who will be involved, plus agreements on how to do this.
 - A work plan and time schedule for RAAKS.

Programme	
Day I	
9.00	Introduction
9.15	<i>Getting to know each other.</i> Each team member takes a few minutes to draw an image of her/himself, including characteristics that seem important to share with the other members (background, education, work experience, hobbies etc.). The images are then presented and explained.
10.15	Break
10.45	<i>Knowledge networks in our daily work.</i> Team members work together in pairs to identify the knowledge networks that led to their participation in the diagnosis, using Exercise 1 from the following appendix. Each pair of team members summarizes the results of their discussion on a sheet.
11.45	Presentation of the summary sheets and discussion of different types of knowledge, sources of knowledge, 'reliability' of sources and relevant topics.
12.30	Lunch
13.30	<i>The RAAKS team as a knowledge network.</i> Working in pairs and using Exercise 3, team members identify the key actors of their own networks, the individual objectives and expectations of these actors, their tasks and relationships, and the driving and constraining factors that affect the performance of the networks.
14.45	Break
15.00	<i>Presentation and discussion of the results.</i> Attempt to formulate clues related to getting the greatest possible benefit out of a RAAKS exercise.
15.45	<i>Teamwork: learning styles and team contract.</i> Roles and learning styles that team members may use during the diagnosis should be identified, as discussed in Exercise 4 in the following chapter.
17.00	End of session.

Day II

- 9.00 *Methods of collecting and processing information* (open or structured interviews, use of literature/reports/censuses/maps/aerial photographs etc., transect walks, joining meetings/special events) – a brief introduction. Discussion of methods most appropriate for the diagnosis in the situation to be studied. (See Appendix 3 for related readings, particularly Russell Bernard and Pretty et al.)
- 12.30 Lunch
- 13.30 *Communication with actors* – role play: facilitating an actor workshop. Divide the group into teams of four to six people. Each team prepares a role play of an actor workshop, each with one or more facilitators, team members and other actors (the ‘audience’). The theme of the workshop may be assigned or decided by the teams. Role plays are presented to the group as a whole. After each one, those watching write each of their observations on a separate card. At the end of the plenary session, cards are pinned on a board, discussed and systematized. This will bring out many different points, which can be used to formulate guidelines for real-life actor workshops.
- 15.00 Break
- 15.15 *Work plan*. The team summarizes the concepts, methods and communication techniques discussed, and uses these to produce an outline of a workplan.
- 16.30 *Final agreements* regarding the way the team will proceed.
- 17.00 End of workshop.

Appendix 2 Exercises

This appendix presents a few exercises that RAAKS teams and trainers can use for team building and as a first introduction to RAAKS. Exercises 1, 3 and 4 support team building, and are meant to be used before starting to work in the field. Exercise 4 can also be used later, to monitor and evaluate team interactions. Exercises 1 and 3 can be integrated into workshops such as those described in the previous chapter. It is assumed that participants will read the manual and cards before beginning these exercises, so that the RAAKS vocabulary is a bit familiar.

The materials needed for the exercises include flip charts, marking pens and masking tape (or an overhead projector and transparent sheets to write on), small cards in different colours; if a video is to be used (Exercises 2 and 5), obviously a videorecorder will also be required.

Exercise 1 Knowledge networks in our daily work

The assignment in this exercise can be used to introduce workshop participants to RAAKS concepts, and to help in preparing a new team. The team gains insight into RAAKS by applying these questions to itself. In the process, team members come to understand more about networks in general, and specifically about the networks in which each team member plays a part, and the differing perceptions of RAAKS among team members.

Further, the importance of making explicit choices as part of a RAAKS study becomes evident. Participants may, for example, come up with different ideas about types of knowledge, and begin discussing which one is correct. However, in RAAKS the question is not which is 'right' or 'wrong'. The point is to become aware of the differences, and to use this awareness in deciding among the options for the analysis.

In using the questions below, participants should first answer for themselves, then interview each other and sum up the answers as a group, putting the summaries on paper. At least one or two networks should be worked out as examples. See Tool B3/c (the Source–intermediary–user sheet) for more information on types and sources of knowledge.

