PARTICIPATORY RESEARCH AND EXTENSION IN AGRICULTURE

Organisation of learning in participatory research and extension approaches

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Summary

Organisation of learning in participatory research and extension approaches in agriculture.

Different organisations have developed approaches to include the farmers' knowledge in the research and extension process and to increase the knowledge and skills of the farmer. The increase in knowledge and skills of the farmers is the result of a learning process. The aim of this research is to determine the factors that influence the effects for farmers and scientist of the different participatory research and approaches. First a theoretical framework is developed. This framework consists of characteristics of the organisation, characteristics of the participatory research and extension methods and the effects for farmers and scientists. Based on this framework a survey among managers and field staff of research and extension organisation was conducted. The results of this survey show that most of the organisations use a participatory approach. To get a better understanding of the research and extension processes a case study was made from the research and extension system in Uganda. The case study showed a more differentiated picture of participation.

From the results of the survey and the case study it appears that the factors that have a positive effect on the participation of farmers are an organisation that is development-oriented and promoting an input-based technology. The factors that enhance the learning of farmers are a high level of farmers' participation and sufficient resources of the organisation to support the learning. The learning of farmers is leading to application of the new technology and to results for farmers and scientists in the end.

Abbreviations used

A2N	Africa 2000 Network
AESA	Agro Eco System Analysis
AHI	Africa Highlands Initiative
AKIS/RD	Agricultural Knowledge and Information Systems for Rural Development
CBF	Community Based Facilitator
CBO	Community Based Organisation
CIAL	Comite de Investigacion Agricola Local
CIAT	Centro Community Based Facilitator Internacional de Agricultura Tropical
CIP	Centro Internacianal de la Papa
CORDAID	Catholic Organisation for Relief and Development Aid
EA	Environmental Alert
ERI	Enabling Rural Innovation
F2F	Farmer to Farmer
FAO	Food and Agriculture Organization
FFS	Farmer Field Schools
FPE	Farmer Participatory Evaluation
FRC	Farmer Reflect Circle
FRG	Farmer Research Group
GDP	Gross Domestic Product
HIVOS	Humanistisch Instituut voor Ontwikkelingssamenwerking
IFAD	International Fund for Agricultural Development
INIBAP	International Network for the Improvement of Bananas and Plantains
IPM	Integrated Pest Management
NAADS	National Agricultural Advisory Services
NARO	National Agricultural Research Organisation
NBRP	National Banana Research Programme
NGO	Non Governmental Organisation
NOVIB	Nederlandse Organisatie voor Internationale Bijstand
NRM	Natural Resource Management
PDC	Participatory Development Communication
PEA	Participatory Extension Approach
PM&E	Participatory Monitoring and Evaluation
PRA	Participatory Rural Appraisal
PRE	Participatory Research and Extension
RDE	Rural Development Extensionist
SPSS	Statistical Package for Social Studies
T&V	Training and Visit
ULAMP	Uganda Land Management Project
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
VEDCO	Volunteer Efforts for Development Concerns

1. Introduction

1.1 Origins of this research

In an analysis of agricultural research in the 90's in Tanzania some of the major problems for research were identified as, poor stakeholder involvement, weak research-extension linkages, insufficient analysis of farmer adoption and poor technologies (Ngendello, Mgezei, & Schrader, 2003). Many other research and extension organisations in developing countries are still facing the same problems today. To overcome these problems farmers must get more involved in the extension and research process. Research is the development of new technologies and extension is the dissemination of knowledge.

Different approaches have been developed to facilitate the farmers' participation in the development of technologies to reduce poverty. These approaches are to facilitate the incorporation of farmers' knowledge in the research and extension process and to enhance agricultural knowledge significantly and skills of farmers, which in turn could be reflected in an increase in production. The increase in knowledge and skills is the result of a learning process of farmers and researchers. Learning is an intentional process that requires a designed learning event and a situation where learning can take place. Learning events come in many different shapes, for example, training, discussion, video, farmer experimentation, brochures, radio broadcast, demonstrations, lectures, on-farm trials, exchange visits or a combination of any of these. Before the results for the organisation and for the farmer become visible the farmer has to apply what he or she has learned. The characteristics of the organisation will determine the type of Participatory Research and Extension (PRE) they are applying. A research-oriented organisation will apply a different type of PRE then an extension-oriented organisation. A research organisation dealing with the increase in agricultural production will develop technical solutions and the main reason for the participation of farmers is to validate the research findings. In a development-oriented research program the researchers will interact more intensive with the farmers in order to get an understanding of the farmers' situation. An extension approach targeting an increase in production will apply a transfer of knowledge model while an organisation aimed at the empowerment of the farmer groups will encourage more activities carried out by the farmers. In Figure 1.1 the relation between organisational characteristics, type of PRE and the effects is given.

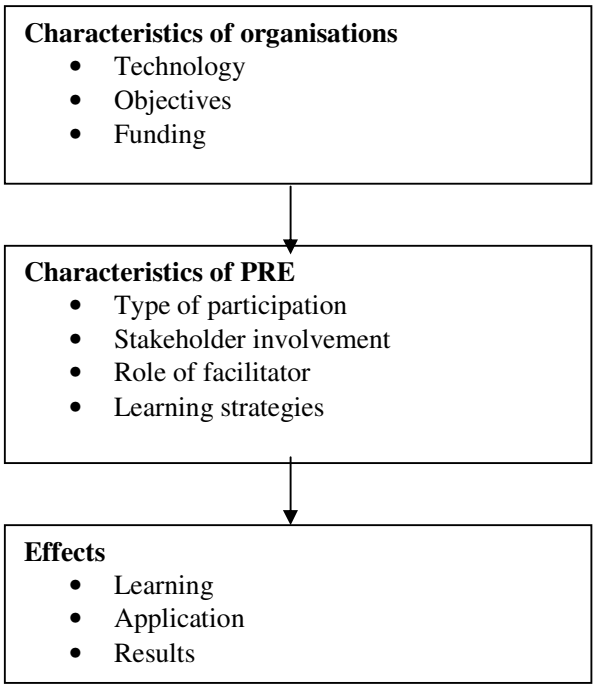

Figure 1.1: *Characteristics of the organisation, PRE and effects*

The type of technology is forming the content of the learning event, so it can be expected that the type of technology will determine the design of the learning event. Extension approaches developed for simple technologies are not adequate for complex technologies (Eilittä, Mureithi, & Derpsch, 2004). A more input-based technology, such as seed, pesticides or a new variety will require a different approach compared to a knowledge-based technology, such as integrated pest management or integrated crop management.
A number of development organisations have promoted different PRE approaches like Farmer Field Schools (FFS), and the Participatory Extension Approach (PEA). To describe the differences between the various PRE approaches the characteristics from the framework of Probst, Hagmann, Fernandez and Ashby (2003) are used, like the stakeholder involvement, the type of participation, and the learning strategies that are used. Different PRE approaches have a different approach to learning and will therefore use different types of learning events, for example, FFS have a constructivist approach to learning and rely on explorative learning events. In PEA learning is more directed to the transfer of knowledge and therefore an instructional design of the learning events is used.
The outcomes of the PRE are (Probst et al., 2003):

- The development and assessment of technologies;
- Generation of new theoretical insights to influence policies;
- Developing approaches for organisational and institutional innovation;
- Increase of knowledge of farmers;
- Empowerment of farmers to become equal partners in the development process.

As part of an International Fund for Agricultural Development (IFAD) financed research project, the Centro Internacional de la Papa (CIP) has initiated case studies in four countries with different approaches and different technologies. Travelling to four countries was beyond the budget for this master thesis and therefore a survey to get the views on PRE of a wide selection of PRE practitioners has been chosen, complemented with data from one country.

1.2 Aims of this research

The aim of this research is to determine the factors that influence the effects for farmers and scientist of different participatory research and extension approaches. This will be done by answering the following research questions:

- What are the characteristics of the organisations implementing PRE?
- What are the characteristics of the various types of PRE?
- What are the effects of PRE for farmers and scientists?

1.3 Research methodology

The research will be conducted in three stages.

1. Develop a framework for participatory research
2. Conduct a survey of the field staff and managers
3. Carry out case studies in Uganda

Participatory research and extension is a very wide and ill-defined subject therefore in the first palce a theoretical framework will be developed based on literature. This framework will consist of an analysis of the different perspectives of PRE in the literature and will include aspects like the who are the participants, what is the purpose of research, how are participants involved and what type of research is conducted. The results of this analysis are presented in chapter two.
Second, based on the framework developed in chapter two a questionnaire is constructed to conduct a survey among field staff and managers in research, development and extension organisations to investigate their perspectives regarding the different approaches in PRE. The results are presented in chapter three.
Third, a detailed study of PRE in Uganda is conducted to supplement the data from the survey with more detailed information from several cases of different PRE approaches. This information helps to

get a better understanding of the data collected in the survey. To collect this detailed information investigations in two stages will be carried out. First interviews with members of the management and field staff of various development, research and extension organisations are held. In the second stage some of the farmers who have participated in the different programs are interviewed. The findings from the interviews are presented in chapter four using the same framework as the survey to make crosschecks on the data possible.

1.4 Overview of the following chapters

Chapter two gives a theoretical background of PRE. The chapter describes the developments that led to the present focus on farmer participation and gives a framework to analyse the different PRE approaches. A comparison is made between two main groups of PRE approaches. In chapter three the survey to investigate the opinion of field staff and managers is described and the results are presented. It outlines the construction of the questionnaire and the procedures used to apply the questionnaire. In chapter four the case study in Uganda is presented. First the results of the interviews with twelve organisations are presented followed by the results of the visits to four organisations with different PRE approaches and promoting different types of technologies. In chapter five the conclusions and discussion are presented.

2. Theoretical background of PRE

In the past the agricultural system was divided in three parties, research, extension and the farmers, each with clearly defined roles. Research organisations were developing the technology while extension organisations were taking the technology to the farmers and taking the farmers problems back to researchers for them to solve. But it appears that farmers were not following the advice from the researchers. This could be caused by a poor technology resulting from ineffective research or from poor extension methods by not using the appropriate strategies to disseminate the technology to the farmers. To overcome these problems an active involvement of farmers in the research and extension process was required so various participatory research and extension (PRE) approaches were developed. The PRE approach is depending on the type of organisation. Research and extension are long seen as a task for the national government like education or health services. With the economic reforms and privatisation extension is moving to private service providers and Non Governmental Organisations (NGO) to provide the necessary services to farmers. To enforce the national agricultural research organisations, the international research organisations like CIP and the International Centre for Tropical Agriculture (CIAT) were established. These organisations collaborate with the national agricultural research programs. The national extension services focus on production and therefore resource poor farmers were not able to benefit fully from the extension programs. To improve the livelihood of this group of farmers donor funded development organisations started programs with a wider scope as only agricultural production. These programs can include beside agriculture issues like health, gender, HIV/AIDS, education etc. The aim of the program is to improve the living conditions of the farmers and the empowerment of the rural community to become an equal partner in the development process. The characteristics of the organisations are described in paragraph 2.1 to answer the first research question: *What are the characteristics of the organisations implementing PRE?*
Participatory approaches to agricultural research, extension and development are fluent. There is not one approach but depending on the history and orientation of the organisation, the beliefs and expectations different approaches are developed. Often an approach starts with a single person or in a single project and gradually the approach develops, is described and spread to other organisations. These organisations further develop this approach. This leads to a wide range of approaches. Even if the approaches are labelled the same the content may be very different. It is therefore necessary to categorize an approach on how it is intended and implemented and not on a title alone. PRE is not invented at one time but it is the result of a development in agricultural research and extension over a long period of time. In paragraph 2.2 five major changes leading to participatory approaches are described. In paragraph 2.3 a framework developed by Probst et al. (2003) to differentiate between the various approaches is presented. This framework will be used to answer the question: *What are the characteristics of the different types of PRE?* In paragraph 2.4 two important PRE approaches, the farmer field school and the farmer research group are compared. In the last paragraph the expected effects from PRE are discussed to answer the question: *What are the effects of PRE for farmers and scientists?*

2.1 Characteristics of the organisation

Organisations can be characterised according to the objectives of the organisation, the way the organisation is funded and the type of technology the organisation is promoting. The objectives of the organisation that implements the PRE can be research, extension or development. The orientation of the organisation will have an influence on the type of PRE. Some of the organisations are funded by the national government while donors fund others.

2.1.1 Objectives of the organisation

Research

Research is the development of new technologies. Technology is the basis for innovations, new ideas, processes or products for an individual or a group aimed at improving or creating new products and processes. Innovations are based on new technologies and can be developed from

existing technologies or adapted from technologies originated from other areas. Technology is the knowledge and know-how in products and processes. Technology is not a discrete commodity, but is embedded in the factors of production such as products, people and methods. Research is the application of scientific theories and techniques in the field of agriculture in order to develop new technologies that can for example increase production, protect natural resources and the environment. Research is usually divided into three types; basic, applied and adaptive research.
Basic research is the experimental or theoretical work that is undertaken primarily to acquire new knowledge without a specific application in view. This is done to generate new understanding of biological processes.
Applied research is aimed at gaining knowledge or understanding to determine the means by which a specific, recognized need may be met in a timely manner. Applied research is carried out to solve specific, practical questions and is not to gain knowledge for its own sake. It is almost always done on the basis of basic research. Often academic or international agricultural research institutions carry out this type of research.
Adaptive research is the transfer and adaptation of pre-existing research results to provide the basis for application by the end users. This research is aimed at the adjustment of technology to a specific need of a particular set of environment.
In participatory research there are two directions; a pragmatic direction and a political direction. In the pragmatic approach participatory research is seen as a way to strengthen the cooperation between farmers and researchers in order to produce more appropriate technologies. Farmers are able to communicate their needs to the researchers and the researchers can develop solutions in cooperation with the farmers. In the political direction of research Freire (1972) has had a great influence on the course of thinking about development. He defined participatory research as an approach to create social change. Participatory research is a process used by and for people who are exploited and oppressed. The approach challenges the way knowledge is produced with conventional social science methods and disseminated by dominant educational institutions. Through different methods, it puts the production of knowledge back into the hands of the people where it can strengthen their struggles for social equality, and for the elimination of dependency and its symptoms: poverty, illiteracy, malnutrition, etc. Freire puts a strong emphasis on empowerment. Empowerment is a consequence of "liberatory learning". Power is not given, but created during the activities in which the co-learners are engaged. The theoretical basis for this discovery is provided by critical consciousness; its expression is collective action on behalf of mutually agreed upon goals. Learning for empowerment is different from building skills and competencies, these being the results of conventional schooling (Freire, 1972).

Extension

Extension is the dissemination of technologies. Dissemination is the systematic distribution of information or knowledge through a variety of ways to potential beneficiaries for practical application. The implementation, which is putting the innovation into practice, is depending on three sets of factors, the environmental factors, the innovation factors and the personal factors.
The environmental factors are those factors or characteristics of the environment that influence the dissemination of innovations or the utilization of innovations by farmers like support, marketing conditions, availability of inputs and culture.
Rogers (1995) has identified six innovation factors that influence the diffusion and adoption of research:

- Complexity of the innovation;
- Perceived relative advantage of the innovation;
- Compatibility of the innovation to existing values, experience and need;
- Trialability, or the degree to which the innovation can be experimented with;
- Observability, or the degree to which the results of implementing an innovation are visible;
- Relevance, the degree to which the research is applicable to practice.

Besides the innovation factors there are also individual factors. Those are the relevant characteristics of the individual that influence the utilization of the innovation by practitioners. Examples of

characteristics are: age, education level, autonomy, problem solving ability, open-mindedness, social-, economic- and geographical-conditions. The environmental factors are often influenced by the organisations that disseminate the technology. Organisations, governments and institutions have general goals like to increase the income from agricultural activities, to promote food security, encourage empowerment of communities and to promote sustainable development. Based on needs assessments the organisations design programs to achieve these goals. Programs have often an integrated approach to stimulate the implementation by farmers of the new technology by paying attention to characteristics that will enhance the adoption and implementation. At the same time the organisation will take measures to improve the environmental factors like providing credit, create marketing opportunities, improve the necessary infrastructure and make inputs available, sometimes even at subsidised rates. To increase the success rate of the program the personal characteristics can be used in the selection of the participants for the program.

Development

Programs of development organisations often have an ideological background. When this background is religious, these organisations will implement their program through church related organisations. The background can also be solidarity of the more wealthy with the "poor and oppressed". Programs of development organisations are targeting the poorer levels in society that are often left out in government programs. These groups are difficult to reach and have a multitude of problems that cannot be solved with a single sector approach of only improving health or education. Government programs tend to be single sector because the programs are related to a specific ministry or department within the government. Development organisations have more freedom to use a multi-sector approach because they are not associated with the government ministries. The ideological background of the organisation puts emphasis on the empowerment of the communities. This empowerment enables the community to advocate their case at the different levels of government.

2.1.2 Type of technology promoted by the organisation

In general terms, technologies can be classified as input-based or knowledge-intensive. (Rogers, 1995). In input-based technologies the physical component of the technology, the "hardware" is dominant. These technologies usually have direct effects on yield and depend mostly on the availability of a physical input (seed of a new variety or an agrochemical). Input-based technologies often depends on a single simple message that fits in with the current farming system, shows clear and immediate effect, does not involve too much risk and is reversible. Adoption rates for this type of technology are good as shown in the IFAD study (IFAD, n.d.). IFAD evaluated several projects and found that successful innovations shared the following characteristics:

- They followed a more structured process, with clear sequential steps;
- They addressed a need widely shared by the poor;
- They built on existing or traditional knowledge, technologies, practice, cultural and social norms;
- Their advantages were clear to farmers and the rewards were rapidly visible;
- The cost of adopting the projects was affordable, in terms of the financial burden, increased workloads and social costs;
- They were relatively simple, and less likely to arouse distrust among the rural poor;
- They were well tested: prior testing and piloting of innovations is necessary to reduce risks and unknown factors, particularly when innovations are brought in from outside the area;
- They were based on exchanges of farmer knowledge within project areas and among regions;
- The project design approach was flexible and frequent adjustments took place during implementation of the innovations;
- There was genuine commitment on the part of IFAD, project and cooperating institution staff, and systematic IFAD follow-up;
- The correct policy environment and effective partnership facilitated them;
- They are easily reversible if they do not succeed.

