

## **Towards maximal regional growth potential in sugar beets – about the Team 20/20 PLA-project in Sweden 2003-2008**

Anita Gunnarsson, Department of Horticulture, Swedish University of Agricultural Sciences, Alnarp, Sweden

*Paper for the Action Research - Action Learning workshop: social Learning in Nature-Society Relationships – Methods and Tools in Action, Budapest, 23rd to 26th of June, 2008.*

*This paper was produced as examination for an international PhD-course in Action Research. The paper was examined and accepted in October 2008 by professor Sriskandarajah Nadarajah, The Swedish University of Agricultural Sciences, Department of Urban and Rural Development, The Division of Environmental Communication.*

## CONTENTS

A guide for the reader.....	3
The Team 20/20 story – an introduction .....	3
Breeding ground for the PLA approach .....	3
Preunderstanding about PLA .....	4
The intention behind the choice of PLA approach.....	4
Fundlers’ reaction.....	5
Group formation.....	5
From field to management focus, via a formative evaluation.....	6
Experimental part 2003-2007 .....	6
Action program (AP).....	6
Communication tools .....	8
Measurements and calculations.....	8
Results and conclusions .....	8
Practical implementation and conclusion.....	9
Management part 2006-2007 .....	9
Aims and methods.....	9
Results .....	10
Conclusions - management part .....	11
New research task in a new research cycle 2008 .....	11
Discussion .....	12
SBU’s intentions behind the choice of methodology – versus normatives for AR.....	12
Problem formulation .....	14
Stakeholders .....	15
Supporting the learning process .....	16
Classification of the work .....	16
Conclusions about the project as it actually worked .....	18
Action research or not? .....	18
Did we do the actions in the right way.....	18
What did we learn thanks to the working form? .....	19
Usefulness for participants .....	19
Connections to my research about beet root and biogas digestion .....	20
References .....	20

## **A guide for the reader**

I write this paper with the intension to make a first draft for the discussion in the coat of my dissertation. My dissertation will consist of 5 papers and a coat. Four of the papers are from studies using traditional scientific methods like field trials with block design, pot experiments and so called aeroponic experiments (growing in flowing solution). They are all with concern of plant nutrition in beetroots and/or effluent from biogas digested beet leaves and green manure ley. The fifth article, where I will be the second author, will be about a project that has connections with Action Research – Action Learning or Participatory Learning and Action (PLA). In that project I have been the project leader and facilitator and responsible for implementing the Action Research method.

In this paper I will not comment the four papers about research done according to traditional research methods. In the coat of my dissertation I will start with chapters about those. Just to explain for the reader of this paper I here give an extremely short summary: *Short term N efficiency in organic farming systems can be highly increased by using biogas digestion for crop residues and clover ley instead of leaving the crop residues in the field and growing clover only as green manure. This may be of importance for organic farmers' when considering investment in equipment for farm based energy production. It may also be of interest for societal decision makers with concern of environmental issues such as green house effects and N pollution.*

This paper will give a background of the PLA project and discuss some parts of the process in general and some findings that may be of concern for my research about beetroot and biogas digestion.

I begin with a narrative about Team 20/20, divided in four chapters. The following discussion is divided into five chapters beginning with reflections about our intentions with the choice of methodology versus normatives developed in literature about AR and PAR. I then discuss the problem formulation phase, stakeholders, the support of the learning process in the project and finally how our project can be classified in the possible range of participatory approaches.

Finally I formulate some conclusions about the project as it actually worked.

## **The Team 20/20 story – an introduction**

### *Breeding ground for the PLA approach*

The story starts in the autumn 2002. A sugar reform within EU was forthcoming. Details were not decided but it was clear that the sugar price should be severely reduced, causing strongly changed condition for sugar beet producers and sugar industry.

Swedish Beet Research (SBU) owned in equal parts by the only Swedish sugar industry (Danisco Sugar, DSAB) and the beet growers' organisation in Sweden (SBC) had recently finished a big (32 million SEK) research and development project. That project was named 4T. The project partners were SLU and Findus (food industry) but the project was coordinated by SBU (or rather the precursor as SBU was the result of a newly implemented reorganisation).