Questions

- ❓ What types of knowledge and information related to RAAKS have you encountered?
- ❓ What sources of knowledge and information have you used (or are you using) to learn more about RAAKS?
- ❓ Can you give these sources of knowledge and information a name – that is, assign them to categories? If not, why not?
- ❓ Which of these sources do you consider to be the most reliable?
- ❓ Who or what first directed your attention to RAAKS?
- ❓ What themes in the situation to be studied most appeal to your imagination?

Exercise 2 Identifying a knowledge system

This exercise can be used to practise applying the knowledge systems perspective to a specific problem situation. The time required for this exercise is approximately 120 minutes.

Participants are divided into small groups and asked to divide the key questions (below) among their groups. A case study/problem situation is then provided. This could be on paper, or if possible as a video.¹ Alternately, one of the participants could describe a problem situation, or participants could act out a situation (role play). Each group is asked to divide the key questions (below) among themselves. Information can be summarized as outlined in Tool A5, 'Summarizing Phase A'.

Answers to the questions are then presented (using for example a flip chart) and discussed, comparing the similarities and differences in the answers of the small groups. If the participants will go on to Phase B, they will need to agree on one problem situation to be used as a starting point for the Phase B analysis.

Questions and activities

- ? What actors (individuals, groups and organizations) are involved?
- ? What are their objectives?
- ? Is there a shared objective?
- ? What problems do you think each of these actors perceives?
- ? External factors: what and/or who are driving/constraining forces?
- ? Make a drawing of the problem situation.

Exercise 3 Knowledge networks and the team

This is a further exercise that can be used by a RAAKS team or by participants in a training workshop. Team members are asked to apply the knowledge systems perspective to their coming RAAKS study. They look at themselves and the team as participants in one or more knowledge networks, and how these are relevant to the study. How does the knowledge network that is being examined perform, and how this will affect the performance of the team and the success of the study?

In working to understand knowledge networks, it is very helpful to use graphic methods, drawing one or more pictures of the situation. (See 'Systems drawings' in Chapter 3.)

1. Two effective video packages are a video about Benin (The system and the soil) or the Netherlands (A day in the country). Each package includes a film made from the perspective of knowledge systems, a workbook for facilitators, and a booklet explaining the context of the film. Both films are available in either French or English, and may be free of charge to governmental and non-governmental organizations in low and middle income countries: submit a letter explaining how the film will be used and ask if this is possible. (At the time of publication the price for others, including all commercial organizations, is US\$ 150). Contact TVE Training and Distribution Centre, P.O. Box 7, 3700 AA Zeist, the Netherlands, telephone 31 340 692 0499/fax 31 340 692 2484.

Questions

- ❓ Who are the actors in the knowledge network? Who can be seen as the key actors, and who should not? What other actors would it be necessary to talk to, to understand the network? Why?
- ❓ What information will be needed from each key actor, to understand the network?
- ❓ What individual objectives may each of the different actors have?
- ❓ What results are expected from the knowledge network, and by whom?
- ❓ What/who are driving/constraining forces behind the functioning of the network?
- ❓ What tasks have to be performed by whom to achieve an optimum result?
- ❓ What contacts already exist between the various actors?
- ❓ What relevant knowledge networks do the actors already utilize? In what areas? (See also Exercise 1, 'Knowledge networks in our daily work'.)

Exercise 4 Teamwork

This exercise can be used not only at the beginning of the first phase of RAAKS, but also as an interim evaluation of the ongoing teamwork during the process. The main idea is to explore the way the team will work together, and to make agreements related to this. As preparation for a RAAKS study, you need to discuss how to work together as a team – do's and don'ts, how to solve conflicts, division of tasks, and so forth. The agreements that come out of this discussion can be formalized in a sort of 'contract'.

The following questions can be used to structure discussions; they also provide an outline for the team's contract. The questions and information gained can be used to divide up tasks within the team, and in monitoring and evaluating team performance.

Questions

- ❓ Does the team find it necessary to divide tasks?
- ❓ How is the exchange of information between team members organized?
- ❓ How are decisions taken (discussion and giving arguments; forced by time pressure; focus on results; consensus; dominant team members, etc.)?
- ❓ How are disputes settled (consensus, voting, etc.)?
- ❓ Can different roles be seen among the team members?
- ❓ What learning styles are seen among team members? Are the roles being played appropriate to the learning styles of the 'player'?