These findings are very much in line with the six innovation factors that influence the diffusion and adoption of research that Rogers (1995) has identified.
Knowledge-intensive technologies, such as Integrated Pest Management (IPM), depend on farmers learning biophysical principles involved in pest control and then applying the acquired knowledge to make better decisions. In this case, Rogers refers to this kind of knowledge as the "software" of the technology. This type of technology is more complicated and requires a change in attitude. Often the results are not immediately visible and changes in the power structure and the organisational set-up are needed. More stakeholders are involved often with conflicting interest. A balance between short term and long-term effects needs to be found. An example of a complex technology is green manure. Eilittä et al. (2004) found low adoption rates for green manure/cover crops because it does not seem to fit in with the present farming system. There are no direct benefits, the crop requires more labour, occupies land where food crops could have been grown and most species are not fit for human consumption. Walker and Crissman (1996) found that the adoption of improved varieties, an input-based technology, has been significantly higher (reaching about 20% of Peruvian potato area) than the knowledge-based technology IPM (less than 5%). This suggests that input-based technologies would favour economic impact in the short term. However, IPM and participatory approaches build human and social capitals, which are essential for the sustainability of innovation in technological and organizational terms (Ortiz, Garrett, Heath, Orrego, & Nelson, 2004).

2.1.3 Funding of the organisation

The government can provide funding for the research- and extension-organisations. This makes the organisation subject to all the regulations regarding planning, budgeting and salary structures that are prevalent within the government. Governments in developing countries are struggling to provide sufficient funds for an efficient operation of research and the extension services.
Non Governmental Organisations (NGO's) are organisations that supplement government tasks. They work within government programs but are financed by donors. There is a substantial influence of the donors on the NGO because the NGO has to apply to the donors for funding for projects and they only will get their money when the project fits within the donors' policy. This way the donor will have an influence on the type of PRE the NGO is implementing. Through donor financing the NGO is more flexible in the expenditures and are able to pay higher salaries for the same jobs compared to the government resulting in a migration of qualified staff from government to NGO.

2.2 Developments leading to the appearance of PRE methods

2.2.1 Development in agricultural policies

In colonial times and the early years of independence the objectives of the national agricultural policies of African states were aimed at increasing the production of cash crops for export. This type of agriculture started under the colonial rule but after independence the governments continued to support large-scale cash crop growers. The government could use the revenues from the export of these crops for development. The technology for cash crops was often imported from other countries. Before a new crop was introduced the farming system was studied because the new cash crop had to fit in with the existing cropping patterns and the success was depending on the availability of labour.
In early agricultural research, based on rationalism, uniform recommendations were produced and disseminated among farmers. The application of the scientific knowledge of the researchers by the farmers should lead to higher production. Recommendations were mainly focussing on technical solutions like improved varieties, fertilizer and chemical crop protection. This concept worked well with homogeneous groups of farmers cultivating the same crop on the same type of soil under similar climatic conditions. The success of the "green revolution", the boost in production of rice and wheat in India and Asia was based on these blanket recommendations.
Later the concept of growing cash crops was extended from the large-scale producers to the small-scale producers, the small holders. This approach was targeting income generation by the rural population through the cultivation of cash crops. The aim was to create employment in the rural areas

and stop the people from moving to the cities to look for income. The idea was that the economic benefits would trickle down to the poor. This cash cropping system lasted from about 1910 to 1970.

In the 70's several severe droughts put the focus on national food self-sufficiency. This approach is aimed at making the nation self-sufficient in food, especially grains. When these droughts occurred attention was drawn on the dependency on the import of food grains. Because the prices for food imports were rising the countries saw a need to produce their own grain. Agricultural research starts looking at all agricultural activities in interaction with each other, the farming system. The farming system research focussed on traditional food crops and irrigated rice. The objective of this research was to keep the food prices in the urban areas low. Food prices are a political sensitive area. The target group of the extension service were the small holders. Small holders were seen as more efficient producers as the commercial farmers and by targeting the small holders a larger group was involved in the development. Now a larger group was receiving direct economic benefits from their activities and do not have to wait for the trickling down of the benefits from the more wealthy farmers engaged in the cash cropping system. Beside the food production also the possibilities for setting up cottage industries were explored to absorb the surplus labour in the rural areas. A lot of development activities like small industrial workshops were set up.

The government can use pricing policies to promote agricultural production. Offering guaranteed prices to producers can stimulate the production. Agricultural marketing boards were introduced to offer a fair price to farmers. A different approach can be the subsidizing of inputs like seeds and fertilizers or cheap credit schemes. Also ploughing services and disease control in cattle can be ranked as subsidies. "Supply shifters" are agricultural policies to increase the production by improving the quality of the inputs for the production process. This relates both to intellectual and physical inputs. These inputs can be improved seeds, technology, and infrastructure like roads, credit, extension, research and irrigation. The "green revolution" is an example of a "supply shifters" policy (Delgado, 1995).

Besides the pricing policy, extension is an important instrument for the government to promote agricultural production. The "Training and Visit" (T&V) is an extension approach that concentrates on the transfer of scientific agricultural knowledge and technology from research institutions to farmers. The term training and visit sums up the process of service delivery. Subject matter specialists give training to frontline extension agents on new but simple technical issues. The trained extension agents visit contact-farmers to deliver the technological messages. The goal of T&V was to increase crop production in controlled environments (e.g. irrigation schemes). Early experiences have shown quick production increases in cotton, rice and wheat. A different approach to extension is the "farmer-to-farmer" (F2F) system. A characteristic of the F2F extension approach is that farmers learn from other farmers about new agricultural technology or practices. The dissemination of innovations develops spontaneously when one farmer has successfully tested a new practice or technology, attracting the interest of other farmers. If the innovator is willing to share the knowledge, a farmer network may develop. But F2F extension can also be used in planned development projects. This approach is based on the conviction that farmers can disseminate innovations better than official extension agents because they have an in-depth knowledge of local crops, practices, culture and individuals, they communicate effectively with farmers, and are almost permanently available in the community. Innovations are provided by agricultural research institutions and later tested and adapted by selected farmers (GTZ, n.d.).
The 80's saw a decline in the world market prices for agricultural products that the developing countries were exporting. The governments were forced to cost reduction by reducing the government services like research and extension. More focus was put on industrial development and cash crops for the generation of revenues from export. The aim of the structural adjustment programs was a reduction of the bureaucracy and the promotion of a more open market to stimulate production. The program left it to the government to draw up plans for a more efficient research and extension service but the capacity of the government for planning was rather poor and the international agricultural research centres offered assistance to the governments with planning (Worldbank, 1994).

Over the years the focus of research and extension shifted from cash crops to food grains but with an emphasis on commercial production. This left out the subsistence farmers. In the 80's a change can be noticed. There is more attention for marginalized groups, the effects of abundant use of pesticides became clear and more attention was given to good governance. At the same time the farmers were not merely seen as receivers but as partners in development. In the following paragraph these changes will be further explained.

2.2.2 Focus on marginalized groups

Population growth, climatic change and pressure on the available land caused people to move into areas that are not suitable for viable agricultural production. The marginalized groups are getting more divers by changes in economic patterns and the differences in land tenure are increasing. The marginalized groups get attention mainly through donor agencies. Donor agencies are enforcing this attention by putting conditions in loans and manpower assistance that the donors provide to governments and research institutions. It was tried to repeat the "green revolution" in Africa and South America. In these parts of the world this approach to increasing food production was less successful then in Asia. In Africa and South America the small holder agriculture was very divers and the climatic, ecologic, social and economic conditions differ from area to area. There is a wide range of variety in soil types, crops, and rainfall patterns. Blanket recommendations did not work and recommendations had to be more adjusted to local conditions. Extension and research had to cover larger areas and a wider variety in conditions with the increase in attention for marginal groups. A way to increase the coverage is the inclusion of farmers in the research process. The focus on marginal groups causes problems in the allocation of research funds. As most of the rural population is living in the low potential rain fed areas resources for research and extension are withdrawn from the high potential areas (Delgado, 1995).

2.2.3 Environmental degradation

The technical solutions promoted by the "green revolution" had a serious impact and the environment and the sustainability of the system came under question. The natural environment has great influence on agricultural production. To have a sustainable system all aspects in the system have to be taken into account. A few examples of the links between the environment and agriculture are cattle grazing on natural pastures, trees and shrubs harbouring useful insects and soil covered with vegetation prevents erosion. A focus on increase of agricultural production can have a negative impact on the environment. So led the widespread use of broad-spectrum insecticides to the eradication of useful predatory insects and had an unchecked growth of plague insect as a result, destroying large areas of rice. Deforestation, overgrazing and intensified land use led to severe soil erosion. Based on these negative experiences the need for a more holistic approach to agricultural production was felt. Not only the production is important but also the natural environment that is supporting this production needs to be taken care of in Natural Resource Management (NRM). There are several conflicts of interest between direct poverty alleviation and national resource conservation. At some instances natural resources have to be sold because it is the only source for short-term income. Solutions are no simple technical interventions but are sought in the improvement of management whereby a balance must be found between the conflicting interests of various groups and conflicts between long-term and short-term benefits. At the moment research and extension can no longer focus on agricultural production alone but also have to include the NRM.

2.2.4 Civil society

In the 90's a combination of rapid population growth, stagnating agricultural income and environmental degradation called for a new approach in agriculture. It was hoped that the private sector would fill the gaps left by the withdrawing government but the low prices on the world market for agricultural products did not help to improve the situation. Sustainable development requires an accountable government so decentralisation was promoted to bring the funds and decision making closer to the farmers. Decentralised government decisions making and financing is a condition for participatory research but is also the outcome of the participatory process (Probst, 2000). To be able to hold a government accountable the communities must be organised and educated for their task. The

empowerment of marginal groups was promoted and the farmers needed to improve the linkage with research to be able to influence the research agenda. In the new Worldbank policies, cost recovery is an important item because the one who is paying is the one who is deciding what is going to happen. Extension has an important role to play in the organisation building in rural communities.

2.2.5 Valuation of farmers' knowledge

The traditional approach of agricultural extension was a hierarchy. The scientist, at the top, was the one who created the technology and this technology was disseminated through the extension service to the farmers who had to apply this technology. When a problem arises in the farmers' field the problem was brought to the extension service. When they did not have a solution the problem was taken further to research that came up with a solution. The creation of knowledge was with the scientists and the knowledge that the farmers had built up over many years, was neglected. In this system the role of the farmer is only receiving the technology. Later more attention was given to the knowledge of the farmer. The farmer knows best his or her own situation and will have to make choices that fit his or her conditions. The scientists later valued the knowledge the farmer has build up because this knowledge was adjusted to the local conditions and tested and proven over the years under farm conditions. The "farmer first" approach emphasises the rational nature and sophistication of rural people's knowledge, believing strongly that knowledge can be blended with, or incorporated into formal scientific knowledge systems. This requires a mental change from scientists and extension workers because farmers are no longer the mere receiver of the technology but farmers have become partners in the technology development process.

2.2.6 Constructivism

New insights developed in the learning process of humans. In the past people were seen as receivers of information. In the 17th century the rationalism became more important. Science was based on experiments, observations and proof. There is one reality and the task of the scientist is to reveal this objective value-free reality. Researchers are drawing up hypothesis describing the universal laws and conduct experiments to verify their hypothesis. A lot of effort is put in trials to make them valid. As long as the level of the information was fit for the person, the person was motivated and the information was structured in the right way the receiver should be able to store the information and use it at a later stage or in a different situation. When farmers see the benefits from the new technology they are willing to learn this and apply it at their own farms. Extension workers were providing training for farmers based on the findings of the agricultural research. Some examples of a rationalist approach are the "transfer of technology" and T&V approaches.

Constructivism developed a more philosophical notion of knowledge. According to the constructivism there is no universal knowledge but knowledge only exists inside the heads of people. What is stored in memory and how the information is interpreted is depending on the personal characteristics like previous knowledge, situation and interest of the person. The learner is an active constructor of his own knowledge. Learning is no longer an individual process but takes place in interaction with others. Knowledge is always an interpretation of reality. In the constructivist view the creation of knowledge is an active process where the learner must get involved with. Learning is based on experiences. Learning will take place in an authentic environment and requires social interaction and collaboration. FFS is an approach based on a constructivist view.
With the introduction of constructivism, learning is no longer transfer of knowledge from the person who knows to the person who does not yet know. Learning becomes an active process whereby the stakeholders have to create their own knowledge. As a result of the constructivist approach system thinking was introduced in the complex of researchers, extensionists and farmers. Agricultural Knowledge and Information Systems for Rural Development (AKIS/RD) is a conceptual framework to guide development work and extension in rural areas. It is based on the assumption that numerous individuals and institutions hold agricultural knowledge and information. Unfortunately, people and institutions often fail to share their knowledge, expertise and information. Consequently, they do not form together an agricultural knowledge and information system that is able to generate innovations. The AKIS/RD framework is intended to help to conceptualise and organise knowledge and

information systems that generate enough synergies to pave the way forward toward agricultural innovations. AKIS/RD links people and institutions to promote mutual learning and generate, share and utilize agriculture-related technology, knowledge and information. The system integrates farmers, agricultural educators, researchers and extensionists to harness knowledge and information from various sources for better farming and improved livelihoods (FAO, 2000).

2.3 Characteristics of PRE methods

These five processes, the focus on marginalized groups, the concerns about the environmental degradation, the building of a civil society, the valuing of farmers experience and the focus on constructivism, led to a new approach in agricultural research and extension; the participatory approach. Some of the strengths of participatory research are (Critchley, 1999):

- The technology is easy to adopt and to spread;
- It can empower individual farmers and rural communities;
- Strengthens the link between farmer, extension worker and researcher;
- Farmer experimentation directs the research agenda.

Some of the weaknesses/ constraints are:

- Initially it takes more time and resources;
- It requires skills, change of attitude and flexibility of mind on the part of both farmers, extension and research staff, which is often lacking.

A wide array of methods developed in research and extension with the aim to work on technology development with farmers, involve all stakeholders and empower the rural communities. Governmental and non-governmental institutions increasingly acknowledge the need to move away from top-down instructions and pure technology transfer towards a more participatory approach that directly involves farmers, rural populations or rural communities in defining and achieving their own development goals. The starting point for this change is the recognition that rural people are the owners of their own development. This realisation entails a number of changes for all involved actors. Rural people have to take the initiative and think about their own problems and appropriate solutions. For agricultural extension agents, this means fundamental changes in the way they work. They have to learn how to interact and become the listeners and facilitators of a development process. The overlap between research and extension becomes increasingly larger (GTZ, n.d.). Probst (2000) found a lot of different participatory approaches to agricultural extension and research. Names of approaches are often not self-explanatory; in many cases they can only be understood if the history is known. Looking at different approaches a wide diversity can be identified. In Table 2.1 some of the characteristics of the different approaches are presented as contrasts.

Table 2.1: *Contrasts in participatory approaches* (Probst, 2000)

Centralized (top down)	Decentralized, participatory (bottom-up)
Basic research	Adaptive research
Marketing	"Co-production", participatory approach
Researcher-led	Farmer-led
Discovery-oriented	Literacy oriented
Partial	Holistic, multidisciplinary
Research only	Integrated range of services
Government agency-based	Self-help, NGO-based
Functional participatory research	Empowering participatory research
Participation only in some stages	Participation in all stages (priority setting, implementation, evaluation)

Probst et al. (2003) developed, based on these differences, the following set of parameters to classify different approaches to technology development. The description of these variables can serve as a checklist to analyse participatory research approaches.

- Types of participation;
- Stakeholder involvement;
- Roles of facilitator;
- Learning strategies.

In the following paragraphs these variables are further explained.

2.3.1 Types of participation

Johnson, Lilja, and Ashby (2003) have developed a system to classify the level of participation. They distinguished five levels:

- Conventional (no farmer participation): scientists make the decisions alone without organized communication with farmers.
- Consultative (functional participation): scientists make the decisions alone, but with organized communication with farmers.
- Collaborative (empowering participation): decision-making authority is shared between farmers and scientists, and involves organized communication among them.
- Collegial (empowering participation): farmers make the decisions collectively in a group who are involved in organized communication with scientists.
- Farmer experimentation (no researcher participation): farmers make the decisions in a group without organized communication with scientists.

To refine the level of participation the different stages of the program, design, implementation and evaluation can be included because Sanginga, Lilja and Tumwine (2001) found different types of participation at these different stages. During planning and analysing participation is at a lower level as during implementation.

2.3.2 Stakeholder involvement

The selection of participants is important. When they all have the same background, the range of possible solutions is restricted because all participants have more or less the same knowledge. By exposing the members to new ideas from other group members, new solutions can be found. When the group is too diverse it is hard to get an agreement on the best solution. The problem should be relevant to all the participants and challenging enough to encourage the development of problem solving skills. The selection of the members of the group can be done on different grounds. The selection can be through self-selection; farmers come voluntary forward to participate. The selection of members of the group can be based on efficiency. This will often exclude the poor farmers as they have little reserves to engage themselves in risky experiments. The community can select participants but again the target group may be excluded based on social economic constraints. Lastly the researchers may appoint participants but this will not be very motivating.

2.3.3 Roles of facilitator

In PRE two groups of actors can be distinguished. The external actors are for example the scientists or the facilitator appointed by the organisation. The local actors are the participants. The role of the facilitator is very important in the execution of the program because this person is the link between the organisation and the participants. The facilitator is the one that has to implement the program and transfer the learning strategies. In a learning situation the facilitator will have a more a teaching function whereby the facilitator is seen as the expert providing knowledge to the participants. In a development orientated PRE method the facilitator will have a more coaching role thereby stimulating the learning process of the participants. The facilitator should be well trained to perform these tasks. If the PRE is aimed at a collaborative approach the scientists should be involved in the actual process, as the decisions in the program will be taken on basis of equality between the participants and scientists. The facilitator can be selected from the group of participants or from the community. The facilitator will have to receive training prior to the start of the program to be able to guide the group processes. Once the facilitator is appointed by the organisation the facilitator should show a real commitment to the participants. In the PEA the different roles of the facilitator are clearly

described. The role of the participants can be the receiver of information or providing labour during trials. In a more learning oriented approach the participants will be an active inventor of solutions.
PEA is different to conventional extension approaches. In a PEA, the principal task of extension workers is not to transfer agricultural know-how and technology to farmers but to facilitate an in-depth situation analysis by the farmers themselves at the beginning of the relationship between the extension service and a community through the application of a Participatory Rural Appraisal (PRA). Once the farmers have become aware of the causes of their problems and have identified the most pressing of these, the extension workers provide technical knowledge and technologies, which may be useful to resolve the problems identified. To perform well in a PEA, extension workers need not only agricultural expertise, but also good analytical, pedagogical and facilitating skills. The "participatory" part of a PEA means that farmers are the principal decision-makers in defining goals, planning, implementing and evaluating development activities. PEA puts emphasis on strengthening farmers' problem-solving capacities from the very start (GTZ, n.d.).