The moment had come, for SBU, to prepare for a new big project. The idea to work with participatory methods came from a research preparation group, consisting of one farmer (member of the boarder of SBU), the managing director of SBU and me. The preparation group, however, used input from a wide network of people contacted between our meetings.

At that phase the term On-farm-research was mentioned as a possible research approach. The first time the suggestion came it was from the managing director. On-farm-research was put on our priority list with issues interesting for further research. The choice to concentrate on an On-farm research approach was taken after a ranking of the ideas on the priority list. At the moment for ranking also a representative from Agricenter, the advice - and information bureau within Danisco Sugar, was present. At that time we did not clearly discuss what we meant with On-farm-research. However, there was a mutual image that farmers should be closely engaged, at least in the practical performance of actions. One reason for choosing the On-farm research approach, was that we thought that many of the other issues on our priority list could be included in an On-farm-research approach. At the same time we would get the opportunity to adapt and disseminate the findings from the 4T project and from other earlier projects in case of not already implemented.

#### *Preunderstanding about PLA*

The priority list was considered by the boarder of SBU and the decision was taken to concentrate on realising the PLA idea. After the decision by the SBU boarder I spent three weeks in preparing an application for funding. Since some years ago I had got in contact with the PLA approach a couple of times: the first time was from a person engaged in rural development and my reaction was: “Okay, that may be a way of working when outsiders from another country come to a developing project in the third world – but nothing that we need in Sweden. As advisors and researchers we already know everything that we need about the context, and we are used to talk to farmers in “the right way””. The second time I got in contact with the concept was at a one or two day course in self mobilised PLA (deltagardriven forskning) arranged by some researchers at SLU oriented towards organic farming. I was then the group leader for a consultant team within organic farming. At that time my main reaction was: “Okay, as group leader for the consultants in organic agriculture I could very well engage myself or any of the other consultants in this – but only if we are fully financed. The main benefit, however, is for the university researchers that have too little contact with farmers. For us, always working very close to the farmers, there is no actual need for this approach.” Soon after the course SLU made an attempt to initiate a PLA activity with organic farmers in my region but it failed.

With this background<sup>1</sup> I didn't know much about the PLA approach, but still much more than the other staff at SBU and also than the boarder of SBU. I read about PLA, especially in a Swedish introduction book by Eksvärd (2003) and in a book about On-farm-research by (Mutsaers m fl, 1997). The former gave an introduction to many of the ideas behind PLA and also to the importance of the group process and communication tools. The latter had among others a useful part about using statistics in On-farm-research. With that in the luggage, mixed with literature about “known” potentials in sugar beet growing technology I wrote an application for money to The Swedish Farmers' Foundation for Agricultural Research (SLF). At this time I was 25% through a PhD education on SLU in an area that had nothing to do with my work at SBU or with PLA.

#### *The intention behind the choise of PLA approach*

As already mentioned, the research preparation group, which suggested the project approach, never clearly discussed what the exactly were the reasons for choosing the On-farm-research methods. However, during the process of writing the application, we had an internal discussion within SBU which was also anchored within the SBU boarder. That resulted in a list with arguments for and intentions with the kind of PLA approach that we planned. The list was used in the application to SLF. According to that list we believed that

<sup>1</sup> I actually also had a 16 p university course in Organisational psychology in 1995/96.

- the largest knowledge about what is possible to perform on a farm is possessed by the farmer and the advisor connected to the farm.
- group dynamics and social learning work as a strengthening forces in a forward aiming developmental work
- by choosing farmers that are already in the upper quartile in sugar yield we would avoid making the project an extension project instead of a development project that was our intention.
- by performing technological experiments in field scale we would get the possibility to elucidate system effects. For example an action that has a positive impact on the soil structure (for example a catch crop) should not only give effect on time for soil tillage and seedbed preparation but also on weed situation (amount, species, time), dirt when harvesting the beets e t c.
- If finding new technology the diffusion to other farmers would go quicker as farmers trust more in workability of farmers solution tested in field scale than on researchers solution only tested in small plot field experiments or in pot experiments.