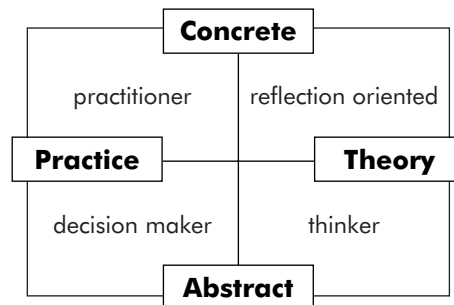
Styles of learning

When asked to reflect on how they managed their teamwork during a RAAKS seminar, one group of students used Kolb's *styles of learning* (1986) as a framework to discuss and make use of their experiences. Each team member was asked to think about the tasks he or she had carried out during the seminar: what did this suggest about their ways of working? Finally, each member decided which part of the diagram best described his or her learning style.

The diagram suggests two axes, along which you can locate yourself (see Figure A1). It describes elements of personality or character that affect the way you learn. One axis ranges from concrete to abstract: do you see yourself as generally thinking in more specific, real-world terms, or more abstractly? The other axis goes from practical to theoretical. The more practical thinker 'learns by doing' – first acting, then using experience to help in grasping the underlying concepts. A more theoretical person prefers to understand concepts before acting. This leads to the four combinations shown in the diagram. For example, in this system someone oriented both to concrete thinking and to practice is called a 'practitioner', while someone who combines abstraction and theory is called a 'thinker'.

Focusing on learning styles can help both individuals and the team to gain insight into individual styles. This provides clues that can help the team to cooperate better: learning styles affect the way a team performs. Talking about learning styles helps to avoid the tendency of groups to cover up differences to prevent conflict – but then the differences can stand in the way of cooperation. The 'thinkers' in the group may be seen by the 'practitioners' as 'not wanting to do anything but talk'; they want to 'get things moving.' On the other hand, thinkers may feel practitioners 'act too hastily, without any plan of action'. In this situation, everyone can easily lose sight of their common goals in a battle to support their own points of view. If instead team members acknowledge their different styles and see these differences as a strength, they can achieve real 'synergies' – bringing together their different approaches, to make use of the strengths of all and achieve results that exceed what could have been expected from any one alone.

Figure A1
Learning styles



Source: Adapted from Kolb, 1986

Exercise 5 Exploring a problem situation

The objectives of this exercise are: to define the boundaries of a problem situation and analyse it from a knowledge systems perspective; to operationalize Phase A (that is, to translate the results into actions) and to apply one window from Phase B; and to integrate participatory methodologies in the work of the team. As in Exercise 2, this exercise can be used to practice applying the knowledge systems perspective to a specific problem situation. Here, a ranking technique from PRA (participatory rural appraisal) is added to the analysis. The time required for this exercise is approximately 120 minutes.

To carry out this exercise, participants divide themselves into three diverse groups – that is, within each small group people should be different with respect to work and educational backgrounds, sectors they represent, gender, age, ethnicity and so forth. People who often work together should be separated. Choose a problem situation from practice or use a video (see Exercise 2). After becoming familiar with the problem situation, groups answer the questions and then carry out the activities, using the cards mentioned below. The cards that remain after the ranking can be put on the ground or pinned up in such a way that the actors, their objectives, the problems they see and the external factors that influence them become visible.

Questions

- ❓ What actors (individuals or groups) are involved? (Participants make an inventory of the actors, writing the name of each actor on a card)
- ❓ What are the actors' objectives? What do they see as the problem(s)? How successful are the actors in solving these problems? (Participants write each objective and each problem on a separate card.)
- ❓ What are the external factors? (Participants write each external factor on a separate card.)

Activities

- Identify the most important problems, actors and external factors, using steps 1, 2 and 3, below.
- Using the results of steps 1, 2 and 3, look again as a group at the problem situation. Does the group still accept the problem statement, or do they want to re-define the problem situation?
- Make a drawing of the problem situation.
- Choose one of the 'B' windows and apply it to the case. Make the results graphically visible in some way.
- Present the results.

Group ranking of problems, actors and external factors

Step 1: Problem ranking

Spread out the cards that show the problems identified. Each participant then receives three beans. (Alternatively: women and men receive beans of different types or colours.) Each person decides which three problems seem the most important to them, and puts their beans on those problem. (You can put all three beans on one problem if you like.)

The number of beans received by the various problems shows which ones the group sees as most important. If men and women have used different beans, any differences in their voting will now be visible. The most important problems are separated and spread out on the ground. (Option: if for example there are not clear differences in the number of beans received by the problems listed, you can carry out another round of prioritizing with beans, first setting aside the problems that were clearly less important).