2.3.4 Learning strategies

The organisational structure of the research and extension organisation will greatly determine the design of the learning event. If the organisation is centralized, it will have a top-down approach to research. A decentralised organisation will be more likely to get involvement of the stakeholders. All PRE methods take groups as learning unit. Action learning is a learning process that actively involves groups of farmers. Action learning is applying the ideas of the constructivism. In action learning a group of people is trying to solve a problem. The aim of this is to come up with a solution for the problem but at the same time the participants have to learn general problem solving skills and change the dynamics of the group. Often the learning is more important as the immediate solution because the problem solving skills can be applied in many situations while a solution is often only useful in one particular situation. Learning takes place through reflection on the actions performed (Smith, 2001). The idea of action learning is based on Western based values like egalitarianism, equality and informality. In Europe and America it is common to discuss problems in public while in other cultures it is more difficult to discuss your problem with people outside the direct family or with people of a different social standing. The learning through reflection is common in the Western educational system but in other cultures learning is more a one-way activity from teachers by providing answers to students. In Western cultures action is favoured, something has to be done, and the initiative of the individual is appreciated. In other cultures people are more focussing on the consensus and respect for the existing hierarchical structures, action is only taken after permission. These points need attention when implementing action learning. During the selection of the group the hierarchy issue should be addressed and sufficient time must be spent on group forming processes. The problem selected should be in the reach of the participants and they should have authority to implement the solution. Creating a safe environment is important so that questions can be asked to encourage learning through reflection (Marquardt, 1998).
PRE is a form of action learning and Dilworth (1998) describes four important issues for effective action learning. These are the composition of the group, the selection of the problem to be solved by the group, the purpose of the problem solving and the role of the facilitator. The composition of the group can be based on the efficiency, to get skilled people in the group to quickly solve the problem or people who are really in need of the learning resulting from the problem solving activities. The problem selection is important to get commitment to the learning process. The participants should be the owners of the problem and the solution should be relevant to them. The outcome of the learning process can be different for the various groups of stakeholders. These outcomes are the results from a change in behaviour and attitude. Examples of those changes are researchers who see farmers as their partners in the development of technology and farmers who get a better insight in the relation between pests and environment.

2.4 Farmer Field School and Farmer Research Group

There are two main concepts towards participation of farmers. These are FFS on one side and on the other side FRG, also known as Comite de Investigacion Agricola Local (CIAL), farmer participatory research, and participatory technology development. These last three approaches will be mentioned under the term FRG in this paper. Both approaches have a different objective and history. Both FFS and FRG, are aiming at promotion of integrated decision making and innovation for sustainable agriculture by farmers but FFS is focussing on participatory learning and is therefore more an extension approach while FRG is aiming at building local research capacities making it research / development oriented. (Braun, Graham & Fernandez, 2000).

2.4.1 Farmer Field School

FFS was developed in Asia to reduce the losses by insects in rice. The farmers were using chemicals to kill the insects but at the same time they also killed the predators of the insects resulting in more severe insect damage. The objectives of the FFS were to give farmers insight in the ecological principles as well as improving farmers' analytical and decision-making skills and empowering the farmers so they could influence decision makers. Farmers are engaged in experiential learning based on a curriculum. This is making FFS a training method (Probst, 2000). The FFS was designed and implemented with support from large donor agencies like the Food and Agriculture Organization (FAO) and the United States Agency for International Development (USAID).
This model for learning of farmers of knowledge-based technologies proved to be successful and is now used in other areas as well like watershed management forestry and animal husbandry.

2.4.2 Farmer Research Group

FRG were established to involve farmers in the research process. The reason to start with FRG was that researchers experienced a low acceptance rate for their recommendations and started to explore ways to get a stronger link between farmers' needs and research outcome. Farmers are included in the research process to identify the farmers' needs and test the possible solutions. Farmers are trained to conduct formal research. This will increase the credibility of their findings with the official research institutions because the data are gathered in a scientific way. FRG were set up with the assistance of development organisations like Nederlandse Organisatie voor Internationale Bijstand (NOVIB).
In Table 2.2 these two approaches are compared using the framework of Probst et al. (2003) and the differentiation criteria from Thijssen (2002).

Table 2.2: *Comparison between FFS and FRG (Probst et al, 2003; Thijssen, 2002)*

	FFS	**FRG**
Assumptions	Constructivist, participants have to construct their own knowledge	Knowledge to be discovered
Type of participation	Farmers are participating in a by scientist designed learning environment	Farmers are experimenting, the scientist is partner in the development process
Objectives of organisation	Extension	Research
Stakeholder involvement	Provides a more traditional teacher-student relation for learning about knowledge provided by outsiders	Promotes a bottom-up learning environment based on indigenous knowledge
Roles of facilitator	Facilitator leads the FFS by coaching and providing knowledge	No facilitator, farmers design their own learning environment
Research and extension methods	"Fixed" learning targets, curriculum based	An open-ended process
Source of solutions	Solutions developed outside and adjusted to local conditions	Solutions developed within community
Attitudinal changes	Accommodate existing attitudes of researchers and extensionists	Seeks major changes in attitudes of researchers and extensionists
Organisation	Project approach	Program approach
Scope of activities	Focus on certain components of farming systems which are perceived of great importance for large areas	All possible facets of farming systems depending on locally felt needs

Some authors are stating that the FFS and the FRG could be supplementary to each other. The FRG will identify suitable technologies and these are disseminated through FFS to a larger group of farmers. (Braun et al., 2000; Nelson, Ortiz, Orrego, Tenorio, Mundt, Fredrix & Vien, 2001). According to Humphries, Gonzales, Jimenez and Sierra (2000) and Neubert (2000) this is a doubtful approach because:

- Farmers might not be able to identify the cause of their problems;
- Farmers are not able to articulate their problems;
- Social structures make it not possible to articulate problems;
- The problems of the poor and women are neglected compared to the more influential farmers problems;
- A farmer committee will be able to find solutions for simple problems but will lack the knowledge to develop solutions for complicated problems;
- The committee lacks the knowledge to develop a learning program like a curriculum, learning events and a field book for FFS;
- Organisations that worked in a top-down approach using FFS will now have to change to a bottom –up approach from FRG.

To create a FFS, a curriculum need to be drawn up and learning activities designed. Van de Fliert, Johnson, Asmunati and Wiyanto (2003) and Miagostovich (n.d.) report a developing time of three years of research with farmers before the curriculum can be drawn up. In a FFS exercises, field observations, group discussions, planning of field experiments, implementation of experiments, evaluation, data collection, record keeping, data analysis, identification of indicators and reflection by farmers make up the curriculum. All these activities are planned and facilitated. The training of the facilitators on technical subject matter and training skills is needed. These tasks may be too

complicated for communities to carry out resulting in a dependency on external facilitators like researchers, extensionist or development workers.

2.5 Expected effects of the PRE approach

The effects of the PRE will be different for the various groups of stakeholders, farmers and organisation. The outcomes for the organisations will depend on the objectives of the organisation.

Farmers

The learning strategies are aimed at the learning of the participants and therefore determining the success of the intervention. Development is a process of change. In order to make a change new knowledge, skills or a change in attitude is required. Learning is the process of increasing knowledge and skills and to change attitudes therefore development starts with learning. Participatory approaches in research and extension are aimed at making this learning as effective and efficient as possible. By applying the participatory approach at all stages of the development process the learning of the stakeholders will increase. During the problem identification stage, often carried out as a PRA, the farmers will get a better understanding of their situation and a sense of ownership of the development process. By involving farmers in the planning stage the relevance and efficiency will increase because at an early stage the existing knowledge of the farmers is included in the solution. The involvement of farmers in the implementation will give them an opportunity to learn through experience what is a very strong learning approach. By involving farmers in the evaluation will give them a chance to learn through reflection. The solution will often contain a learning component to bridge the gap in existing knowledge, skills and attitude towards the knowledge, skills and attitude necessary to get better results. The organisation will design a learning event to stimulate the learning of farmers. The design of the learning event will depend on the objectives, the available resources and the beliefs about learning of the organisation. Different organisations may design different learning events with the same objectives. In order to get results it is essential to apply what has been learned. It is not only the design of the learning event that determines how the learning takes place but also the characteristics of learner are important. The farmer's motivation and ability to learn and the relevance of the topic will determine the effectiveness of the learning event. In Figure 2.2 the steps from the dissemination of the technology to the results are explained. The technology is disseminated in a program to the participants who are supposed to learn. This learning is shown as a change in attitudes and increased skills. Applying these changes will result in a changed behaviour. In the end this changed behaviour should lead to better results.

Dissemination	Learning →	Implementation →	Innovation →	Results →
Program goals: increase production, empowerment and sustainable development, use of new technologies, participation of farmers	Participants: change attitudes, improve knowledge and increase skills	Participants: implement changed attitudes, improved knowledge and increased skills	Participants: change behaviour, application of new technology	Results: increase production, empowerment, sustainable development

Figure 2.2: *Stages in the dissemination process leading to better results*

Research

The expected results of PRE for the scientists are a direct link between the farmers and the scientists and more valid research data. Through the link between farmers and scientists, the scientists will get feedback on their work and they are able to develop technologies that have a close fit with the farmers' needs. More appropriate technologies will enhance the adoption of the technology by the farmers. By involving farmers in the research process the technologies can be tested under a wider

range of conditions because more test sites are used and the validity of the research results will increase.

Extension

The expected results of PRE for extension is that farmers are more involved in the learning process by applying different learning strategies which allows a more active role of the farmers. The different learning strategies in the PRE give the farmers a better understanding of the new technology and this better understanding can be used when farmers are involved in dissemination systems like F2F.

Development

PRE approaches take farmer groups as learning units. By organising farmers in groups and giving attention to the group development process the groups will be strengthened and the group can grow into a Community Based Organisation (CBO) that is able to perform other tasks as the original agricultural task the group was formed for. For example groups develop from agricultural production into literacy or AIDS awareness groups.

2.6 Conclusion

The choices of an organisation for a certain PRE method will depend on the objectives of the organisation, the type of technology the organisation is promoting and the way the organisation is financed. The PRE method can be described with the type of participation, the stakeholder involvement, the role of the facilitator and the learning strategies applied by the organisation. The results from applying the PRE will be different for farmers and scientists. The farmers are expected to see an increase in knowledge and by applying this new knowledge their income will increase and their confidence will grow so they will become equal partners with the scientists in the development process. The scientists will be able to test and improve their technologies. To see if this framework is applicable to existing research, extension and development organisations, a survey among managers and field staff of these organisations is conducted. This survey is described in the next chapter.

3. Survey: views of managers and field staff on PRE

PRE is developed to include the knowledge of the farmers in the research findings by improving the relation between farmers and scientists. Through PRE farmers are more involved in the technology adaptation and adoption process. The aim of this research is to determine the factors that influence the effects for farmers and scientist of different participatory research and extension approaches. This will be done by answering the following research questions:

- What are the characteristics of the organisations implementing PRE?
- What are the characteristics of the various types of PRE?
- What are the effects of PRE for farmers and scientists?

A questionnaire is developed to investigate the views of managers and project staff on PRE. A questionnaire was chosen as an instrument to carry out this survey because it can be administered at a long distance and is cheap to apply (Swanborn, 1981). The framework developed in chapter two is used to construct the questions. A brief overview of the framework is given in paragraph 3.1. In paragraph 3.2 the constructs derived from the framework are presented and the way this survey was conducted is described. In paragraph 3.3 the results of the survey are presented followed by a discussion of the results in paragraph 3.4.

3.1 Framework for the survey

In chapter two a framework was developed to investigate the characteristics of the organisation and the PRE method, and the effects of PRE. This framework is presented in Figure 3.1.

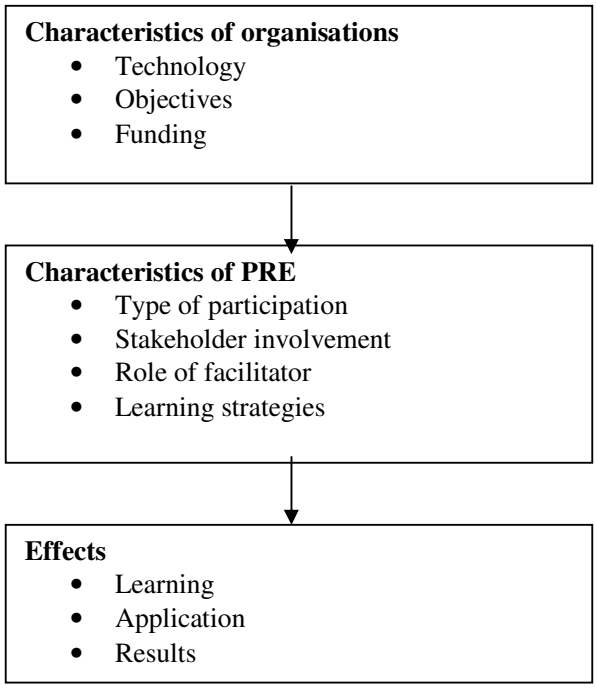

Figure 3.1*: Characteristics of the organisation, PRE and effects*

The objectives and the funding of the organisation will have an influence on the type of PRE the organisation is using. Also the type of technology being promoted by the organisation will have an influence on the PRE method chosen by the organisation. In this survey input-based technology is described as a technology whereby the main focus is on the improvement of farmers' conditions through the introduction of physical inputs of higher quality as the present inputs, a more stable supply of inputs and inputs at lower costs. Examples of input-based technology are new disease resistant potato lines, improved breeds of cattle or more effective chemicals. Knowledge-based technology is a

technology whereby the main focus is on the improvement of farmers' conditions by improving the management and organisation. These improvements are made on the basis of increased knowledge, analytical skills and decision-making powers of participants. Examples of knowledge-based technology are integrated pest management, grazing-land control or erosion control.
There are many different types of PRE. PRE is in this survey defined as all activities aimed to increase the income of farmers from agricultural production, to promote sustainable development and to improve the technology. These activities are in consultation and collaboration with the farmers. Each organisation will have its own definition of participation. Because there is a very broad spectrum of PRE approaches without clear definitions to differentiate between the various systems, all activities whereby the farmers are involved in an active, collaborative learning process are considered in this survey as PRE. In order to make the different approaches comparable the approaches are analysed by using some of the characteristics as described by Probst et al. (2003). The effects of applying PRE will be different for organisations and farmers. In this survey the effects for both groups will be investigated. In the following paragraphs the components, characteristics of the organisation, characteristics of the PRE method and the expected effects of the PRE methods are discussed.

3.1.1 Characteristics of the organisation

The type of technology that the organisation promotes influences the type of PRE that is used by the organisation. Knowledge-based technologies will require a more intensive contact with the farmers and during a longer period of time. To transfer complicated concepts like NRM a different set of learning events must be designed compared to dealing with the promotion of an improved bean variety.

Objectives

Often the role of research and extension is not clearly defined so some organisations can have a main orientation either in research or extension while others combine these two. The outcome for an organisation can be a combination of improved research data and a greater acceptance by participants of a new technology. The organisation is implementing the program through a PRE method and is supplying resources like manpower, knowledge and inputs. The organisation can also be involved in the training of the facilitators and the design of the training material. Organisations can have different objectives when adopting a PRE method. The method can be aimed at developing general recommendations, what is more a research objective. The method can also try to adjust the technology to local conditions what is more an extension objective or the method can have the development of the participants as the main aim. Often there will be a mixture of different objectives depending on the donor orientation and the organisation applying PRE. These different objectives will be translated into a different design of the learning event, resulting in a range of possible learning activities.

Funding

The funding of the organisation will influence the choices of PRE methods for the organisation. If government funds the organisation the government rules, regulations and culture will apply to the organisation. If donors fund the organisation it is depending on the rules, regulations and culture of the donor. The way of funding will determine how the learning will be shaped and implemented.

3.1.2 Characteristics of PRE

Types of participation

During the PRE process farmers can get involved in different ways. The level of participation is based on the division of decision-making powers between farmers and scientist during the different stages of the program. The decision-making determines the sense of ownership of the solutions that are developed. If farmers have a great influence on the decisions that are taken during the planning, implementation and evaluation of the program it is more likely that the outcome of the program is better adjusted to the needs of the farmers.

Stakeholder involvement

The selection of participants is important to assure that the intended groups can participate. If farmers volunteer to take part in the program they will be more motivated. PRE methods can also be differentiated at the level of stakeholder involvement. This involvement is expressed in the type of participation of farmer and scientist and the role of the facilitator. If the PRE is aimed at a collaborative approach the scientists should be involved in the actual process, as the decisions in the program will be taken on basis of equality between the farmers and scientists. Also if the facilitators are appointed by the organisation they should show a real commitment to the farmers.

Roles of the facilitator

A facilitator is a person directly involved with the training, coaching and support of groups of farmers. The facilitator can be selected from the group of participants or the community or be part of the research, extension or the development organisation. The facilitator is the one that has to implement the program and transfer the learning strategies. In a learning or development orientation the facilitator will have a coaching role while in a program to increase production the facilitator will act more as an expert.

Learning strategies

Organisations develop different learning events. The design of the learning event will depend on the beliefs of the organisation about learning. For example an organisation that has a constructivist view on learning will design a learning environment whereby farmers are actively involved in acquiring knowledge through experimentation. Also the available resources like manpower and financing will determine the shape of the learning event.