#### *Funders' reaction*

Half of the funding for the work was supplied from a traditional research fund for sugar beet research governed by SLF. The rest was money directly from SBU i.e. 50:50 paid by DSAB and SBC. The scientific experts at SLF had, as far as I can understand, no knowledge about or experience of PLA as methodology. The pressure from SLF was high to produce a “traditional” research outcome. One main critic from them was that we would not be able to produce generalizable knowledge. We were, anyhow, allowed to start the project in the spring 2003 but we were demanded to complete the application with further explanation on statistical topics and to anchor the project in a scientific expert committee at the latest in the autumn 2003. I was allowed to suggest persons for the committee myself and my suggestion was accepted. The scientific committee consisted of three persons: 1) the researcher in the SLF committee who was the submitter of my application in SLF the decision group 2) an associated professor in soil science who was my fellow-applicant 3) an associated professor at the department of rural and urban development. Person no 3 was chosen because he had experience from traditional research methods in natural science and multivariate statistics but was also involved in the germinating interest for PLA and action research at SLU. The result of the discussion with the scientific group was a renewed declaration from SBU to SLF with detailed explanations about how multivariate statistics could be used and a recommendation from the research group to get in contact with a PhD with experience from action research, We then got funding for three more years and the scientific expert group declared themselves redundant as the project organisation already worked with the principle of using ad hoc committees.

The SBU boarder was not saddled by the positivistic, or any other, scientific paradigms. However it was of economical importance to get the finance from SLF. The SBU boarder also found it valuable to get a so called formative evaluation, thus evaluate the ongoing project with the purpose to improve it. Therefore we directed money within the budget to finance a formative evaluation by a PhD-student in collaboration with a PhD researcher with knowledge and personal experience from action research.

#### *Group formation*

The principle for the participant group constitution was (i) beet growers with high beet yields (ii) at least 20 ha of beets (average in Sweden was 14 ha) (iii) representative for the different parts of the sugar beet growing region in Sweden in crop rotation as well as in mix of

production branches and soil types (iv) interested to join the project which next to investment of time in the project also would mean a certain intruding in their beet fields. Next to the farmers the group consisted of advisors within plant husbandry, DSAB's specialist advisors for the beet crop and agronomists working with sugar beet research and development within SBU. The three rolls of project leader, facilitator and research leader was hold by one of the agronomist at SBU – me. In close connection with the project, was also a professor in soil science/soil tillage from the Swedish University of Agriculture (SLU) and a scientist (PhD) in soil biology and plant protection, also from SLU. All participants in the group were paid for the time spent in meetings and the farmers got compensation for extra work in the field.

#### *From field to management focus, via a formative evaluation*

The learning and research cycles are presented in Figure 1. In the first two cycles, the group worked with the conception that the problem, caused by the beet price reduction, could be solved by performing others in the beet field or possibly at the beet storage. In that way the sugar yield would raise and/or the production cost per area unit fall. The goal for the project was specified within the group during the first summer: “increase yield with 20% and reduce costs with 20% until the year 2006. The working name was then also decided: “Team 20/20”. From the end of 2005 it stood clear that we would not be able to solve the problem for this category of farmers by changing the routines in the beet field. We then enlarged the focus in the project to include farm economy and management. We also engaged a researcher with speciality in farmers' economic decision making. More Details about the two parts of the PLA project (the field focus experiment, 2004-2006, and of the project with management focus, 2006/07) are found in the Appendix.