Note: during step one, each of the problems should be written down, and a record should be kept of the 'scores' – the number of beans received by each problem.

Step 2: Ranking actors

In step 2, for each of the high-priority problems, participants are asked which actors are the most important and who should take the lead in solving the problem. Again, for each problem, after the group has listed the actors each participant is given three beans to indicate which ones they see as most important.

Step 3: Ranking external factors

Participants are then asked which external factors have the strongest influence, and receive three beans to indicate the most important factors.

Step 4: Results

The results of the ranking process can be made visible by making a table, as seen in Table A6.

Table A6
Summary of a group ranking

External factors			Problems ^a	Actors		
Policy	Drought	Internal factors		Local government	Community	NGO
x	x		1. Food	x	x	x
x			2. Roads	x		
x			3. Education	x		
x		x	4. Income		x	x

^a Number indicates the priority assigned by the group

Appendix 3

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RAAKS networks and organizations

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Contact person: Stephan Seegers, Hemonystraat 18-4, 1074 BP Amsterdam, the Netherlands. Tel./fax: +31 (0)20 6700312, E-mail: stephan.seegers@pi.net

STOAS: a consultant agency in rural development and agricultural education offering tailor-made training in RAAKS.

Contact person: Lambertus Vogelzang. STOAS Head Office. Agrobusiness park 91a, P.O. Box 78, 6700 AB Wageningen, the Netherlands. Tel.: +31 (0)317 424711. E-mail: lav@stoas.nl, fax: 0317 424770.

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Contact person: Chris de Klein, 12 KM, Multan Road, Chowk Thokhar Niaz Baig, Lahore 53700 Pakistan. Tel.: +92 (0)42 5410050-53. Fax: +92 (0)42 5410054, E-mail: iimi-pak@cgnet.com

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Appendix 4 Glossary of key concepts

Actors/social actors

People are at the core of the knowledge system perspective used in RAAKS – not as passive recipients but as active, knowledgeable participants who can arrive at decisions. ‘Actor’ as used here may refer to an individual person or to a group, organization or network: all interact, taking and implementing decisions on the basis of their own perceptions, interests, agendas, understandings and the opportunities they are able to see. (Also see ‘The AKIS perspective’ in Chapter 1.)

Area of human activity

The area that is the primary concern of the actors in the knowledge system being considered (this could be any type of activity – providing care for the elderly in place X, or the shrub and tree nursery sector in place Y). Three dimensions can be used to describe an area of human activity: the particular target groups or constituencies involved; the problem(s) that concern the actors; and/or where these problems occur (the region, agroecological zone and so forth). (See Tool A1, the Problem definition exercise.)

The breadth or specificity of the area of activity chosen plays an important role in defining the problem to be considered by a RAAKS team. (For example, it may be necessary to choose between a focus on ‘agriculture’ and one on ‘rural development’.) Too broad a definition may produce so much information that it becomes difficult to handle, but a narrow definition may focus the team’s attention too early, excluding important information. (See *Problem*, below.)

Communication

A process that may take place when people or groups of people exchange information, including symbolic information, with each other. The information involved in such exchanges can take many different forms – for example, it may be spoken or written, on video or radio, or electronic. In describing the process, any one or combination of various aspects may be emphasized, such as the communications media, the participants, the cultural issues involved or the rules that govern the exchange process. (See ‘The knowledge and information systems perspective’ in Chapter 1 of the accompanying book, *The social organization of innovation*.)

Communication networks

Patterns of communication that arise as a direct consequence of actors’ decisions to search for, to exchange and to make use of the experiences, knowledge and ideas of others. This leads to increases in both formal and informal communication – perhaps through e-mail exchanges, meetings, newsletters, workshops, journals, conferences or courses. These communication patterns are one of three ‘social forms’ that emerge from interactions among actors in their search for new ideas. (See ‘Understanding the social organization of innovation’ in Chapter 1; Window B3, Knowledge network analysis; and *Convergence* and *Resource coalition* below.)

Configuration

A particular arrangement of actors. An *innovation* configuration appears when actors work together to achieve innovation. It is made up of the convergences (see below) and

networks (for both communication and resource sharing) that emerge as a part of this process. Mutually accepted views, procedures and ground rules for collective behaviour with respect to innovation come into being, making joint decision making and coordinated action – and eventually the steering of innovation processes – possible. (See ‘Understanding the social organization of innovation’ in Chapter 1 and *Innovation* below).