3.1.3 Expected effects of the PRE approach

Expected outcomes from the program are different for the various groups of stakeholders. There are three different groups of stakeholders in PRE. First the farmers who want to see their income increased and learn problem-solving skills. To achieve these results learning must take place and the learning must be applied in the farmer's situation. According to the transfer of training model from Baldwin and Ford (1988) it not only the learning and the application that determine the results but also the environment and the personal characteristics of the farmer contribute to achieving results. The choices for the PRE method will influence the acceptance of the new technology by the farmers. Second, the extension organisations that have to deliver the inputs, like training, knowledge and physical inputs to the farmers. The third group is formed by the research organisations that have to test and adjust their technologies to on-farm conditions. Researchers would like to have a stronger link between researchers and farmers so the researchers can adjust better to the farmers needs and can test their technology in a wider variety of locations. It is not sufficient to look at the results alone but also the efforts made to get these results should be taken into account to be able to say something about the efficiency of the PRE method applied.

3.2 Research method

3.2.1 Construction of the questionnaire

Table 3.1 shows the constructs to determine the characteristics of the organisation, the type of PRE and the effects of the PRE methods, based on the differentiation criteria of Probst et al. (2003).

Table 3.1: *Constructs to measure the characteristics of the organisation, PRE and the effects*

Constructs	Questions[1]
Characteristics of the organisation	
Technology	18
Objectives	1,2,3,19
Funding	3
Characteristics of PRE	
Types of participation	12,13,14,16
Stakeholder involvement	7,8,9
Roles of facilitator	10,11,15,35,36,37
Learning strategies	26,27,28,29,30,31,32,33
Effects	
Learning	38,39,40
Technology acceptance	22,23,24,25,34
Application	41,42,43
Results Farmers	44,45,46,47
Results Organisation	48,49,50,51,52,53
Efficiency Farmers	54,55,56
Efficiency Organisation	57,58,59

[1]The question number refers to the questionnaire included in Appendix 1

3.2.2 Administering the questionnaire

Table 3.3 shows the matrix used for the identification of possible respondents to the questionnaire. This table was used as a guideline to search e-mail addresses on the Internet. The organisations are examples of organisations that have been approached. This matrix was further refined by looking for the type of organisation indicated in the matrix in each of the English speaking countries in Sub Saharan Africa.

Table 3.3: *Selection matrix for respondents*

	Agriculture	Animal Husbandry	Forestry	National Resource Management
National governments	Extension Research	Extension Research	Extension Research	Extension Research
International agricultural organisations	CIAT, CIP, ICRISAT, ICARDA, IITA	ILRI	CIFOR, ICRAF	CGIAR, IWMI
International donors	Worldbank, IFAD	Worldbank, IFAD	Worldbank, IFAD	Worldbank, IFAD
International development organisations	FAO, UNDP	FAO, UNDP	FAO, UNDP	FAO, UNDP
Non governmental organisations	CARE, Oxfam, Pelum, SNV	CARE, Oxfam, Pelum, SNV	CARE, Oxfam, Pelum, SNV	CARE, Oxfam, Pelum, SNV

A total of 230 e-mail addresses were selected. All the selected addresses received an e-mail with the questionnaire attached and instruction on how to return the answers. A request was included to forward the questionnaire to other interested parties. After three and five weeks a reminder was sent. The respondents could react in three ways to the questionnaire; print the questionnaire and return it by mail, return it by e-mail or fill out the questionnaire on line. During the visits in Uganda additional copies of the questionnaire were distributed during interviews.

3.2.3 Data analysis

After entering the responses the data is analysed with the program Statistical Package for Social Studies (SPSS) version 12. First the scales to measure the various variables are constructed and the reliability of the scale is determined. To determine the influence of the characteristics of the organisation on the PRE approach independent sample T-test are conducted to compare the means of the characteristics of the PRE approach and the effects of the groups formed by the characteristics of the organisation. The results are presented in paragraph 3.3.4. To determine the influence of the type of PRE on the effects for farmers and scientists regression analyses are conducted. If PRE is effective there should a higher level of PRE leading to more effects. The results of the regression analysis are given in paragraph 3.3.5.

3.3 Results

In Table 3.4 the way of responding to the questionnaire is shown. Most of the questionnaires were received during the interviews. From Southern and Eastern Africa 34 questionnaires were received while the remaining three came from South America. From these results it shows that e-mail is not suitable communication channel to conduct a survey in South and Eastern Africa.

Table 3.4: *Way of responding*

Method of response	**Number**
Mail	1
E-mail	11
On-line	5
During interviews	20
Total	37

3.3.1 Characteristics of the organisations

The answers are at organisation level. If more people responded from the same organisation the average of the responses is used in the data analysis. In total 37 responses were received divided among 23 organisations. About one third of the respondents are managers while two third of the respondents are field staff. In Table 3.5 the number of respondents for each type of the organisation are presented. The number of responses was low but for the three organisation characteristics, type of technology promoted, objectives and way of funding, a reasonable distribution was obtained.

Table 3.5: *Number of responses for each type of organisation*

		Number of respondents	
Characteristics of organisation	Total	Government funded	NGO funded
Technology			
Input-based technology	5	2	3
Knowledge-based technology	18	7	11
Objectives			
Development	6	0	6
Extension	6	4	2
Research	10	5	5
Funding			
NGO	14		
Government	9		

3.3.2 Characteristics of PRE

In Table 3.6 the scales are shown that have been constructed to measure the characteristics of the PRE approach and the effects. In general an alpha of .70 is regarded as an indicator that the construct is measuring the same topic. The alpha for application is .54 and thus the scale for application is not reliable. Application is part of the chain of learning-application-results so if application cannot be measured accurately it is difficult to establish if the effects are a result of learning.

Table 3.6: *Scale construction*

Constructs	**Items in scale**	**Items deleted**	**Number of items**	**Alpha**
Characteristics of PRE				
Type of participation	12,13,14,	16	3	.82
Stakeholder involvement	7,8,9		3	*
Roles of facilitator	15,36,37	35	3	.65
Learning strategies	26,27,28,29,30,31,32,33		8	.84
Effects				
Learning	38,39,40		3	.62
Acceptability of technology	22,23,24,25,34		5	.76
Application	41,42,43		3	.54
Results Farmers	44,45,46,47		4	.61
Results Organisation	48,49,50,51,52,53		6	.72
Efficiency Farmers	54,55,56		3	.62
Efficiency Organisation	57,58,59		3	.72

* For stakeholder involvement no alpha was calculated because the items got no numeric responses

In Table 3.7 the average score for PRE characteristics for the different organisations are given. In the following part the PRE characteristics are described in detail.

Table 3.7: *Average scores for PRE characteristics*

	M	*SD*
Type of participation	60%	20%
Roles of facilitator	3.64	0.70
Learning strategies	3.40	0.71

Types of participation

In a PRE approach at least a collaborative level of participation is expected. Hereby decision-making authority is shared between farmers and scientists, and involves organized communication among them. (Johnson et al., 2003). In the survey the average decision-making during the different stages was shared between the scientist and the farmers as can be seen from Table 3.8.

Table 3.8: *Decision making by participants*

Stage	Design		Implementation		Evaluation	
	M	*SD*	*M*	*SD*	*M*	*SD*
Decisions made by participants	59%	23%	62%	26%	58%	22%

On average during the three stages of the project cycle the decisions are for 60% (*SD*=20%) taken by the participants and for 40% by the scientist. This shows a collaborative relation between farmers and scientist indicating that the organisations are implementing a PRE approach.

Stakeholder involvement

To increase the participation of the farmers and give the farmer group a sense of ownership it is important that that the facilitator is selected by and coming from the farmer group or the community. When the facilitator is selected by the organisation or employed by the organisation the participation

of the farmers is reduced. In CBO's the empowerment of the community is important and a CBF contributes to this empowerment. Table 3.9 shows that the selection of participants and facilitators is equally shared between the organisation and the other stakeholders like the participants and the community. Only development-oriented organisations are allowing less participation of the stakeholders in the selection process. Table 3.9 indicates that the facilitator was in 78% of the programs selected by the implementing organisation and the community mostly did the selection of the participants. The selection of the facilitator was mostly done by the implementing organisation

Table: 3.9: *The selection of participants and facilitator*

Selection of participants	Organisation	Community	Volunteers	Other
Number of respondents	0	14	9	1

Selection of facilitator	Organisation	Community	Participants	Other
Number of respondents	18	4	1	0

Background of facilitator	Organisation	Community	Participants	Other
Number of respondents	13	5	3	2

The way the selection of participants and facilitator is conducted is an indication of the PRE approach of the organisation. An exception is the development-oriented organisation where the facilitator is in most cases coming from the organisation.

Role of the facilitator

When dividing the work of the facilitator between coaching and providing knowledge 63% (*SD*=18%) of his work consists of coaching. In a participatory approach the facilitator should act as a coach to stimulate the learning process of the farmers instead of transferring knowledge from the facilitator to the farmer. The results reported are the values on a five-point Likert-scale where respondents could indicate if they agreed with statements indicating a positive attitude towards PRE. When strongly disagreeing the value 1 was given while the value 5 was given if the respondent was strongly agreeing with the statement. So the value 3 is neutral and any value above 3 is regarded as a more or less positive attitude to PRE. On average (*M*=3.64, *SD*=0.70) the organisations see an encouraging role for the facilitator.

Learning strategies

The organisation must have resources available to be able to implement a PRE approach. The respondents of the organisations are not very enthusiastic (*M*=3.40, *SD*=0.71) about the available resources of the organisation for the leaning events. The organisations lack trained staff, financial resources, and the capacity to develop training material. This will hamper the effectiveness of the learning.

3.3.3 Expected effects for farmers and scientists

In Table 3.10 the average scores for the various constructs to measure the effects are given. The different effects will be further explained in the following sections.

Table 3.10: *Effects of PRE*

Effects	*M*	*SD*
Learning	3.38	0.73
Acceptability of technology	3.96	0.61
Application	3.66	0.56
Results farmers	4.06	0.49
Results organisation	4.20	0.50
Efficiency farmers	3.96	0.58
Efficiency organisation	4.15	0.62

Learning

To get results from PRE learning is the first step. The learning by the farmers is only moderately rated on the Likert-scale (*M*=3.38, *SD*=0.73) by the respondents. According to the respondents the farmers have not learned sufficiently. The low level of learning can be the result from the low level of support the organisation gives to learning (*M*=3.40, *SD*=0.73). It can be expected that the low level of learning will have a negative impact on the results.

Acceptability of technology

The respondents indicate that the technology is easily accepted because it is rated (*M*=3.96, *SD*=0.61) on a five-point Likert-scale whereby five is the highest level of acceptance. If the organisation is selecting the proper technology that is useful for the farmers and this technology is disseminated using participatory method the farmers are willing to accept the new technology. The acceptance of the technology is important because without acceptance no application will take place.

Application

Although the learning was not rated very high the farmers are applying what they have learned according to the responses on the Likert-scale. (*M*=3.96, *SD*=0.61). Application is a necessary step to come to results. The scale to measure application is not very accurate according the alpha values in Table 3.6 so it is difficult to draw a firm conclusion on application.

Results

The respondents are more positive about the results for farmers (*M*=4.06, *SD*=0.49) and scientist (*M*=4.20, *SD*=0.50) from the implementation of PRE. They see positive results on the Likert-scale of the PRE. In Table 3.10 the average scores for the various constructs to measure the results are given. The efficiency is also a result because efficiency reflects the balance between effort and result. The efficiency for farmers (*M*=3.96, *SD*=0.58) and the efficiency for the organisation (*M*=4.15, *SD*=0.62) are high on the five-point Likert-scale. A high efficiency will encourage stakeholders to continue with their new behaviour. The results for farmers are an increase in income and empowerment while the scientists are able to improve the technology. These results for farmers and scientists are one of the reasons why PRE was introduced. It can be concluded that the PRE methods implemented by the organisations are successful in achieving their goals.

3.3.4 Influence of organisation characteristics on type of PRE

The aim of the survey was to investigate the influence of the characteristics of the organisation on the type of PRE that is being implemented and the influence of the characteristics of the organisation on the effects for farmers and scientists that are a result from the PRE approach. In Table 3.11 the average scores for the different types of organisations are given. A set of t-tests was conducted to compare the influence of the different organisational characteristics like funding, objectives and technology.

Table 3.11: *PRE characteristics for different types of organisations*

	Technology		Objectives			Funding	
	Input	Knowledge	Research	Extension	Development	NGO	Government
	M	*M*	*M*	*M*	*M*	*M*	*M*
Type of participation	77%[1]	55%[1]	66%[2]	45%[2]	60%[2]	56%	53%
Roles of facilitator	3.72	3.62	3.86	3.45	3.51	3.58	3.69
Learning strategies	3.24	3.45	3.62	2.92	3.58	3.08[3]	3.61[3]

[1, 2, 3] Significant difference

Note:

- Type of participation is the percentage of decisions taken by farmers.
- Roles of the facilitator and learning strategies are scores on a five-point Likert-scale.

Technology

In a program dealing with input-based technologies farmers are taking significantly, $t(21) = 2.33$, $p = .03$, more (M=77%, SD=14%) of the decisions while scientists take 23% of the decisions. In programs promoting knowledge-based technologies the farmers take 55% (SD=19%) of the decisions while the scientists take only 45% of the decisions. A program promoting knowledge-based technologies will be more complicated and scientists are more in charge of the program compared to a program for input-based technologies. Table 3.12 shows the results of the t-tests to analyse the influence of the characteristics of the organisation on the level of farmer participation in the research and extension processes.

Table 3.12: *Results of t-test for type of technology promoted*

Type of technology	Input		Knowledge				
Characteristics of PRE	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*
Type of participation	77%	14%	55%	19%	2.33	21	.03*
Roles of facilitator	3.72	0.66	3.62	0.73	0.28	21	.79
Learning strategies	3.24	0.63	3.45	0.74	-0.59	21	.56
Effects							
Learning	3.41	0.42	3.37	0.81	0.11	21	.92
Acceptability of technology	3.91	0.54	3.98	0.65	-0.22	21	.83
Application	3.67	0.34	3.67	0.61	0.01	21	.99
Results Farmers	3.94	0.50	4.09	0.49	-0.58	21	.57
Results Organisation	4.23	0.57	4.19	0.50	0.14	21	.89
Efficiency Farmers	3.60	0.28	4.07	0.62	-1.62	20	.12
Efficiency Organisation	4.14	0.56	4.16	0.65	-0.06	20	.95

* Difference is significant at the 0.10 level (2-tailed)

Objectives

For investigating the effect of the objective of the organisation the organisations with the same objective were compared with a combination of the other two e.g. extension organisations were compared with research and development organisations combined. For research oriented and development oriented organisation no significant influences could be found in the types of PRE applied and the effects. To analyse the influence of the characteristics of the organisation on the level of farmer participation in the research and extension processes t-tests were carried out. In Table 3.13 the results of the t-tests for extension-oriented organisations are presented. For extension-oriented organisations the participation of farmers in decision-making (M=45%, SD=22%) was significantly, $t(20) = -2.09$, $p = .05$, lower as in the other types of organisations (M=64%, SD=17%). The amount of resources put into learning (M=2.92, SD=0.45) was significantly $t(20) = -2.13$, $p = .05$, lower then the other organisations (M=3.60, SD=0.73) and the learning (M=2.78, SD=0.86) resulting from the learning strategies was also significantly, $t(20) = -2.51$, $p = .02$, lower compared to research and development organisations (M=3.57, SD=0.58) The acceptance of the new technology in extension programs (M=3.50, SD=0.64) was significantly, $t(20) = -2,31$, $p = .03$, lower as in the other types of organisations (M=4.13, SD=0.55).

In Table 3.14 the results of the t-tests for development and in Table 3.15 the results for research-oriented organisations are presented.

Table 3.13: *Results of t-test for extension-oriented organisations*

Orientation of organisation:	Extension		Other[1]				
Characteristics of PRE	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*
Type of participation	45%	22%	64%	17%	-2.09	20	.05*
Roles of facilitator	3.45	0.72	3.73	0.73	-0.82	20	.42
Learning strategies	2.92	0.45	3.60	0.73	-2.13	20	.05*
Effects							
Learning	2.78	0.86	3.57	0.58	-2.51	20	.02*
Acceptability of technology	3.50	0.64	4.13	0.55	-2.31	20	.03*
Application	3.50	0.28	3.71	0.64	-0.75	20	.46
Results Farmers	4.02	0.45	4.08	0.53	-0.25	20	.81
Results Organisation	4.17	0.30	4.23	0.58	-0.23	20	.82
Efficiency Farmers	3.87	0.90	4.01	0.50	-0.45	19	.66
Efficiency Organisation	3.94	0.73	4.23	0.61	-0.90	19	.38

[1] Development and research organisations combined.
* Difference is significant at the 0.10 level (2-tailed)

Table 3.14: *Results of t-test development oriented organisations*

Orientation of organisation:	Development		Other[2]				
Characteristics of PRE	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*
Type of participation	60%	15%	58%	22%	0.21	20	.84
Roles of facilitator	3.51	0.59	3.71	0.77	-0.57	20	.58
Learning strategies	3.58	0.84	3.36	0.70	0.63	20	.54
Effects							
Learning	3.66	0.61	3.24	0.76	1.23	20	.23
Acceptability of technology	4.06	0.55	3.92	0.67	0.46	20	.65
Application	3.79	0.67	3.60	0.54	0.72	20	.48
Results Farmers	3.92	0.51	4.11	0.50	-0.79	20	.44
Results Organisation	4.01	0.70	4.29	0.43	-1.16	20	.26
Efficiency Farmers	4.00	0.51	3.97	0.64	0.10	19	.93
Efficiency Organisation	4.11	0.59	4.18	0.67	-0.20	19	.84

[2] Extension and research organisations combined.