The process was analysed, in the spring 2005, in a so called formative evaluation based on a semi structured interview of the participants. One of the suggestions in the evaluation was to introduce outsiders to the project as provocateurs or for new inspiration. Another suggestion was to define and discuss the chosen system boundaries. Both advices were followed. Especially the second was probably important for preparing the way so that the boarder of SBU allowed more money to let us work with the management focus in 2006/2007. The outsider brought in a discussion about what we actually were doing: he suggested that we should not view our work as a natural scientific research project but rather as a research question formulating project. At that moment we saw that the we were not even in the neighbourhood of reaching the goals for the experimental part: i.e. 20% yield increase and 20% reduced costs. The outsider helped us to accept that if we, out of our experiences could formulate one or more good new natural scientific research topics we had made a good job.

A new interview round was made the spring 2008 but it is not yet analysed.

### **Experimental part 2003-2007**

#### *Action program (AP)*

The main part of the experimental work was performed in a field scale where about 3 ha in the middle of a beet field were used for studying the added effects of an Action Program (AP). The AP included mutual ideas but was adapted to local possibilities and conditions. The mutual ideas for the action program was: (i) autumn grown catch crop or a full year green manure ley in order to improve soil fertility (ii) placement of fertilizer, preferably with a new machinery developed for levelling or light harrowing, placement of fertilizer, drilling, and repacking the soil over the seed row – all in one moment (iii) liming to a somewhat higher pH goal than is normally used in Sweden (iv) reduced amount of tractor runs and reduced soil