Basic configurations are models that can be used to help identify prime movers and dominant relationships among actors in a situation that is under study. They provide one way of looking at innovation configurations. (See Window B6, Coordination analysis; Tool B6, Basic configurations; and Chapter 5 in *The social organization of innovation*.)

Convergences

When a number of actors begin to share ideas and define relevant problems, alternatives and solutions in similar ways, their views can be said to be converging. In a team or network, actors whose views converge to some extent can work together more effectively – for example, it becomes easier to narrow down the scope of their inquiries and the range of issues and alternatives they see as relevant to innovation. (However, strong convergence can be a disadvantage, leading actors to ignore important information that does not match their perceptions!) Convergences are one of the three ‘social forms’ that emerge from interaction among actors in their search for new ideas. (See ‘Understanding the social organization of innovation’ in Chapter 1 and *Communication networks* and *Resource coalitions* in this glossary.)

Information

For the purposes of this resource box, information will be defined as the explicit part of knowledge, which can be exchanged among people. It is a pattern imposed on a carrier such as sound, radio waves, paper, diskettes, electronic cables and so forth – any sort of written or spoken message. Although actors who produce information generally do so to express a particular meaning, they can never be sure the intended beneficiaries will attach that same significance! (See ‘The knowledge and information systems perspective’ in Chapter 1 of *The social organization of innovation*.)

Innovation

A *social process* of interactive inquiry that actors carry out in order to construct or reconstruct their practices (see *Social practice*, below). The main elements are experimentation and networking, which may result in developing new methods and materials (technical, social or other) or in adaptation of ideas, practices and other elements developed by others. Because innovation requires interaction among actors, it can be seen as the outcome of a process of mutual learning. (See ‘Understanding the social organization of innovation’ in Chapter 1, plus *The social organization of innovation*, Chapter 5.)

Innovativeness

A social competence. A collective capacity to learn: to generate, identify, obtain, develop and put to use technologies that are appropriate to specific conditions and societal objectives. The capacity for innovativeness is embedded in the social relations and interactions of a large number of semi-autonomous actors – individuals, groups, organizations and institutions. (See ‘Innovativeness as a social competence’ in Chapter 1; more detail can be found in *The social organization of innovation*, Chapters 1 and 6.)

Interface

A shared boundary between actors where interactions may occur. One way to increase relevant interactions (and therefore communication) is to identify strategic interfaces, and encourage or build linkages at these points.

Knowledge

The set of concepts, meanings, skills and routines developed over time by individuals or groups as they process information. Knowledge is in people, 'between the ears'. It is intrinsically related to social practice. Actors generate, transform, integrate, exchange, disseminate and utilize knowledge while going about their daily business. (See Chapter 6 in *The social organization of innovation*.)

Knowledge network

Individual people who join together to deliberately generate, share and use ideas, knowledge and information; each participant is both a source and a user of information. Often existing local knowledge networks can be identified and encouraged. (See Window B3, Knowledge network analysis; and Tool B3/c, the Source-intermediary-user sheet.)

Knowledge and information system (KIS)

A linked set of actors – individuals, organizations, institutions and networks. Multiple linkages emerge (or are strengthened) as a result of their networking in search of innovation. System performance depends heavily on elements such as cooperation among actors, effective communication, agreement with respect to objectives and interests, and how well the system defines and coordinates its tasks. (See 'The AKIS perspective' in Chapter 1, *Networking* below and *The social organization of innovation*, Chapter 1.) RAAKS involves actors in looking at their existing system or systems, studying for example communication patterns, convergences, resource coalitions and configurations to see how the system is put together. This makes it possible to consider what changes might be useful – perhaps new networks or other types of linkages that could be improved or established to promote innovation – and to work towards commitments to achieve this.

Knowledge management

This concept suggests that a KIS can be designed or re-designed to improve its performance. That is, when we understand the way a knowledge and information system functions, we can begin to design interventions to increase the individual, social and/or institutional benefits it provides. (See Window C1, Knowledge management analysis; Tool C1, Knowledge management analysis; and 'An eye on knowledge management' in *The social organization of innovation*, Chapter 1.