Table 3.15: *Results of t-test for research-oriented organisations*

Orientation of organisation:	Research		Other[3]				
Characteristics of PRE	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*
Type of participation	66%	18%	53%	20%	1.60	20	.13
Roles of facilitator	3.86	0.80	3.48	0.63	1.27	20	.22
Learning strategies	3.62	0.71	3.25	0.73	1.20	20	.24
Effects							
Learning	3.51	0.58	3.22	0.85	0.91	20	.37
Acceptability of technology	4.18	0.57	3.78	0.64	1.51	20	.15
Application	3.66	0.65	3.65	0.52	0.03	20	.98
Results Farmers	4.17	0.54	3.97	0.47	0.94	20	.36
Results Organisation	4.36	0.49	4.09	0.52	1.26	20	.22
Efficiency Farmers	4.02	0.52	3.94	0.68	0.29	19	.77
Efficiency Organisation	4.30	0.64	4.03	0.63	0.96	19	.35

[3] Extension and development organisations combined

For research-oriented and development-oriented organisations no significant influence was found on the type of PRE and on the effects. Extension oriented organisations tend to be less participatory and the farmer learn less compared to research and development oriented organisations. The main

objective of the extension organisations is the dissemination of new technology but they seem not to be very effective in this. Some extension organisations are still using the transfer of knowledge model whereby the scientists generate the knowledge and it is the task of the extension organisation to transfer the knowledge from the scientists to the farmers. In this model there is not much opportunity for participation by the farmer.

Funding

In Table 3.16 the results of the t-tests to analyse the influence of the way the organisation is funded on the level of farmer participation in the research and extension processes and the influence on the effects. A significant influence from the way of funding of the organisation on the type of PRE and the effects of PRE could be found. NGO's (*M*=3.08, *SD*=0.54) are putting significantly, $t(21) = -1.86$, $p = .08$, less resources in learning then government-funded organisations (*M*=3.61, *SD*=0.75). This is leading to significantly, $t(21) = -1.97$, $p = .06$, less learning in NGO's (*M*=3.03, *SD*=0.88) compared to government funded (*M*=3.61, *SD*=0.54) and to a significantly, $t(21) = -1.85$, $p = .05$, lower application rate in NGO's (*M*=3.41, *SD*=0.50) compared to government funded organisations (*M*=3.83, *SD*=0.55).

Table 3.16: *Results of t-test NGO*

Funding of organisation:	NGO		Government				
Characteristics of PRE	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*
Type of participation	56%	18%	62%	22%	-1.52	21	.14
Roles of facilitator	3.58	0.55	3.69	0.81	-1.05	21	.30
Learning strategies	3.08	0.54	3.61	0.75	-1.86	21	.08*
Effects							
Learning	3.03	0.88	3.61	0.54	-1.97	21	.06*
Acceptability of technology	3.73	0.72	4.11	0.51	-1.52	21	.14
Application	3.41	0.50	3.83	0.55	-1.85	21	.08*
Results Farmers	4.00	0.49	4.09	0.50	-0.43	21	.67
Results Organisation	4.22	0.54	4.19	0.50	0.13	21	.89
Efficiency Farmers	3.86	0.77	4.03	0.44	-0.64	20	.53
Efficiency Organisation	4.08	0.74	4.20	0.54	-0.47	20	.65

* Difference is significant at the 0.10 level (2-tailed)

A possible explanation can be that government organisation are receiving more money then NGO's and that this extra money is put in the development of training capacity and that they are therefore achieving better results.

3.3.5 Influence of PRE on effects for farmers and organisation

Before determining the magnitude of the influence of PRE characteristics on the effects for farmers and organisations the correlations between the characteristics and the effects must be established first. In Table 3.17 the correlations between the different constructs are given.

Table 3.17: *Inter correlations characteristics of PRE and effects*

Construct	1	2	3	4	5	6	7	8	9	10
1. Participation	--	.61*	.27	.27	.36***	.55*	.36***	.33	-.09	.32
2. Roles of facilitator		--	.38***	.11	.45**	.52**	.45**	.29	.13	.13
3. Learning strategies			--	.77*	.57*	.38***	.47**	.51**	.40***	.36
4. Learning				--	.55*	.27	.31	.37***	.42**	.36
5. Acceptability technology					--	.43**	.32	.50**	.26	.36
6. Application						--	.56*	.45**	.18	.26
7. Results Farmers							--	.64*	.64*	.60*
8. Results Organisation								--	.58*	.68*
9. Efficiency Farmers									--	.68*
10. Efficiency Organisation										--

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (2-tailed).
*** Correlation is significant at the 0.10 level (2-tailed).

To determine the influence of the characteristics of the PRE approach on the effects for farmers and scientists regression analysis are conducted. First the influence of the independent variables of the characteristics of the organisation and the characteristics of the PRE method on the learning of farmers is analysed in the first regressions model. In the second model the learning is included in the independent variables to explain the acceptance of the new technology. In this way the model is each time elaborated with a new variable resulting in seven models. In Table 3.18 the variables for the seven regression models are presented. The variable organisation consists of type of organisation, technology being disseminated and the way the organisation is funded.

Table 3.18: *Variables used in regression analyses*

Regression analyses						
1	2	3	4	5	6	7
Independent variables						
Organisation	Organisation	Organisation	Organisation	Organisation	Organisation	Organisation
Participation Facilitator Strategies	Participation Facilitator Strategies Learning	Participation Facilitator Strategies Learning Acceptance	Participation Facilitator Strategies Learning Acceptance Application	Participation Facilitator Strategies Learning Acceptance Application Results farmers	Participation Facilitator Strategies Learning Acceptance Application Results farmers	Participation Facilitator Strategies Learning Acceptance Application Results organisation
Dependant variables						
Learning	Acceptance	Application	Results farmers	Results organisation	Efficiency farmers	Efficiency organisation

Model 1. Learning

First the analysis of the influences of the characteristics of the organisation and the PRE approach on the learning of farmers is carried out. In Table 3.19 the results are presented. This learning is an effect from applying a PRE method by an organisation. Learning must take place before the new technology can be applied and results become visible. From the analysis it appears that the characteristic "learning strategies" of the PRE approach significantly predicted the learning scores of the effects for farmers, $\beta = .78$, $t(15) = 4.45$, $p<.01$. This model is also explaining a significant proportion of variance in learning effect scores, $R^2=.71$, $df=15$, $F=5.12$, $p<.01$. The characteristics of the organisation and the other characteristics of PRE like the type of participation, and the roles of facilitator, were not contributing to the effects of learning. If the organisation is well organizing the learning events they will increase the learning of farmers.

Table 3.19: *Factors influencing the learning of farmers*

	Beta	t	p
Funding	-.01	-0.04	.97
Development	.12	0.64	.53
Extension	-.11	-0.57	.58
Technology	.05	0.28	.78
Participation	.16	0.67	.51
Facilitator	-.29	-1.41	.18
Strategies	.78	4.45	.00*

* Influence is significant at the 0.10 level (2-tailed)

Model 2. Acceptance

The factors of model 2 in Table 3.20 are explaining 50%, R^2=.50, df=14, F=1.76, p=.17, of the variance in the score for acceptance of the new technology but none of the factors make a significant contribution.

Table 3.20: *Factors influencing acceptance of technology*

	Beta	t	p
Funding	-.11	-0.46	.65
research	.11	0.42	.68
Extension	-.12	-0.42	.68
Technology	-.05	-0.24	.82
Participation	-.06	-0.18	.86
Facilitator	.38	1.29	.22
Strategies	.02	0.05	.96
Learning	.39	1.11	.29

Model 3. Application

Table 3.21 shows that the PRE characteristic "type of participation" significantly predicted the application scores of the effects for farmers, $\beta = .63$, $t(13) = 1.97$, $p<.07$. If farmers are more involved in the learning process they will apply more of what they have learned because they will have a greater sense of ownership of the new technology. The model predicts 55% of the variance in the score for application R^2=.55, df=13, F=1.79, p=.17. It was expected that the level of participation, the amount of learning and the acceptance of the technology should also have a positive effect on the application because if the farmers learn and they accept the technology they will apply the new technology on their farm but this did was not supported by the data collected.

Table 3.21: *Factors influencing the application of the new technology*

	Beta	t	p
Funding	-.24	-0.99	.34
Development	.15	0.62	.55
Extension	.32	1.28	.22
Technology	-.25	-1.08	.30
Participation	.63	1.97	.07*
Facilitator	.08	0.27	.79
Strategies	.16	0.45	.66
Learning	-.11	-.30	.77
Acceptance	.18	0.68	.51

* Influence is significant at the 0.10 level (2-tailed)

Model 4. Results for farmers

The factors of model 4 in Table 3.22 are explaining 51%, R^2=.51, df=12, F=1.26, p=.35, of the variance in the score for results for farmers but none of the factors make a significant contribution. It was expected that the level of application by the farmers of what they have learned significantly predicted the result scores for farmers but this is not supported by the survey.

Table 3.22: *Factors influencing the results for the farmers*

	Beta	t	p
Funding	.05	0.20	.85
research	.26	0.89	.39
Extension	.36	1.10	.29
Technology	-.15	-0.59	.57
Participation	.17	0.44	.67
Facilitator	.06	0.18	.86
Strategies	.24	0.61	.55
Learning	.17	0.45	.66
Acceptance	-.09	-0.33	.75
Application	.43	1.41	.18

Model 5. Results for the organisation

Table 3.23 shows that the acceptance of the new technology, β = .44, t(11) = 1.84, p=.09, significantly predicted the result scores for the organisation. The model explained a significant proportion of variance in the result scores for the organisation, R^2=.70, df=11, F=2.38, p=.08. If farmers find it easy to apply the new technology the organisations are also successful because they get information from the farmers that is useful for the organisation to improve their program. However in this analysis it could not be established that the results for the farmers are an effect from the application of the new technology.

Table 3.23: *Factors influencing the results for the organisation*

	Beta	t	p
Funding	.19	0.87	.40
Development	-.20	-0.87	.41
Extension	.20	0.86	.41
Technology	.11	0.54	.60
Participation	.21	0.66	.52
Facilitator	-.42	-1.56	.15
Strategies	.40	1.26	.23
Learning	-.12	-0.38	.71
Acceptance	.44	1.84	.09*
Application	.18	0.67	.52
Results farmers	.38	1.61	.14

* Influence is significant at the 0.10 level (2-tailed)

Model 6. Efficiency for farmers

Table 3.24 shows that the results for farmers, β = .44, t(11) = 1.84, p=.09, significantly predicted the result scores for the efficiency for the farmers. The model explained a large, but not significant proportion of variance in the efficiency scores for the farmer, R^2=.61, df=11, F=1.44, p=.29. Efficiency is depending on results. Results are necessary before the efficiency can be determined. To determine the efficiency the results are compared to the efforts required to achieve these results.

Table 3.24: *Factors influencing the efficiency for the farmers*

	Beta	t	p
Funding	.06	0.19	.85
Development	.14	0.47	.65
Extension	-.10	-0.36	.72
Technology	-.21	-0.75	.47
Participation	-.15	-0.40	.70
Facilitator	.17	0.56	.59
Strategies	-.27	-0.69	.51
Learning	.48	1.25	.24
Acceptance	-.11	-0.31	.76
Application	-.19	-0.61	.56
Efficiency farmers	.74	2.60	.03*

* Influence is significant at the 0.10 level (2-tailed)

Model 7. Efficiency for organisations

Table 3.25 shows the results for the organisation, $\beta = .91$, $t(11) = 2.44$, $p=.04$, significantly predicted the result scores for the efficiency for the organisation. The model explained a significant proportion of variance in the efficiency scores for the organisation, $R^2=.54$, df=11 . F=1.06, p=.47. Results are necessary before the efficiency can be determined. The high value of beta indicates that the constructs for results and efficiency for organisations are not differentiation between the two aspects.

Table 3.25: *Factors influencing the efficiency for the organisation*

	Beta	t	p
Funding	-.21	-0.62	.55
Research	-.05	-0.14	.89
Extension	-.17	-0.44	.67
Technology	-.11	-0.35	.73
Participation	.00	0.00	1.00
Facilitator	.03	0.08	.94
Strategies	-.28	-0.62	.55
Learning	.16	0.38	.72
Acceptance	-.09	-0.24	.82
Application	-.20	-0.60	.56
Efficiency organisation	.91	2.44	.04*

* Influence is significant at the 0.10 level (2-tailed)

By including all the characteristics of the organisation and of the PRE approach in the regression models it is difficult to find a significant contribution of one of the factors with the low number of cases in the survey. There is a link between results and efficiency but from the high correlation between these factors it appears that both constructs for results and efficiency are measuring the same aspect. There are no indications that learning is leading to application and application is leading to results. The poor linkage between learning and application may be attributed to the low alpha value for the scale to measure the application. The influence of the characteristics of the organisation and the PRE approach are minimal.

3.4 Conclusion

In the survey it was found that all organisations are using a PRE approach. The level of participation is different in the various approaches. The three characteristics of the organisation, technology being disseminated, the objectives of the organisation, and the funding, have an influence on the level of participation.

First, if the organisation is disseminating an input-based technology there seems to be less participation of the farmers compared to organisations disseminating a knowledge-based technology. Because of the simplicity of the input-based technologies no complicated research and extension methods, allowing for much farmer participation are required.

The second characteristic of the organisation, the objective of the organisation, has a great influence on the level of participation. Extension-oriented organisations tend to be less participatory and less learning takes place compared with research and development-oriented organisations. Extension organisations often use the transfer of knowledge model while research and development use more participatory methods to incorporate the farmers' knowledge in the new technology and build the capacity of farmers through active participation in the development process. An extension organisation is an organisation that specializes in the training of farmers but against the expectations they are not very successful in the training. This can be explained by the fact that most extension organisations are funded by the government and often have problems with low budgets and poorly trained extension workers.

For the third characteristic funding it was found that government-financed organisations invest more in the learning strategies and have a better result for learning and the application of the new knowledge. This is contradictory with the results for extension-oriented organisations that are often government financed. In this survey there were only four government funded and two NGO funded extension organisations. These numbers are too low to determine the negative effect from being extension-oriented and the positive effect of having government funding on learning. The differences between the two types of organisation can be investigated in a further research.

This research has an explorative character to find out the relevant variables that have an influence on the learning of farmers. A total of seven variables was included in the model and tested. For future research other variables can be included like variables describing the personal characteristics of the learner and the environment of the learner. The low number of respondents in the survey limited the statistical possibilities to analyse the data and made it difficult to draw any firm conclusions. The survey was conducted by e-mail what proved not to be an effective medium because e-mail is poorly read in eastern Africa. It would have been better if the survey was distributed through organisations. Also the title of the survey, participatory research, may have excluded a group of potential respondents from development and extension organisations. The results of this questionnaire showed some problems of non-differentiating questions. This research should be repeated with fewer variables and more respondents to see if the here reported influences are true.

The respondents are managers and field staff working for the various organisations and have a positive attitude towards the organisation they are working for and therefore the answers in the questionnaire have a positive bias.

The choice of a questionnaire as instrument to conduct the survey limited the collection of in-depth information because it requires detailed questioning to describe a PRE approach. To collect this detailed information field staff who are implementing the program and the beneficiaries of the program, the farmers, are interviewed during a case study carried out in Uganda. This case study is described in the next chapter.

4. Case study of PRE approaches in Uganda

The aim of this research is to determine the factors that influence the effects for farmers and scientist of different participatory research and extension approaches. This will be done by answering the following research questions:

- What are the characteristics of the organisations implementing PRE?
- What are the characteristics of the various types of PRE?
- What are the effects of PRE for farmers and scientists?

To be able to cross check the data from the survey as presented in chapter three and collect more in-depth information to answer the research questions a case study was conducted. As country for the case study Uganda was selected because the country has a strong presence of different development organisations at all levels. There are international and national research institutions, non-governmental development organisations and there is a national extension service. In paragraph 4.1 a brief outline will be given of the country. In paragraph 4.2 the research method is described. This method consists of document analysis, field visits, interviews with the management of various development and research organisations and interviews with representatives of farmer groups implementing the programs of these organisations. The fieldwork was conducted from 28 August 2005 till 24 October 2005 in Uganda. In paragraph 4.3 the results from the interviews with the management of twelve organisations are presented. In paragraph 4.4 the results of the in-depth study of four organisations using different PRE approaches are given. In paragraphs 4.5 a comparison between the four organisations is made and 4.6 the conclusions of the case study are presented.

4.1 Uganda

Uganda is a landlocked country in Eastern Africa located on the equator. It shares borders with the Democratic Republic of Congo in the west, with Rwanda and Tanzania in the south; with Sudan in the north and Kenya in the east. The capital city is Kampala with approximately seven million inhabitants. In Figure 4.1 a map of Uganda is provided indicating the districts where the case studies have been carried out.

Uganda is a formerly British Protectorate and gained independence in October1962. The country was divided along ethnic and religious lines. In 1971 the dictator Idi Amin and the army took over power. In 1979 Tanzania stepped in and made an end to the rule of Amin. Elections where held and a new government was established. At the moment still some fighting is going on in the north of the country. The country covers an area of 235.796 square kilometres and has a population over 26 million people. Over 80% of the population is either subsistence farmer or work in agricultural related fields.

Language

In Uganda English is the official language but many local languages are spoken. The main local language is Luganda spoken by the Baganda making up 20% of the population and living around the capital Kampala.

Natural resources

Uganda has a tropical climate without much seasonal variation. The average temperature is between 20 - 27^{o}C and an annual rainfall of 1000 – 2000 mm but the rainfall in not evenly dispersed resulting in dry and wet areas. The altitude of 1000 m tempers the climate. There are two growing seasons, the main season from February till June and the minor from August till January. The main lake is the Lake Victoria, the second largest lake in the world. The sources of the Nile are situated in Uganda. About 25% of the country is arable land, pastureland accounts for 9%; forest woodlands make up 28 % and open water 28%. The country has several agro ecological zones, hillsides, mainly in the border areas and sandy plains in the middle. The soil fertility is declining and erosion is an increasing problem.