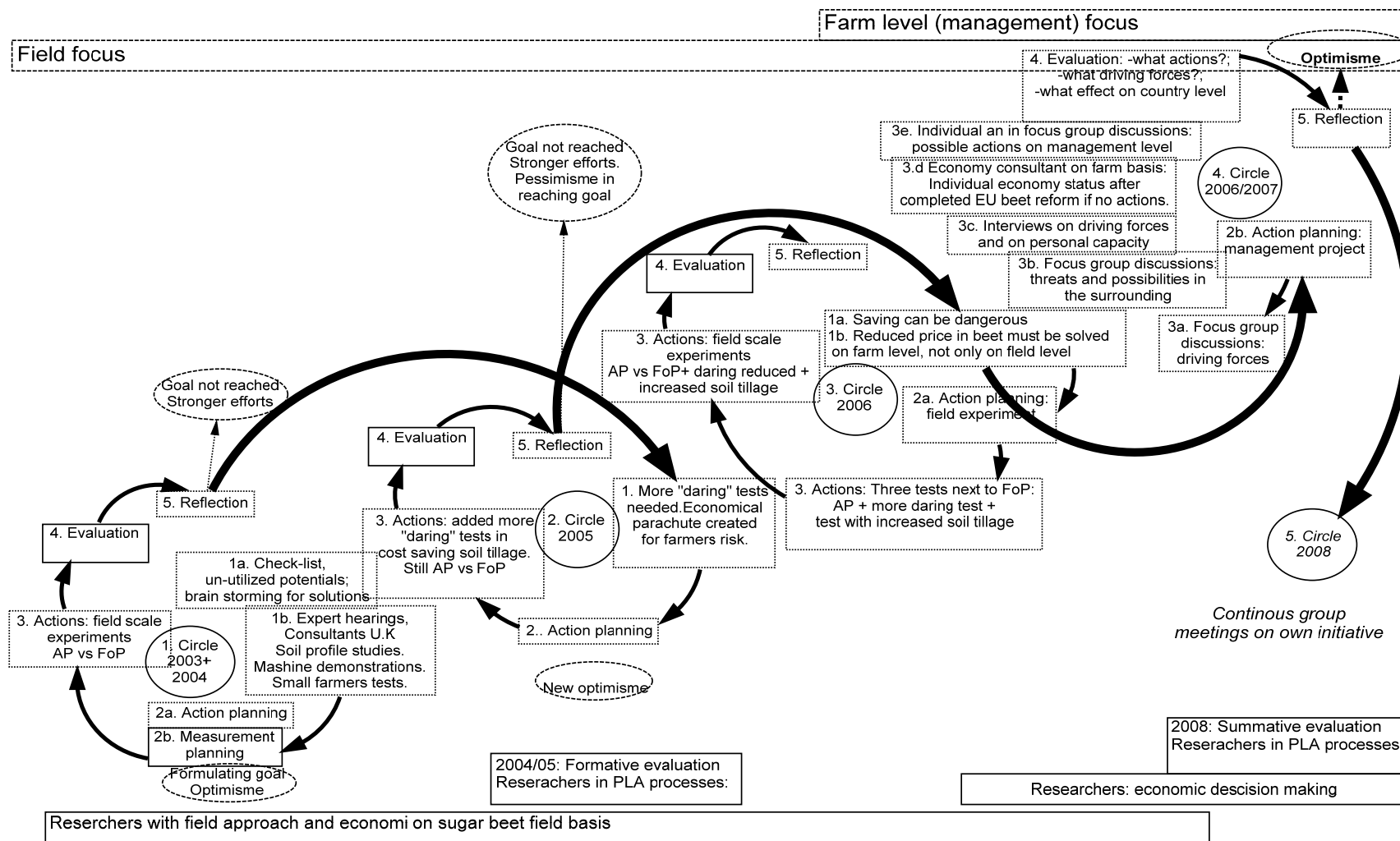


Figure 1. Cycles in research, action and learning process in Team 20/20 – sugar beet project for meeting the EU sugar reform.

tillage with purpose to reduce cost but not beet yield (v) utilize all possible system effects of actions (i) to (iv) such as e.g. possibility for earlier drilling thanks to non plough system or catch crops, reducing amount of fertilizer thanks to placement of fertilizer.

None of the actions in AP were earlier used in any of the Farmers ordinary beet growing program (FoP).

#### *Communication tools*

##### First year

- individually going through a check list for how to get best results in sugar beet growing
- mutual brain storming and group discussions for getting ideas of how to increase yield or reduce costs
- expert hearing about action program and measuring program
- expert advisors from U.K. visiting each farm and suggesting actions to take into account for each farm
- individual calculation of real production cost for sugar on each farm followed by group discussion about the results
- formulating the goal: + 20% in yield – 20% in costs per ha or – 33% in production costs per unit sugar

##### Yearly

- yearly group meetings in field for discussing and learning from one year to the other
- yearly group meetings in the winter for discussing and learning from results of field work
- yearly summer and winter: farm meeting (advisor + farmer + technology expert + facilitator/project manager to discuss local action program e t c,
- yearly farm-wise field meetings with soil profile studies
- the farmer was participating in all decisions in his field, even when equipment were hired especially for the AP

#### *Measurements and calculations*

- a rigorous program with measurement and analyses was designed in order to make a causal interpretation of the results on sugar yield of the AP compared with FoP
- all measurements were performed by field research staff and analyses made at laboratories by specialists e.g. in nematology, soil biology, chemical analyses of soil and plant e t c.
- results were presented yearly mostly after statistically analyses for farm-wise differences between AP and FoP
- yearly economic calculations of net and gross margin in AP and FoP

#### *Results and conclusions*

In total 28 experiments the full measurement program was performed. (Beside those, about 15 introductory experiments were performed.) On average the action program (AP) gave the same yield but lower gross margin than Farmers ordinary program (FoP). However from the big deviations between the fields we could draw the following conclusion: AP had made yield rise were:  $\diamond$  plant establishment was not reduced in AP,  $\diamond$  soils were sandy rather than silty,  $\diamond$  nutrient status in small beet plants general was good  $\diamond$  problems with harmful insects or soil pathogens in spring were small. The conclusion was that  $\diamond$  a change in a beet growing system must never intrude with a demand of an even establishment of beet plants in time and geometry  $\diamond$  there was a positive synergy effect on beet yield of placement and reduced tillage  $\diamond$  Brassica as a catch crop had positive effects on early plant growth but may, on clay soils



with low or moderate precipitation, have a negative effect on final beet yield probably due to reduced N availability. ◊ the concept with Brassica catch crop and non-plough tillage is ready for wider implementation/adaptation on soils with 70% sand or more. On heavier soils the net N residual effects must be further evaluated.