Learning

A complex activity that manifests itself in a relatively stable change in behaviour of a person or a group of persons. Learning is rooted in the human capacity to improve one's understanding and skills on the basis of day-to-day experience. Such a change is sometimes also observed after a person or group has been involved in an organized learning activity or has gone through some kind of 'critical' experience.

Linkages

Connections between actors that allow the exchange of resources such as information, money, labour and other material or immaterial assets, such as power, status, or 'goodwill'. Linkages are a quite significant part of a knowledge and information system;

studying them can show whether (or how tightly) actors are connected to each other, how actors communicate and work together, and which actors and relationships are most important to the functioning of the system. Thus when knowledge management is to be used to facilitate change, linkages are a major focus. (See ‘The AKIS perspective’, in Chapter 1; Cases 1 and 2, in Chapter 2; Window B4, Integration analysis; Tools B4/a and B4/b; and ‘Drawing attention to integration...’ in *The social organization of innovation*, Chapter 1.) Linkages can be either formal or informal; both are important!

Linkage mechanisms

Organizational arrangements (e.g. liaison offices, meetings or administrative relationships) that help to link up the parts of the system. This facilitates the exchange of resources – perhaps by contributing to communication (meetings among farmers, with extension workers or liaison offices are some examples), coordination (e.g. mutual adjustment of activities, such as water distribution or publicity campaigns) or resource transfers (perhaps credit, salary payments or shared labour).

Mission statement

A short concise statement setting out the essential purpose of an individual or organization; ideally, this statement specifically describes objectives, relevant constituencies and activities, plus other stakeholders and/or partners, rather than being ‘beautiful but vague’ (Window A3)! Different actors strive for different kinds of development: they may have widely differing views of what must be achieved, how and by which actors. What an actor sees as a mission sets the stage for their activities; it affects their expectations, the ways they search for information, and their impact. Similarly, the degree of diversity among the mission statements of relevant actors has a strong influence on the system. (See Windows A3 and C1, and Tool A3, the Actor objective sheet.) Further, a mission statement operationalizes the concept of volition (discussed in *The social organization of innovation*, Chapter 6.)

Networking

An active process of building and maintaining meaningful interactive relationships with relevant actors; one of the most important ways actors organize themselves to search for the ideas and information they need to change their practices – that is, to innovate. Within a system, networks link relevant sources and users of knowledge and information or other resources. Therefore, the more effective and efficient the networking among stakeholders in development, the better the chance of innovation. The process of networking leads in turn to more or less stable patterns of relationships: convergences, communication networks and resource coalitions; in short, innovation configurations. This makes actors increasingly capable of supporting the purposeful generation, use and transformation of innovations.

Because the composition and integration of a network affect communication and resource linkages, they impact the availability and relevance of these resources and the extent to which the system achieves its objectives. Networks are thus an important part of knowledge management strategies. (See ‘Innovativeness as social competence’ and ‘Understanding the social organization of innovation’ in Chapter 1; Window B4 and Tools B3/a, B3/b and B3/c – the Info–source–use exercise, Communication network sheet, and Source–intermediary–user sheet. See *The social organization of innovation*, Chapter 5, for more discussion of networking, networks and configurations; and Chapter 6 for more on convergences.)

Participation

The involvement of actors in the process of making decisions that will affect them, including what is to be done and how. In a RAAKS study, planning for the inclusion and meaningful participation of those who have typically been called 'beneficiaries' or 'target groups' is essential. Successful use of participative approaches requires respect for others' knowledge and experience and willingness to involve them in implementing, contributing, sharing and evaluating proposed solutions. Participation may involve individuals, groups or their representatives. The quality of participation has a great impact on the outcome of the process, and can greatly increase the chance that key actors will support the results – so that action results. Decisions in this area are probably the most important of any taken by a RAAKS team. (See Chapter 2 and *Problem/problem definition* below.)

Problem/problem definition/problem situation

Even when a problem is stated in their assignment, a team must look carefully at the way they will define the area of human activity (see above) and problem (Window A1) to be considered. The fact that different stakeholders have different ideas about the definition of any problem is a key element in a RAAKS study, encouraging stakeholders to assess and re-assess their understanding of the problem situation and their own role in it. The picture of the underlying problem evolves as a variety of actors work together.