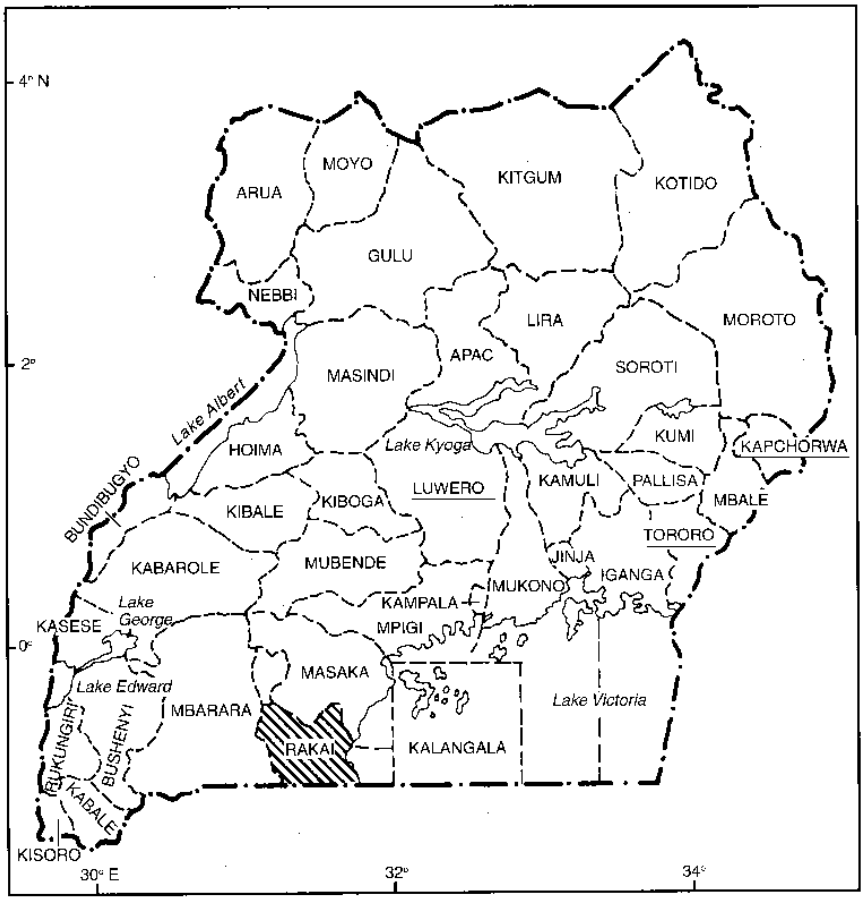

Figure 4.1: *Uganda and its neighbouring countries*

Economy

The economy of Uganda is mainly based on agriculture. Major export crops like coffee, tea and tobacco are grown on large-scale farms and account for 60% of the Gross Domestic Product (GDP). Most farmers are subsistence farmers who produce cassava, banana, grain and potatoes for household consumption while the surplus is sold on the local market.

Agricultural research and extension

In Uganda a range of international and national research and extension organisation are present. International agricultural research centres are targeting goals at a high level like poverty alleviation, food security and sustainable development but at the same time they are expected to produce technologies for resource poor farmers for the whole region of Southern Africa. To promote the dissemination of the research findings the international institutions collaborate with adaptive research and dissemination partners like national agricultural research organisations, extension services, development organisations and farmer groups. Beside the international research there is also the National Agricultural Research Organisation (NARO). This organisation is conducting research at national level and is divided in several programs. Some programs are oriented around specific crops or animals while other programs are dealing with integrated topics like land use. For the dissemination of the technologies there are the development organisations and the extension service. Uganda used to have a government extension service with a top down approach but this was not very efficient. In 1997 the National Agricultural Advisory Services (NAADS) was created to coordinate extension service provisions to subsistence farmers. The NAADS program consists of two components: a social and a technical component. The social component consists of organizing farmers in groups and helps to build confidence within the group so the group will be able to engage in marketing and contract advisory services. The technical component consists of technology development and dissemination

through private service providers. Contracts for these advisory services are tendered among the private service providers. In the future the farmers are required to pay for these services with the idea that the farmers will have a better control over the services they are receiving (Ministry of agriculture, 2000).

4.2 Research method

To collect information from organisations and farmers to answer the research questions interviews were selected as an instrument because interviews give the possibility of asking more questions then in a printed questionnaire, make it possible to interview a group of people at once and give an explanation to the questions (Swanborn, 1981). The field visit consists of two parts, interviews with development, research and extension organisations and an in-depth study of four selected organisations. First interviews are held with the management of organisations to get a general view on PRE in Uganda. Twelve organisations are selected based on their size, objectives and funding. Interviews with the management of each of the twelve organisations were held. The interviews focus on three topics, the characteristics of organisations, the characteristics of PRE, and the effects for farmers and scientists. The characteristics of the organisation are the technology being promoted, the objectives of the organisation and the way the organisation is funded. The characteristics of the PRE method are the stakeholder involvement, the role of the facilitator and the learning strategies.
In-depth studies of four organisations are held to get information on the implementation of PRE and the effects for farmers. Based on the twelve initial interviews four organisations are selected for an in-depth study. The organisations are selected based on the characteristics of the organisation and the PRE approach. The organisation should be working directly with farmers. Based on the variables funding, characteristics of organisation and technology twelve different combinations are possible so there are also twelve potential organisations to visit for an in-depth study but due to the time constraints only four organisation have been selected. These are ActionAid, A2N, NARO and VEDCO.

4.3 Interviews with twelve selected organisations

There are many development and research organisations working in Uganda. To get an overview of the orientation, and the views on learning and development of the various organisations, interviews with management staff of organisations implementing different PRE approaches to research and extension are conducted. An initial selection is made based on the way of funding, being donor funded or government funded, the orientation of the organisation; being development, research or extension oriented, the size of the organisation, because larger organisation have a wider coverage and therefore more experience, and the organisation should have a participatory approach. Based on these criteria twelve organisations are selected. In Table 4.2 the organisations where the interviews are conducted are listed. The checklist used for the interviews is provided in Appendix 2.

Table 4.2: *Twelve organisations for initial interviews*

Funding	Objective		
	Research	Extension	Development
NGO	1. Africa Highlands Initiative (AHI) 2. International Network for the Improvement of Bananas and Plantains (INIBAP)	--	3. ActionAid 4. Appropriate Technology (AT)-Uganda 5. Africa 2000 Network (A2N) 6. Environmental Alert (EA) 7. Prolinnova 8. Volunteer Efforts for Development Concerns (VEDCO)
Government	9. NARO (horticulture) 10.NARO (banana) 11.NARO (post harvest management)	12. NAADS Uganda Land Management Project (ULAMP)	--

There are no NGO extension organisations and government development organisations included in the interviews because these organisations are difficult to find. In the past each department in the ministry of agriculture like crop production, animal husbandry, forestry, had its own extension service. Extension was a single sector activity. Development is not dealing with a single sector but is offering an integrated package including for example health, agriculture and education to improve the livelihood of the farmers. Government organisations involved in the dissemination of technology that are linked to a single department are therefore classified as extension. Organisations that have a broader view on development compared to the single sector approach of extension are therefore classified as development and not as extension organisation. A broad view on development is mostly found with NGO's while the single sector extension approach is mainly found with government-funded organisations. So there are mainly development oriented NGO's and extension oriented government organisations.
The interviews are analysed using the framework supplied in Appendix 3. The results from the twelve interviews are presented in Table 4.3 in paragraph 4.3.1.

4.3.1 Results of interviews with twelve selected organisations

Table 4.3 gives an overview of the results of the interviews with the twelve organisations. For each of the organisations the name of the PRE approach used by the organisation and the type of technology being promoted is indicated. During the interviews an inventory was made of ten activities carried out by the organisation during the research and extension process. Five of these activities can be labelled as participatory. These are participatory rural appraisal, community-based facilitator, farmers' involvement in evaluation, technology development by farmers and the organisations directly working with farmers. Non-participatory activities are a central demonstration plot and training. The remaining three activities, exchange visits, technology testing and on-farm demonstrations, are undetermined. It depends on the way the activity is carried out if it can be labelled as participatory. For example an on-farm demonstration designed and implemented by farmers is participatory while a demonstration designed and laid out by scientists is not participatory. To indicate the level of farmer participation in the PRE approach the total of the participatory activities is presented in the column "Level of participation". For example INIBAP is working directly with farmers and evaluates with farmers so the level of participation is 2.

Table 4.3: *Activities carried out by the twelve organisations*

			Activities										
			Participatory					Undetermined			Non part		
Organisation	Participatory Approach	Technology	Participatory Rural Appraisal	Community Based Facilitator	Working directly with farmers	Farmers evaluation	Technology development	Exchange Visits	Technology testing	On farm demonstrations	Training	Central demonstration plot	Level of participation
AHI	Research	K			[4]	**X**							1
INIBAP	Farmer Participatory Evaluation (FPE)	I			**X**	**X**		X	X	X	X	X	2
ActionAid	Farmer Reflect Circle (FRC)	K	**X**	**X**	**X**	**X**		X		X	X		4
AT Uganda	Farmer Led Multiplication	I	**X**	**X**[1]	**X**	**X**		X	X	X	X		4
A2N	Farmer Field School (FFS)	I	**X**	**X**[2]	**X**	**X**	**X**	X	X				5
EA	FFS	K	**X**	**X**[2]	**X**	**X**	**X**	X	X				5
Prolinnova	Participatory Technology Development	K			**X**	**X**	**X**		X				3
VEDCO	Participatory Development Communication (PDC)	I	**X**	**X**[1]	**X**	**X**		X		X	X	X	4
NARO (horticulture)	FPE	I			**X**	**X**		X	X	X	X	X	2
NARO (banana)	FPE	I			**X**	**X**		X	X	X	X	X	2
NARO (post harvest)	Extension	I			**X**	**X**				X	X	X	2
ULAMP (NAADS)	Participatory Extension	K	**X**		[3]	**X**		X		X	X		2

I=Input based, K=Knowledge based

1. Staff of the organisation facilitates groups and community based facilitators.
2. First generation FFS is facilitated by staff of the organisation, second generation FFS are facilitated by CBF's.
3. Implemented through existing government extension programs.
4. Implemented through government agencies and NGO's.

In Table 4.4 the average scores for the number of participatory activities of the organisation are given for the different types of organisation.

Table 4.4: *Farmer participation in different types of organisations*

	Technology		Objectives			Funding	
	Input	Knowledge	Research	Extension	Development	NGO	Government
	M	*M*	*M*	*M*	*M*	*M*	*M*
Participation	3.14	3.00	2.00	2.00	4.17	3.63	2.00

No significant difference in participation could be found (t=-0.18, *df*=10, *p*=.86) between organisations promoting an input-based technology (*M*=3.14, *SD*=1.22) and a knowledge-based technology

(*M=3*.00, *SD*=1.58). In the survey input based technologies scores higher on participation compared to knowledge-based technologies but from the interviews this difference is not repeated.
Development organisations (*M*=4.17, *SD*=0.75) are more (t=-5.40, *df*=10, *p*<.01) participatory compared to research and extension organisation (*M*=2.00, *SD*=0.63). In the survey no significant difference between development and other organisations is found.
NGO's (*M*=3.63, *SD*=1.30) are more (*t*=-2.44, *df* =10, *p* =.04) participatory compared to government-financed organisations (M=2.00, SD<0.01). This is contradictory to the findings from the survey where NGO's scored significantly lower then the government financed organisations.

Based on the initial interviews and analysis, four organisations were selected for in-depth field visits based on the type of organisation and the level of participation. The in-depth study will focus on the farmers because they are the main intended beneficiaries of the PRE approaches. This in-depth study consists of interviews with project staff and representatives of farmer groups that receive assistance from one of the four selected organisations.

4.4 In-depth study of four selected organisation

During the interviews with the twelve organisations only managers at the headquarters in the capital city are interviewed. This selection of respondents will give a positive view on the performance of the organisation. To collect information of the beneficiaries of the PRE, representatives of farmer groups that receive assistance from the organisation are interviewed because all organisations work with farmer groups. The purpose of the interviews is to cross check the information provided by the organisations, see how the farmers experience the PRE method that is implemented and find the effects for farmers. The groups that are interviewed and also the farmers who take part in the interview are selected by the organisation. During the interviews a representative of the organisation is present. It is not possible to contact farmers directly without going through the organisation. The selection procedure of respondents and the presence of the representative will encourage reports of positive information. During the open unstructured interviews with farmers the following topics are covered:

- History of the group (starting date, initiative to start the group, purpose of the group);
- Activities of the group (meetings, marketing, sharing labour);
- Training received (method of training, training topics, relevance of training, organisation);
- Results of training;
- Assistance by other organisations.

In total 17 interviews with 135 farmers where conducted, representing 17 groups from four organisations The 17 groups that were interviewed had a total membership of 665. The groups were selected by the organisation. In addition to the interviews with the farmers interviews with field staff of the organisations and government agencies were held. In Appendix 4 the details of the farmer groups and the additional interviews with project staff are given. All the interviews were compiles using the same format as given in Appendix 5.

4.4.1 Results of in-depth study of four selected organisations

The results are based on interviews with the representatives of 17 farmer groups, project staff of the four selected organisations and field staff of government agencies working in the same districts as the selected organisations. In the following four paragraphs case descriptions of the four organisations are given. The organisations represent different objectives, a different way of funding, and promote different technologies. The case descriptions of the organisations described in the following paragraphs are shown in Table 4.4.

Table 4.4: *Case descriptions*

Case	Organisation	Objective	District	Funding	Technology
1	A2N	Development	Tororo	NGO	Input-based
2	ActionAid	Development	Kapchorwa	NGO	Knowledge based
3	NARO	Research	Luwero	Government	Input-based
4	VEDCO	Development	Luwero	NGO	Input-based

4.4.2 CASE 1: Africa 2000 Network-Uganda

A2N-Uganda is a non-governmental development oriented organisation. The organisation was started 1986 by the United Nations Development Programme (UNDP) and became an independent NGO in 2001. The PRE method A2N is applying is the Farmer Field School (FFS).

Technology

A2N uses mainly input based technologies to increase agricultural production. These technologies are the introduction of improved agricultural practises like line planting and spacing and the supply of inputs like seeds of improved varieties and fertilizer.

Objective

The objective of the organisation is improved and sustainable livelihoods for the smallholder farmer through the promotion of sustainable agricultural technologies and empowerment of local communities. A2N is a development-oriented organisation including a wide range of activities. It is aiming at social development and linking the farmers to markets. At the same time A2N carries out research on contract basis for CIAT and NARO. These are trials designed by scientist that are conducted under farmer's management in the FFS. Also A2N carries out research on their own behalf to generate recommendations for local problems like low soil fertility, low production of existing varieties and pest and diseases. So A2N is combining extension, research and development.

Funding

The CORDAID, UNDP, the FAO, and the Rockefeller foundation finance the organisation. UNDP and the FAO are donors who promote FFS.

Participation

Farmers are participating in a learning environment designed by scientists. During PRA farmers are involved in problem identification and prioritisation. At the beginning of the season the scientist and the farmers decide on a work plan that will serve as a curriculum for the FFS activities. This work plan is reflecting the interest of the farmers and the scientist. Farmers are involved in finding solutions and market opportunities. FFS is providing a more traditional teacher-student for learning about knowledge held by outsiders. Solutions are sought in improved varieties and the use of fertilizer. Through the Agro Eco System Analysis (AESA) indigenous knowledge is included in the solutions. During this analysis farmers discuss possible causes and solutions based on field observations on the learning plot. Because A2N is carrying out contract research the involvement of the farmers is reduced because scientist designs the trials and farmers are only involved in the implementation. Treatments in trials are a combination of the farmers past experiences and solutions brought forward by the scientist. The evaluation is a joined activity of farmers and scientists.

Role of the facilitator

The facilitator is leading the FFS through coaching. During the coaching the facilitator asks the farmers questions, organizing the activities, encouraging members and providing knowledge and inputs like seeds and fertilizer. For example one group gave an estimate of the learning of farmers can be attributed for 40% to the facilitator and for 60% to fellow farmers. At the same time the facilitator is the coordinator for the contract research trials and in that capacity he is chasing the farmers to comply with the set out procedures and the collection of data. In order to promote the concept of FFS, promising members of an existing FFS are asked to become facilitator in a different, newly started FFS after attending a "training of trainer" course provided by A2N. FFS are part of an FFS association

that provides grants and credit for starting up a FFS. The FFS association serves as a platform to advocate the case of the FFS at the various government administrative levels.

Learning strategies

FFS is taking a constructivist approach to learning. Farmers have to learn through experience. Learning takes place at the central learning plot where the group conducts trials and demonstrations. These activities are planned in the curriculum. A facilitator from the community or organisation is coaching the group in their learning process and provides information where necessary.

Results

Farmers are reporting to have an increase in income resulting in improvements of their houses. These improvements are observable in the shape of corrugated iron roofing or houses build of fired bricks. Farmers are sharing knowledge on other topics during their FFS activities and work together at each other's land on a rotational system. The food security situation at the households has improved through the increase in food production and three meals a day are common. The social contacts help to build a security network to provide for unexpected events.

4.4.3 CASE 2: ActionAid

ActionAid is a non-governmental development oriented organisation. ActionAid is an international organisation that started working in Uganda in 1982. The PRE method ActionAid is applying is the Farmer Reflect Circle (FRC).

Technology

ActionAid is promoting NRM, what is a knowledge-based technology. Whole communities are involves in the implementation of erosion control and soil fertility programs. The programs are supported by newly formulated by-laws drawn up by the community. ActionAid is also aiming at an increase of the household income through improved management, seeds and animal breeds and the use of organic farming methods.

Objective

The objectives of ActionAid are empowerment of local groups, technology innovation and linking better land management practices to livelihood and enterprise options. The organisation is building a network of service providers to coordinate the efforts and supplement each other where possible.

Participation

During PRA farmers are involved in problem identification and prioritisation. Farmers are involved in the formulation of by-laws and gaining support for these laws at local government levels. ActionAid seeks technical solutions for erosion control and crop management.

Role of the facilitator

The facilitator is community based. After an initial training by ActionAid for one week he goes back to the group. In the group problems are identified and prioritised. The topics can be very wide from literacy to crop management. The facilitator returns with a list of problems from the farmers to the next ActionAid training where a work plan is drawn up based on the issues raised by the group. A manual (curriculum) is prepared with instructions for the facilitators and the PRA methods to use. The manual is divided in several units that cover several weeks each. The outcome of a unit is an action plan. ActionAid is proving assistance where necessary.