#### *Practical implementation and conclusion*

Although the results from the total AP were depressing many of the pieces in the action plan will be further tested by the farmers in the group. From an interview after the third and final year of field experimentation we know the

- five out of seven farmers will go on or experiment further with Brassica as catch crop,
- three of five will go on or experiment further with placement of fertilizer and/or reduced amounts of harrowing and/or reduced ploughing depth
- two of seven will go on or experiment further with the special new equipment for drilling and placing fertilizer tested in the AP and/or changing plough towards cultivator before beet growing

We concluded that even though the average effect of the tested AP did not increase yield or improve farmers economy the farmers could pick out specific parts of the action program that were interesting for them. Every farm is unique. What is interesting for the average farm can be valuable for a specific farm – and the other way around.

In general, the farmers were more content with the results than the project leader: the results were a confirmation of that their ordinary program for beet growing was good.

### **Management part 2006-2007**

#### *Aims and methods*

The final year the Team 20/20 group widened the focus of the project to also include farm management. Results from the field experiments showed that we would not find a solution for reducing production cost only by doing changes in beet field action. The management project had as purpose to strengthen the farmers in Team 20/20 in their decision making process and to make themselves and the other actors in the Team 20/20 group more aware of how management decision making in practice is performed. The overall aim was that this, through articles e t c could lead to a better management decision process for all sugar beet growers.

The project had as specific goals to describe

- the economical reality on the farms after full implementation of the sugar reform if no action were taken to reduce the negative effects
- what actions does the farmer think that he will take after having worked the situation through with an economy adviser and discussed possible actions with colleagues in Team 20/20
- how does the farmer think i.e. what reasons and driving forces are important in decision making about actions to reduce effects of the beet reform

During the whole process the work was supported by a reference group with among others a professor in farm management economy with focus on decision making. The methods used was an individual analysis of

- the economical status of each farm based on the year 2005, i.e. the last year before the begin of the sugar reform
- of the impact of the sugar reform when fully implemented, if no actions were taken on the farm to compensate for the reform. (As the details for the reform were not set until

- individual discussion with economy advisor about needs and possibilities to compensate for the reform on each farm
- a focus group discussion followed by individually interviews about values and driving forces in farm management development. The interviews were structured, but including notes with the farmers reflection about the answers
- group discussion about threat and possibilities in the surrounding world
- group discussion about possibilities and possibilities on each farm
- use of communication tool about impact on the farm manager's values on possible management changes
- an analyses were information from all activities were analysed (by economist and me)
- report writing
- possibilities for all farmers and advisors to react on the result of our analyses

### *Results*

General data: The seven farms had an average size of 203 ha (90-315 ha), a 16 – 25% of the acreage with sugar beets, a beet yield that were 19% larger than farmers in their local beet growing region (from +7 to +31% ) and the farmer had an age of 53 years old (46-65).

The effect of the EU sugar reform if no reducing actions were taken by the farm manager was that the profitability of the farms would be reduced with 16 000 – 40 000 Euro.

All farmers in the Team 20/20 group had already taken actions or had decided for actions in order to meet the reduced income from sugar beets. All of them had also one or more ideas of new production or business branches or considerable increases in an actual production branch.

When choosing between possible actions the most important driving forces were – to keep the company sustainable within their time as farmers. – to be able to retire in a desirable way, - to be an independent company manager and keeping the crop production under their own management – to gain social benefits by cooperation with family members or persons outside the family. When possible they minimized the risks with new enterprise branches by testing in a small scale. A common way of decreasing risks in new cost demanding business branches was to collaborate with other farmers. Especially for developing new production branches social benefits were taken into account: possibilities to develop the new branch in collaboration with a family member or in companionship with a college or that the new branch made it possible to keep employed staff in the company where important driving forces when planning for new production branches.