These definitions determine the objectives the team will work towards and, critically, the participants in the study. For example, the problem may seem to be that farmers do not participate actively enough in extension programmes; or it may seem more institutional, such as a lack of coordination between research and extension. In either case, the importance of this decision makes clear that the way the problem is stated must be critically examined! Either of these problems might not be the real issue. (See Windows A1, A4 and A5, Tool A1 and *Area of human activity* and *Participation* above.)

Resource coalitions

Alliances among actors who decide to pool their resources to improve their performance. These alliances are one of the three social forms (see below) that emerge as a result of interactions among actors as they search for new ideas. Such alliances can be used as a means of wielding power and influence. (See 'Understanding the social organization of innovation' in Chapter 1 and *Convergences* and *Communication networks* here.)

Social forms

Patterns that emerge as a result of networking for innovation. With continuing contact, these may stabilize and persist. The existence of these social structures influence later behaviour/interactions of the actors involved; they may have either an enabling or a constraining influence. Engel identifies three such social forms: *convergences*, *resource coalitions* and *communication networks*. (See 'Understanding the social organization of innovation' in Chapter 1).

Social organization of innovation

This phrase recognizes innovation as taking place within a social context; this context can thus either facilitate or impede the process. Further, if the context is sufficiently well understood, the actors involved can work together to organize themselves in ways that are more beneficial to their objectives – that is, they can organize to search for ideas and information that will allow them to change their practices. (See Chapter 1, 'Understanding the social organization of innovation' and the Introduction to *The social organization of innovation*.)

Social practice

The activities we all engage in are largely socially defined. That is, the society in which we function – whether within the family, a particular type of work, or a country, region or tribal group – tends to have rules (written or unwritten) about what makes a competent ‘X’, where X may be a mother, a doctor, a farmer, a particular sort of business, a teacher, a policymaker and so forth. Any set of actions can be seen as a ‘social practice’, in the sense that actors socially define and reinforce rules of competence as they relate to each other. A social practice can then be defined as a discernible set of actors, who define and uphold performance through some form of rule-governed social interaction.

Interplay in-and-between diverse social practices is a breeding ground for innovation; networking is a way of encouraging this interplay among relevant practices. Further, this concept can be useful in understanding the differences in the rules that govern different practices – for example, farmers in comparison to researchers or extension workers. A clearer perception of each others’ activities as social practices in their own right could help to improve the interplay between groups and to generate more effective networking practices among them.

Stakeholders

Actors whose interests are affected by a particular area of human activity, whether as victims or beneficiaries. In a RAAKS study, generally those who are concerned with maintaining or changing performance in this area. (See ‘The AKIS perspective’ in Chapter 1.) As with actors, stakeholders may be individuals, organizations, legal entities, etc.

Synergy

An effect arising from the cooperative activity of two agents that, when working together, produce a combined result greater than either one could have achieved alone. When actors whose resources (see *Linkages* above) complement each other work together, the collaboration increases the effectiveness of all. Each actor then achieves more than they could alone. (See Chapter 1, ‘The AKIS perspective’; and Window C1, Knowledge management analysis).

Window

An analytical perspective that focuses on particular issues relevant to understanding a problem situation. Windows provide a framework for the use of a RAAKS team. (See Chapter 2.)

About the authors

Monique Salomon holds an M.A. in Cultural Anthropology. She is currently based at the Department of Agriculture of the University of Zululand, South Africa as senior lecturer in rural development and extension. She also works for STOAS as an international consultant on knowledge management, participatory development, gender issues and RAAKS, and is a member of Perspectives, a network of RAAKS consultants. Previously she was a lecturer and consultant at the Department of Communication and Innovation Studies, Wageningen Agricultural University, the Netherlands; she has also had professional experience in social work and education in the Netherlands.

Paul G.H. Engel has an MSc in irrigation agronomy and a PhD in agricultural and environmental sciences. After field work with small farmers in Peru, Ghana and Colombia he joined the Department of Communication and Innovation Studies at Wageningen Agricultural University as a lecturer and researcher. He focuses on action research as a means of developing methodologies to facilitate stakeholder participation in agricultural innovation and natural resource management. As a consultant he is primarily engaged with stakeholders who are re-inventing their informal and institutional networks to strengthen smallholder agriculture. As a researcher he concentrates on institutional development and knowledge management issues in decentralized, market-oriented settings. He is now a senior consultant with STOAS International Projects, based in Concepción, Chile, and is also a senior member of Perspectives, a network of RAAKS consultants.

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