Learning strategies

The facilitators are using training as the main mode of knowledge transfer. The topics are determined in the work plan of the facilitator. ActionAid is working with farmer groups. The learning sessions take place at the individual farm at a rotational basis. Through the farm visits the exchange of information between farmers is encouraged. By working with model farmers at village level a system of F2F extension is set up.

Results

Erosion is brought under control resulting in an increase in yield. The structures built to prevent erosion are protected from damage by cattle through the enforcement of the by-laws restricting the movement of cattle. Farmers are reporting to have an increase in income resulting in improvements of their houses. These improvements are observable in the shape of corrugated iron roofing or houses build of fired bricks. Farmers are sharing knowledge on other topics during their FRC activities and work together at each other's land on a rotational system. The food security situation at the households has improved through the increase in food production and three meals a day are now common. The social contacts help to build a security network to provide for unexpected events.

4.4.4 CASE 3: National Agricultural Research Organisation

National Agricultural Research Organisation (NARO) is the organisation that conducts agricultural research at research stations and in the farmers' field. The farmer field trials are conducted at three levels. Ate level one the researcher designs and manages the trial. This level often works with individual farmers; the farmers and the researcher carry out the evaluation together. At level two the researcher designs the trial but the farmer manages it. This level often works with farmer groups. Again farmers and researchers do the evaluation together. At level three is the trial designed and managed by the farmer. The input from NARO is the provision of seeds or planting material for farmers to test. This PRE method NARO is applying is the called Farmer Participatory Evaluation (FPE). The technology developed by NARO is further disseminated through extension organisations. This used to be a national extension service but with the establishment of the national agricultural advisory services programme (NAADS), extension becomes the task of private service providers.

Technology

NARO is developing input based technologies like improved varieties. Research is working on an array of options for the farmer on improved management and varieties. It is the choice of the individual farmer to select from these options what is most suitable for his conditions.

Objective

NARO is working on increased farmer income through the development and dissemination of improved technologies.

Funding

Uganda government, FAO, USAID, Rockefeller foundation, European Union, Worldbank, AHI and many others.

Participation

During the design of the trial the scientists take the decisions while the farmers according research guidelines do the implementation and the evaluation is a shared responsibility between scientists and farmers. The scientists from a list provided by the community select the farmers who participate in the program. The selection is based on capacity and resources of the farmer to carry out the trial. Through the evaluation process indigenous knowledge is included in the solutions.

Role of the facilitator

The scientists who also provide the inputs for the trials provide the initial training on improved management necessary to carry out the trial. NARO field assistants who are also responsible for the collection of data from the trial provide supervision of the trails.

Learning strategies

The FPE tests if the new developed technology is acceptable by farmers. At the final stage of the technology development process the on-farm, farmer management trials are conducted. During the training there is a teaching role for scientists but during the evaluation scientists and farmers are partners each bringing in their own expertise. In a joined evaluation all aspects of the technology are assessed like crop management, post harvest management and marketing. The scientists work in close relation with the selected trial farmers to strengthen the farmer-research linkage. The evaluation

provides the scientists with information from the farmer for further improvement of the technology. The farmer learns while participating in the trials new management techniques and has access to new varieties. If the technology is accepted the dissemination is done through farmer groups who receive training on improved management and planting material from the improved varieties for multiplication and distribution. Although the FPE works with farmer groups the main reason is to have easy access and facilitate the dissemination of new planting material.

Results

The improved management and banana varieties have increased the yield and the quality of the product and the total of area planted with banana has increased. Farmers report to have an increase in income resulting in improvements of their houses. These improvements are observable in the shape of corrugated iron roofing or houses build of fired bricks. Farmers are now able to pay school fees for their children.

4.4.5 CASE 4: Volunteer Efforts for Development Concerns

VEDCO is a non-governmental development oriented organisation started in 1986 as a relief organisation by students from the Makerere University in Kampala (Uganda) and became a NGO in 1992. The PRE method VEDCO is applying is the Participatory Development Communication (PDC).

Technology

VEDCO is using mainly input based technologies to increase agricultural production. These technologies are the introduction of new crops and improved agricultural practises like line planting and spacing, and the supply of inputs like seeds and planting material of improved varieties. Inputs like improved varieties are provided by VEDCO to the farmers as a gift or a loan in kind. For the start of animal projects soft loans are provided by VEDCO. Free veterinary services are provided by VEDCO for pigs as an incentive. VEDCO is promoting organic agriculture by offering alternatives for fertilizers and agro chemicals.

Objective

The objective of VEDCO is to improve the livelihood of small- and medium-holder farmers through capacity building for food security, agricultural trade development and institutional development. Sustainable agricultural development is promoted through two different types of projects. Agriculture for food security aims at increasing the total household production through the introduction of improved breeds and varieties and agronomic practices for traditional crops and animals. This will lead to a broader income base for the household (diversification). The crop agro enterprise development program selects economical viable projects including market opportunities for farmers. Farmers are encouraged to market their produce directly or through marketing associations. The focus is on non-traditional cash crops. Farmers should start with food security and then move to specialisation. A different objective of VEDCO is the empowerment of groups to ask for services.

Funding

HIVOS, NOVIB, Norwegian friends of Uganda and the University of Iowa finance the organisation. HIVOS and NOVIB are development-oriented donors from the Netherlands.

Participation

During PRA the farmers are involved in problem identification and prioritisation. Once the training needs are known the training is designed by the organisation. Solutions and markets are identified by VEDCO. During the training the farmers are mainly the receivers of information. During planning and review meetings with farmers, VEDCO staff and local leaders the program is reviewed and the priorities are set for the coming period.

Role of the facilitator

VEDCO is using two types of facilitators, facilitators from the organisation and community based facilitators. The facilitators from the organisation are instructors who provide training to the whole group. The community-based facilitators are model farmers who have been trained by VEDCO

The model farmer's act as Rural Development Extensionist (RDE) to give training to individuals and small groups (2-4) of farmers in a F2F extension system.

Learning strategies

PDC as implemented by VEDCO is an extension approach using traditional training methods based on farmers needs. The training is based on the transfer of knowledge paradigm. Training is provided to groups in order to have access to a greater number of farmers. VEDCO is setting up model farmers in the communities with demonstrations that are used as training venue. Farmers are not involved in technology development. The organisation is afraid to loose its credibility when the trials in the farmer's field fail. Trails are conducted by NARO and at the central VEDCO training centre. Exposure end exchange visits are conducted to create interest in the new crops and to encourage farmers to adopt new technologies by showing good practises.

Results

Farmers are reporting to have an increase in income resulting in improvements of their houses. These improvements are observable in the shape of corrugated iron roofing or houses build of fired bricks. Farmers are now able to pay school fees for their children. Farmers are diversifying their enterprises by adding vanilla, okra, poultry and pigs to the farm enterprise. Other farmers specialize in crops like pineapple. Farmer groups have entered into contracts with exporters for organic grown crops to Europe.

4.5 Comparison of PRE methods in the four cases

Stakeholder involvement and type of participation

Participatory Rural Appraisal is assuring the participation of the farmers in the design process of the learning event. Through PRA the needs and priorities of the farmer are included in the design and is determining the content part of the design of the intervention. The level of participation of farmers in the design is determined by the objectives of the organisation. Research oriented organisation like NARO will do the design without farmers because the design determines the credibility of the research results and the organisation wants to assure that their research data meet the standards. In development oriented organisations like A2N, ActionAid or VEDCO the farmer will be more involved in the design. The implementation is characterised by the range of activities forming together the PRE approach. Each organisation has its own PRE approach consisting of a selection from study tours to create awareness, training including practical components, trials and demonstrations, and printed support material. The farmer is not involved in the selection of these learning activities. The PRE approach is developed by the organisation as part of the policy of the organisation, based on beliefs within the organisation on the best way to engage farmers in the development process, the available resources and the experiences from the past. This approach is applied uniformly regardless of the simplicity or complexity of the technology being promoted.
Depending on the approach the role of the farmer is different. In a training-based approach like PDC or FRC the farmer will be more the receiver of information. In a learning approach like FFS the farmer will be more actively involved through farmer-led, on-farm trials. When a learning event is implemented through CBF's and includes experimentation then this will see more participation of farmers. On-farm demonstrations are more participatory as a central demonstration plot because more farmers are involved in the demonstrations. The four selected organisations all involve farmers in the evaluation. Johnson et al (2003) recognized five levels of participation: conventional, consultative, collaborative, collegial and farmer experimentation. Table 4.5 shows these levels of participation for the different stages in the research and extension process for the four organisations.

Table 4.5: *Level of participation in different program stages.*

	PRE approach and organisation			
Stage	PDC (VEDCO)	FFS (A2N)	FRC (ActionAid)	FPE (NARO)
Design	Collaborative	Collaborative	Collaborative	Consultative
Implementation	Consultative	Collegial	Collaborative	Consultative
Evaluation	Collaborative	Collaborative	Collaborative	Collaborative

Roles of facilitator

The facilitator acts often as a teacher. They are organizing the learning activities and provide inputs like seeds and fertilizers, and knowledge. There are three types of facilitators. The facilitators from the headquarters of the organisation form the first type. These are well educated facilitators who train other facilitators and provide training to different farmer groups but are not attached to a specific group. The group-based facilitators form the second group and are attached to one or two groups of farmers and are paid by the organisation. Their level of education is lower compared to the facilitators from the headquarters of the organisation and they often originate from the government extension service but started working for NGO's because of the better payment by NGO's. The third type is the community-based facilitator. This is often a member of the farmer group who has received a training of some weeks to become a facilitator. They are not paid but get incentives like a bicycle. The way the facilitators have been trained is determining the way the facilitators are interacting with the farmers.

Learning strategies

The PRE approaches greatly differ in the method of technology dissemination. In FFS a constructivist approach is used. Observation and analysis form the starting point of the learning process. Possible causes and solutions are discussed. Farmers are learning from each other's experiences and where applicable the expertise of the facilitator is brought in. By encouraging the farmers to duplicate one of the trails at their homestead the transfer of training is encouraged. In PDC, FPE and FRC a more technocratic way of teaching is used. Learning methods like explanation, questioning, exercises, presentations and practical work are employed. Demonstrations are used to create interest for the technology. Using model farmers in the community will show the possibilities of the technologies in the local context.

Demonstrations and practical work are not really encouraging the farmers to apply what they have learned because these events often consist of showing and telling. Working in a group assumes a uniform type of farmer with the same ability, the same needs and the same learning style. None of the approaches take into account the characteristics of the adult learner.

The organisations realize that marketing is a crucial factor for the success of any technology to increase the production beyond the level of household consumption. Possibilities to sell the production are explored through the market orientation. A marketing research committee can do this from the farmer group (FFS). The committee will be able to explore mainly local markets. The marketing survey can also be carried out by the organisation so that only technologies with a known marketing potential are offered to the farmers (PDC). The organisation has the possibility to explore also markets further a way and even export markets.

Effects for farmers and scientists

The two main effects for farmers are empowerment and an increase in income. All organisations are working on the empowerment of groups but the groups are not yet equal partners in the development process. In the newly introduced demand driven extension system from NAADS, farmer groups have to request for assistants. To prepare groups for their new role organisations invest a lot of time and effort in group development. This group development work is aiming at an increase in group cohesion. Some approaches, like FFS and FRC, encourage more group cohesion then others because the group carries out activities together and are meeting more often (once or twice a week) compared to the groups under PDC and FPE (once a month to once every three month). All PRE approaches are leading to an increase in income from sales of the surplus of the food crops or sales of cash crops.

The main effects for scientists are an improved technology development process. In FFS and PDC farmers are involved in technology development by carrying out experiments for the scientists.

4.6 Conclusion

During the case study it was found that all organisations are using a PRE approach. The level of participation is different in the various approaches. Three characteristics of the PRE approach, stakeholder involvement, role of the facilitator and the learning strategies had an effect on the level of participation of farmers in the research and extension processes in the various PRE approaches.

First, the stakeholder involvement is only during the needs assessment at the start of the program and during the evaluation at the end of the program. Only during the PRA and the evaluation farmers are participating in the development process. Farmers are allowed to express their needs during the PRA and then the organisation is providing the solution, often in the shape of a training event for the farmers while the farmers are asked during the evaluation if the solution has worked. This way of working is not really participatory because the farmers are not involved in solving their own problems but remain depend on organisation to provide solutions for them.

The second characteristic is the role of the facilitator. The facilitator is mainly acting as an instructor and does not allow much participation of the farmers. This is the result of the learning strategies applied by the organisations.

The third characteristic of the PRE approach is the learning strategies applied by the organisation. Most organisations use training and demonstrations as the main mode of transfer of knowledge. The training and demonstrations are carried out by the facilitator what is not encouraging the farmers to become involved.

All stakeholders report that the programs using a PRE approach are successful to improve the livelihood of farmers and to generate research results for scientists.

There are two main reasons that these reported results have a positive bias. In the first place the selection of respondents was not at random because the selection of farmer groups that were interviewed and the members of the farmer group who were interviewed during the in-depth studies was done by the organisation. The presence of a representative of the organisation during the interviews with the farmers will have contributed to the positive results but it is very difficult to contact farmers without the approval of the authorities.

Secondly, the reported results cannot be attributed to PRE alone. Also the personal characteristics of the learner and the environment of the learner are important to achieve results (Baldwin & Ford, 1988). At the same time when introducing PRE the organisations are also improving the marketing situation for the farmers. This enables the farmers to increase the sales of their products and achieve better results.

The case study was carried out in one country with only four organisations due to limited time and budget. More time should be spent on the initial selection of organisations to cover a wider range of organisations. In Uganda the extension system is being privatised so that there are no extension-oriented organisations operational that could be interviewed during the visit. This privatisation is resulting in a poor linkage between research and farmers because there is no system to disseminate the new technologies developed by research to the farmers. The privatised extension is mainly dealing with short-time input-based interventions.

The results of the survey in chapter three and of the case study in chapter four are combined in the next chapter to answer the research questions.

5. Conclusion and discussion

5.1 Conclusion

The aim of this research is to determine the factors that influence the effects for farmers and scientists of different participatory research and extension approaches. This is done by answering the following research questions:

- What are the characteristics of the organisations implementing PRE?
- What are the characteristics of the various types of PRE?
- What are the effects of PRE for farmers and scientists?

Based on the literature three characteristics of an organisation were chosen to see if these characteristics have an influence on the type of PRE and on the learning of farmers and scientists. These three characteristics are the type of technology that is being promoted by the organisation, the objective of the organisation and the way the organisation is funded. In the first paragraph these characteristics and their influence on the PRE approach are described. To describe the PRE approach of an organisation four characteristics were chosen. These characteristics are the type of participation, the involvement of stakeholders, the role of the facilitator, and the learning strategies applied by the organisation. In the second paragraph the influence of these different aspects of PRE on the effects are described. The effects are described as learning, application and results because before results are achieved the farmers have to learn and they need to apply what they have learned. These effects are described in the third paragraph.

5.1.1 Characteristics of the organisations and their influence on the type of PRE

The first research question: *What are the characteristics of the organisations implementing PRE?* will be answered in this paragraph. In this research three characteristics of the organisation and their influence on the type of PRE were investigated. First organisations using input-based and knowledge-based technology are compared. From the survey organisations promoting an input-based technology have a higher level of farmer participation compared to organisations promoting knowledge-based technology. From the case study it appears that most of the organisations use an input-based technology but according the survey most organisations reported to use a knowledge-based technology. A possible explanation for this difference is that in the program descriptions knowledge-based technologies are described but when it comes to implementing in the field the technology is reduced to a simple input-based intervention. The differentiation between input-based and technology-based is not very useful because there is always a knowledge component in the input-based and an input component in the knowledge-based technologies.

Secondly extension-, development-, and research-oriented organisations are compared. From the survey and case study it appears that extension and research-oriented organisations are less participatory compared to development-oriented organisations. This can be explained from the fact that extension organisations often use the transfer-of-knowledge model that does not allow for a high level of participation. Research organisations focus on getting credible research data and therefore the participation of farmers is limited.

Thirdly government funded organisations and NGO's were compared. Organisations funded by the government invest more in learning and show a higher application rate compared to organisations funded by donors. From the case study it appears that government funded organisations have a lower level of participation but during the field visit only one government funded organisation was visited. This was a research organisation and research organisations have a lower level of participation.

5.1.2 Characteristics of PRE and their influence on the effects for farmers and scientists

The second research question: *What are the characteristics of the various types of PRE?* will be answered in this paragraph. In this research four characteristics of PRE and their influence on the effects for farmers and scientists were investigated. First two characteristics the type of participation and the stakeholder involvement are discussed together. In the survey the organisations report an equal sharing of decision-making but during the case study the only moments when farmers are equally participating with scientists are during the PRA and the evaluation. In research-oriented organisations

farmers participate only during the evaluation. In the survey a higher level of participation had a positive effect on the results.
The third characteristic is the role of the facilitator. According to the survey most organisations have a coaching role for the facilitator. However from the case study it appears that the majority of the organisations use training as the main mode for the transfer of knowledge. During the training the facilitator acts as a teacher. From the survey and field visits it is clear that the organisation selects the facilitator. This indicates a low level of participation of the farmers in the design of the learning environment. The role of the facilitator is a clear indicator for the level of participation because the facilitator is the person who works direct with the farmer groups and strongly determines the level of participation.
On the fourth characteristic, the learning strategies, most organisations reported limited resources for setting up learning activities. The learning activities used by the organisations are effective and leading to learning of the farmers. The learning activities selected by the organisations are training, exchange visits and demonstrations, activities that do not invite much participation of the farmers.

5.1.3 Effects of PRE for farmers and scientists

The third research question: *What are the effects of PRE for farmers and scientists?* will be answered in this paragraph. The effects for farmers are described as learning, application and results because before results are achieved the farmers have to learn and they need to apply what they have learned. First farmers have to learn. If farmers are learning and how much farmers are learning is seldom assessed by the various PRE approaches. It is assumed that, if farmers apply what they have learned, learning has taken place. There are however situations where farmers have learned but they are unable to apply what they have learned. It is essential to assess the learning of farmers when investigating the performance of a program.
The second step is the application of the increased knowledge and changed attitudes by the farmers. From the survey it showed that the higher level of participation is leading to a higher level of application of the new technology by the farmer. It could however not be established in the survey that a higher level of participation is also leading to a higher level of learning. During the case study the application of the new technology was assessed through observations but the scale of application was difficult to establish. Farmers are trying some of the new technologies on a small portion of their farm and maintaining the trial to satisfy the researchers but often the new technology is not implemented at a large scale.
The application of the new technology should lead to results. The expected results for farmers and scientists are different. From the survey and the case study an increase in income was reported, visible as improved housing, payment of school fees for children and a greater food security. The empowerment was more difficult to see. Farmers are not equal partners with scientists in the development process because the scientists take most of the decisions and the scientists manage the funds for development programs. The results for scientists consist of research data from the testing of new technologies under farmer conditions.