The decided actions can be grouped as ◊ increase acreage: 60-70% of the farmers; increase the beet acreage: 70%, improve drainage: 30%; increase collaboration with other farmers: 30%; selling machinery services to other farmers: 60%; limit investments in machinery: 30%; limit labour costs: 30%; invest in new machinery: 30%; new production branches or a considerable increase of an existing production branch: 100%; new heating system (bio energy or other renewable energy source): 85%; negotiate land rent and interest rate: 60%; others: 85%. I will not go into details about what new branches that were planned but 85% of the farmers had far developed plans for enterprise branches not belonging to traditional farm business. 40% of the farmers planned new enterprise branches within traditional agriculture. Altogether we are talking about ten far developed ideas for new enterprise branches or considerable increases of an existing branch.

Even if serious calculations were made that showed that a farm with 1 000 ha and 20% sugar beets would get 150 Euro per ha lower production cost none of the farmers saw a big increase in size as the main solution – even if they were interested in an increased acreage if it could be to a reasonable cost.

### *Conclusions - management part*

All farmers had plans to meet the changes. The crop production will still be an important base in their companies. Their choices for actions are made with concern of a balance between economic reality, personal qualities and values for the farm manager. Farmers' interests and special skills, social values within and outside the family and possibilities to minimize risks were important when choosing actions. Overall values were to keep the company within the family within the farmers' active working life and to keep the traditional farming-part of the company under own management. Thoughts about the next generation were often included in the considerations, irrespectively if a successor of the farming management part of the farm within the family was probable or not.

### **New research task in a new research cycle 2008**

Since end 2007 the group members has continued to meet, for their own pleasure, and own money. My roll for 2008 has been to facilitate and document the group process in a new start and search phase with no other driving force than their will. My task has also been to see if the group, including myself, wants to and is capable to go on with a working form were farmers, advisors and formal researchers are working together in a self mobilised participatory learning and action research work or if the outcome rather will be something more like traditional study circle or experience group were researchers and advisors' roll are that of the expert. A goal for 2008 was that the group should define its forthcoming work, make explicit what is the purpose of the work and in what field will it be concentrated, who are responsible for that things happen, who will be influenced by the work and the results, who can decide over changes or not, what values are pre existing.

We have had three meetings with the whole group until now. In the first meeting we listed issues or areas that anybody found interesting to work with. At the second meeting we worked further with the two areas that were ranked as most interesting. At the third meeting we the defined the work of the group by using the so called CATWOE tool (Eksvärd, 2003, after Checkland as a part of his soft systems methodology) (see Box). Two areas were prioritised: Market survey and soil tillage (see the Box).

One new project has been started: project Bb according to the box. When applying for money

#### **DEFINITION OF THE TEAM 20/20' WORK**

Team 20/20 is a group where the group members themselves, i.e. the old Team 20/20 group decide. We are going to work with topics that concern management with a focus on increased rentability in crop husbandry. During the nearest future we are going to focus on two areas:

- A. Market survey
- B. Soil tillage with the final goal to find farm adapted approaches to reaching a perfect seed bed in two tilliga occasions: one with heavy equipment and one with a seed bed harrow, The B focus may be divided as:
  - a) On-landploughing - practical test
  - b) Farm-wise documentation of the status of today
  - c) Experimental part: make experiments with concrete ideas for how to reach the goal

What we, through the work in the group endeavour is to

- learn more about, get more experience from and exchange experiences about dealing with futures and forwards for agricultural products
- get practicly usable knowledge about ploughing on-land as a tool for reducing harmful soil compaction
- reach a perfect seed bed with two tilliga occasions.

The work will be performed by the members in "old Team 20/20" completed by suitable and interested researchers or experts, differing depending on the actual topic.

The work will impact

- our selves (in the short term)
- the research society and other farmers (in the medium long term)
- the society in all (in the long term)

Our worldview is that we believe that

- 1) We can learn through our way of working
- 2) What we learn, other can learn from us

we clearly declared that it had an PLA approach, but the reports we promised to present were about the technological results and experiences. The financier is a fund for non-research projects govern by LRF. The funder accepted the project but added a demand for a report including a discussion about the methodological approach.

A second project idea about market survey is under discussion with the county boarder (Länsstyrelsen). This project has to do with creating a competence developing program for farmers in market survey including participatory methods.