The answers to the research questions in previous paragraphs are leading to the answer of the main question: *What are the factors that influence the effects for farmers and scientists of different participatory research and extension approaches?* The factors that have a positive effect on the participation of farmers are an organisation that is development-oriented and promoting an input-based technology. The factors that enhance the learning of farmers are a high level of farmers' participation and sufficient resources of the organisation to support the learning. The learning of farmers is leading to application of the new technology and to results for farmers and scientists in the end.
In Figure 5.1 the characteristics that have a positive influence on the effects for farmers and scientists are indicated.

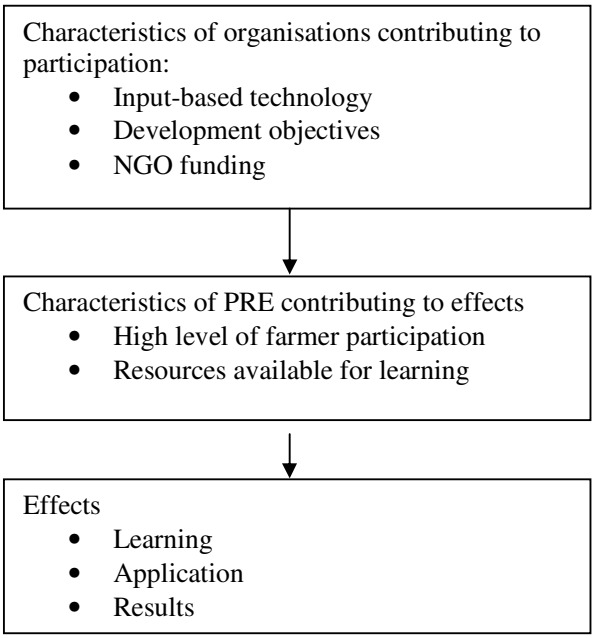

Figure 5.1: *Positive influences of characteristics of organisations and PRE approaches*

Looking at the results from the survey and the case study the conclusion can be made that an increase in participation of farmers in the research and development process is leading to better results for farmers and scientists but some comments must be made to this conclusion. These comments are described in the next paragraph.

5.2 Discussion

The results from this research may not be applicable to all farmers because this research is only dealing with farmers organised in groups and not representing the whole farmer community. It is possible that it is a particular type of farmer that chooses to be in a group. In a future research the differences between farmers organized in groups and unorganised farmers and the best way to reach these unorganised farmers can be investigated. Organisations work with farmers in groups for the empowerment of farmers and the development and dissemination of new technologies. The dual purpose of the empowerment of farmers and the development of technology are often conflicting in the organisations. This is caused by the fact that to get reliable research data the farmers have to follow the rules laid down by the scientists but these rules are not leaving room for the farmers to develop their own solutions. For empowerment stable groups are required who can advocate their case with the local authorities but not all members in the group will have the same priorities. For technology development more volatile groups are formed based on a common interest and these groups fall apart once the problem is solved but organisations do only have one approach to groups. The organisations try to form stable groups that are an easy entry point for their programs and can act as a community-based organisation.

Participation of farmers in the research process requires a long-term commitment of the scientists to the farmers. Through the long-term interaction between farmers and scientists, the scientists gain insight in the causes of the problems of the farmers. When the farmers and scientists jointly develop technologies extension becomes superfluous because the farmers have learned the technologies during the development process but only a small portion of all the farmers are participating in the research process. This is excluding the farmers who have not taken part in the development process from learning the new technology. It is the task of extension to disseminate the new technology to all farmers, the scaling out. To do this in a participatory way the extensionists and development workers should follow a similar, but less elaborate, procedure as the scientists have used during the development of the technology. Scientists should not only develop the technology but also the methods how to disseminate this new technology to farmers. Extensionists and development workers need to be trained in the use of these new dissemination methods. Further research can determine the type of training that is needed for extensionists and development workers.

In this research it is found that participation increases the level of learning of the farmers. For organisations to become more effective they have to increase the participation of farmers. The participation should not be restricted to the problem identification and the evaluation stages but be incorporated in all processes like the development of technology, the design of the learning environment and the implementation of the program. This requires a change in attitude from the farmers and the scientists. The farmers must take up the role of partner in the development process. The farmers are no longer only providers of information and receivers of solutions but they are actively involved in the development of the solutions. The scientists need to function more in the role of a coach instead of the role of a teacher. Therefore the organisations must develop programs to prepare the farmers and scientist for their new roles.

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Appendices

Appendix 1: Questionnaire

QUESTIONNAIRE

Because the vocabulary used may not have the same meaning to everyone a glossary is added at the end of this questionnaire

1. What is the name of your organisation[1]?……
2. In which country are you working?……..
3. What type of organisation are you working for? Put an "x" under the right category, more answers are possible.

Development	Extension	Research	Government	Non- government	Other

4. What is your function in the organisation? Put an "x" under the right category

Field staff	Facilitator[2]	Manager	Other

5. What is the name of the program[3] implemented by your organisation?…….

6. Which is the name of the Participatory Research (PR)[4] method you are using to bring the technology to the participants?…….

7. How many years of experience do you have with this type of PR[4]?……

8. How many participants[5] have been reached over the years using this type of PR?……..

9. What method of selection of participants5 has been used?

Self selection (Volunteers)	Based on efficiency (Capacities)	Community selection	Appointed by the scientist[6]	Other

10. Who has selected the facilitator[2]?

Participants	Community	Organisation	Other

11. From which group was the facilitator selected?

Participants	Community	Organisation	Other

12. Who takes the decisions during the planning of the program? Put an "x" under the right category how the decision-making is divided between participants and scientists.

Participants[4]									Scientists[6]	
100%	90/10	80/20	70/30	60/40	50/50	40/60	30/70	20/80	10/90	100%

Example: 70/30 means 70 % of the decisions are taken by the participants and scientists take 30 % of the decisions.

13. Who takes the decisions during the implementation of the program?

Participants									Scientists	
100%	90/10	80/20	70/30	60/40	50/50	40/60	30/70	20/80	10/90	100%

14. Who takes the decisions during the evaluation of the program?

Participants									Scientists	
100%	90/10	80/20	70/30	60/40	50/50	40/60	30/70	20/80	10/90	100%

15. The facilitator can act in the program as a coach supporting the learning of the participants but can also act as an expert. How are these roles divided in your program?

Coaching									Expert	
100%	90/10	80/20	70/30	60/40	50/50	40/60	30/70	20/80	10/90	100%

16. How much of your time do you spent in the office and how much time in the field?

Office										Field
100%		80/20	70/30	60/40	50/50	40/60	30/70	20/80	10/90	100%

Example: 70/30 means 70 % Office work, 30% Fieldwork

17. There are two groups of beneficiaries of the program, participants and scientists. Participants learn new technologies and scientists learn whether these technologies are appropriate. Indicate by putting an "x" under the right category how in your opinion the benefits are divided between the participants and scientists.

Participants									Scientists	
100%	90/10	80/20	70/30	60/40	50/50	40/60	30/70	20/80	10/90	100%

18. New technology can be based on improved inputs or on improvements in the management for which the participants need to have more knowledge. Can you indicate how far the technology being promoted in your program is based on inputs or on knowledge?

Input-based[7]									Knowledge-based[8]	
100%	90/10	80/20	70/30	60/40	50/50	40/60	30/70	20/80	10/90	100%

Example: 70/30 means the technology consist of 70 % Inputs and 30% knowledge

19. The orientation of the program can be a mixture of technology development and learning of participants. Please indicate the division between these orientations in your program by putting an "x" under the right category.

Technology development								Learning of participants		
100%	90/10	80/20	70/30	60/40	50/50	40/60	30/70	20/80	10/90	100%

Example: 70/30 means the program is for 70% involved in technology development and for 30% in the learning of participants.

Could you please indicate by putting an "x" in the correct column if you do agree with the following statements whereby 1 =strongly disagree 2=disagree 3= neutral 4= agree 5 strongly agree

Statement	1	2	3	4	5
20. This PR method fits the abilities of the participants					
21. The participants have to invest too much time in the program					
22. The new technology has distinct advantages over the present participants practices					
23. The new technology fits in with the present farming system					
24. The technology is easy to apply by the participants					
25. The technology is easy to understand for the participants					
26. The organisation has changed to facilitate the use the PR method					
27. There are sufficient financial resources available to implement the program					
28. There is sufficient staff available who have been trained in the use of this method of PR					
29. The organisation has sufficient training capacity to train participants as facilitators					
30. The organisation has sufficient capacity to develop their own training material					
31. The organisation has adjusted the method of PR to the technology disseminated					
32. The scientist make follow up visits to the participants					
33. The participants continue to meet after the program has ended					
34. The new technology gives immediate visible results					
35. Inputs necessary to apply the new technologies are readily available to the participants					
36. The market situation encourages the use of the new technology					
37. The community accepts the use of new technology					
38. Participants have learned enough to be able to apply the new technology					
39. Participants have learned adequate problem solving skills					
40. Participants have learned scientific research skills					
41. Participants start using the new technology in his / her field					
42. Other farmers start using the new technology					
43. Participants start experimenting with other crops					
44. PR contributes to a higher income for the participants					
45. PR enables participants to solve similar problems in future					
46. PR helps farmers to be accepted as partners by scientists					
47. PR contributes to a better fit between technology and farmers needs					
48. PR contributes to sustainable development					
49. PR helps scientists to get a better understanding of farmers needs					
50. PR enables scientists to get data from more and different locations					

Could you please indicate by putting a cross in the correct column if you do agree with the following statements whereby 1 =strongly disagree 2=disagree 3= neutral 4= agree 5 strongly agree

Statement	1	2	3	4	5
51. PR contributes to reaching the targets set in the program					
52. PR helps to reach the target groups					
53. PR enables women to participate					
54. PR is an efficient method for participants to reach an higher income					
55. PR has proven to be an efficient tool to increase the problem solving skills of the participants					
56. PR is an efficient way for participants to improved linkage with research					
57. PR is an efficient tool for the organisation to improve the research findings					
58. The organisation can efficiently improve the linkage with the farmers by applying PR					
59. The organisation can efficiently improve the position of the participants through PR					

60. Please write down any comments or questions:……

If you are interested in the results or have any further questions you can contact me at wouter.ton@gmail.com

Your information will be treated as confidential.

Thank you for your assistance with my research

Wouter Ton

Explanation of the terms used in the questionnaire.
Because there are so many definitions available the terms used in this questionnaire are explained below to avoid confusion.

1. Organisation: The organisation that is implementing the program through a PR method. The organisation is supplying resources like manpower, knowledge and inputs. The organisation can also be involved in the training of the facilitators and the design of the training material.

2. Facilitators: Persons directly involved with the training, coaching and support of groups of participants. The facilitators can be selected from the group of participants or the community or be part of the research, extension or the development organisation.

3. Program: Intervention by the organisation based on PR method to increase the income of participants from agricultural production, promote sustainable development and / or improve the technology being offered to farmers. This intervention can also be done on a project base.

4. PR (Participatory Research): All activities aimed to increase the income of participants from agricultural production, to promote sustainable development and to improve the technology. These activities are in consultation and collaboration with participants. In this questionnaire no differentiation is made between research and extension. As there is a very broad spectrum of participatory research approaches without clear definitions to differentiate between the various systems, all activities whereby the participants are involved in an active, collaborative learning process are considered in this questionnaire as participatory research.

5. Participants: Target group of PR, farmers organised in groups.

6. Scientist: Staff from research, extension or development organisations involved in planning, the development and dissemination of technologies.

7. Input-based technology: Technology whereby the main focus is on the improvement of participant conditions through the introduction of physical inputs of higher quality as the present inputs, a more stable supply of inputs and inputs at lower costs. Examples are: New disease resistant potato lines, improved breeds of cattle or more effective chemicals.

8. Knowledge-based technology: Technology whereby the main focus is on the improvement of participants conditions by improving the management and organisation The improvements are made on the basis of increased knowledge, analytical skills and decision making powers of participants. Examples are: Integrated pest management, grazing land control or erosion control.

Appendix 2: Interview questions Uganda

Questions to be answered during the initial interviews with various organisations in Uganda.

The methods used in the various programs.

1. What different programs do you have?
   For each of the programs:
2. Who is funding this program?
3. What research / extension method is your organisation using in this program?
4. Can you briefly describe this method?
   - Who is implementing the program in the field?
   - What did you do to get the involvement of women?

The motivation of the choice of applied method out of a range of possible methods

5. Why did you choose this research / extension method out of arrange of possible methods?
   - Level of organisation of the groups
   - Organisational factors; Available manpower, past experiences, organisational policy
   - Other: Donor, Government
   - Program content: Input based / knowledge based.
6. Have you considered other research / extension methods for this program?

A comparison between the different methods.

7. Can you make a comparison between the various programs you are using?
   - Costs
   - Effectiveness
   - Coverage
   - Farmers involvement

Experiences with other methods during the past 5 years

8. Looking back over the past five years are there methods you were using five years ago and you are still using today?
9. Has the method changed over the past five years?
10. How did it change?
    - Implementation in the field
    - Way to involve women,
    - Type of program applied to
11. Why were these changes made?
12. Are there methods you used in the past but that you are no longer using?
13. Can you briefly explain these programs?
14. Why did you stop using them?

Possible changes in the organisation resulting from a change of method

15. How has the organisation adapted to a change of the research / extension method?
    - Training of staff, hiring new staff
16. If you had to write a project proposal for a program based on IPM / soil fertility what research / extension method would you select?
17. What factors are determining this choice?
    - Level of organisation of the groups
    - Organisational factors; Available manpower, past experiences, organisational policy
    - Other: Donor, Government
    - Program content: Input based / knowledge based.

18. What will be the difference if you had to write a proposal for the introduction of a new variety?
19. Will this new programme require changes in the organisation?
    - Training of staff, hiring new staff

Appendix 3: Format for interview with development and research organisations

The methods used in the various programs.	
Organisation	Date: Spoken with:
1 Program	
2 Program donor	
3 Research method	
4 Implementation	
5 Involvement of women	
The motivation of the choice of applied method out of a range of possible methods	
Choice of method	
6 Level of organisation of the groups	
7 Organisational	
8 Other	
9 Program content	
10 Considered other methods	
A comparison between the different methods.	
Comparison with other methods	
11 Costs	
12 Effectiveness	
13 Coverage	
14 Farmers involvement	
15 Group development	
Experiences with other methods during the past 5 years	
16 Method continued last 5 years	
17 Changes in implementation	
18 Changes in involvement of women	
19 Changes in content of program	
20 Reason for change	
21 Method discontinued	
22 Reason	
Possible changes in the organisation resulting from a change of method	
23 Change in organisation	
24 Consequences for staff	
New proposal	
25 New IPM / soil fertility proposal	
26 Method	
27 Reasons for choice	
28 Level of organisation of the groups	
29 Organisational	
30 Other	
31 Program content	
32 Differences with an new variety program	
Remarks	

Appendix 4: Interviews for in-depth study

Interviews with field staff of government agencies and the four selected organisations

Interviews with the field staff of government agencies and field staff the four selected organisations in Table VII were held to complement the information collected from the farmer groups and the management of the organisations.

Table VII: *Additional interviewees for organisational characterisation.*

District	Number interviewed	Function	Organisation
Tororo	1	District Agricultural Officer (DAO)	Ministry of Agriculture Animal Industries and Fisheries (MAAIF)
Tororo	1	NAADS Coordinator	MAAIF
Tororo	3	Field staff	A2N
Luwero	1	DAO	MAAIF
Luwero	4	Field staff	VEDCO
Luwero	1	Field staff	NARO
Kapchorwa	5	Field staff	MAAIF
Kapchorwa	5	Field staff	ActionAid

Interviews with farmer representatives of organisations.

In Table VIII the details of the interviewed farmer representatives of the selected organisations are given.

Table VIII: *Details of farmer representatives of organisations interviewed*

Group	District	Number interviewed	Group size	Organisation
A2N 1	Tororo	1	18	A2N
A2N 2	Tororo	1	23	A2N
A2N 3	Tororo	3	27	A2N
A2N 4	Tororo	6	30	A2N
VEDCO 1	Luwero	2	28	VEDCO
VEDCO 2	Luwero	3	40	VEDCO
VEDCO 3	Luwero	1	13	VEDCO
VEDCO 4	Luwero	4	30	VEDCO
VEDCO 5	Luwero	15	30	VEDCO
NARO 1	Luwero	9	12	NARO
NARO 2	Luwero	15	19	NARO
NARO 3	Luwero	19	25	NARO
NARO 4	Luwero	16	25	NARO
ActionAid 1	Kapchorwa	15	25	ActionAid
ActionAid 2	Kapchorwa	1	30	ActionAid
ActionAid 3	Kapchorwa	8	200	ActionAid
ActionAid 4	Kapchorwa	16	90	ActionAid
Total 17		135	665	

Appendix 5: Format for interview with farmer group.

Organisation: Name of approach: Date of interview: Place of interview:	Name of the group: When started: Purpose to start the group: Membership: Male Female
Characteristics	
Assumptions about learning	
Type of participation	
Objectives of organisation	
Stakeholder involvement	
Roles of external and local actors	
Research and extension methods	
Source of solutions	
Attitudinal changes by farmers and scientists	
Description of the organisation	
Scope of activities	
Motivation of farmers	
Ability of farmers to learn	
Perceived relevance of the new technology	
Organisation of learning event	
Available resources for the learning event	
Method used in learning event	
Content of learning event	
Support for use of new technology	
Feedback on use of new technology	
Opportunity to use the new technology	
Learning by farmers	
Application of new technology by farmers	
Results for the group	
Results for the individual	