## **Discussion**

*SBU's intentions behind the choice of methodology – versus normatives for AR*

Intention 1: the largest knowledge about what is possible to perform on a farm is possessed by the farmer and the advisor connected to the farm:

The intention shows that we respected the value of local knowledge. AR is based on the affirmation that all human beings have detailed, complex and valuable knowledge about their lives, environments and goals (Greenwood and Levin, 2007 p 103, referring Carr & Kemmis, 1985 and Schwandt, 1997). This knowledge is different from scholarly knowledge because everyday knowledge is embodied in peoples actions, long histories in particular positions and the way they reflect on them. This kind of knowledge is different from much conventional knowledge because practical wisdom, practical reasoning and tacit knowledge are its central characteristics.

The first intention also has connection to the AR ideas about that knowledge is context bound. A local theory is context bound and makes sense in the context of years of local processes matching interpretations with concrete experiences (Greenwood and Levin, 2007 p 104). The words “” what is possible to perform” in intention 1 shows that we believed in the workability argument for AR. If we would find a way to improve beet growing technology within the chosen methodology that would be a guaranty for workability. Workability is the central aim of any AR project, most particularly from the point of view of the local stakeholders (Greenwood and Levin, 2007, p 100).

Successful workability does not automatically create a credible understanding of why something worked; it only shows that it did work (Greenwood and Levin, 2007, p 100). Moving from workability to credible knowledge that can be shared beyond the local project requires subjecting the workable outcomes to a variety of counterfactual analyses, to searching the literature and known cases for other approaches that creates similar outcomes. If other cases can be found – a clear responsibility of the professionals in AR – the local AR interpretation of why actions were taken and why they had the effects they did can be contrasted with other possible interpretations that might account for the results In this way an interaction among cases is created that is a core feature of the development of the professional research side of AR. The way Greenwood and Levin (2007) discuss is influences from that their research focus is on social science and organisational development. In our context we, as professional researchers, had the responsibility not only to interpret our results versus other case studies but also versus results from other relevant conventionally agricultural research. For that reason we had a rigorous measurement and analysis program.

The ideas behind AR are that the combination of local knowledge (practical reasoning) and scientifically constructed knowledge has a inherent superiority in the study and resolution of

complex problems (Greenwood and Levin, 2007, p 104). They call that the dialectic relationship between local and professional knowledge. But it is not the easiest part of action research: “Dialectics may sound attractive, but often, as a lived experience, they are exhausting and even enervating.”

Intention 2: group dynamics and social learning can work as a strengthening force in a forward aiming developmental work

The second intention indicates that we believed in the ideas from Kolb (1984) that different people have different preferred learning styles and when learning in a group the different preferences can complement each other. The different kind of abilities that learners need are (Kolb, 1984, referred in Pretty et al. 1995): (i) involve themselves fully, openly and without bias in new experiences i.e. concrete experience respected the value of local knowledge (ii) reflect on and observe these experiences from many perspectives i.e. reflective observation (iii) create concept that integrate observations into logically sound theories i.e. abstract conceptualisation (iv) use these theories to make decisions and solve problems, i.e. active experimentation.

In AR literature the expression social learning is often used. The expression can have several meanings (Wikipedia, The free encyclopaedia) Schusler et al (2003) defined the expression as “learning that occurs when people engage one another, sharing diverse perspectives and experiences to develop a common framework of understanding and basis for joint action. They found eight process characteristics that fostered social learning: open communication, diverse participation, unrestrained thinking, constructive conflict, democratic structure, multiple sources of knowledge, extended engagement and facilitation.

The implementation of intension no 2 is further discussed under the subtitle Supporting the learning process

Intention 3: By choosing farmers that are already in the upper quartile in sugar yield we avoid making the project an extension project instead of a development project that is our intention.

With this approach we had the opportunity to externalize the expert farmers’ tacit knowledge which is one of five important issues needed for optimizing the collaboration between farmers and scientists in the field of technological innovations suggested by Hoffman et al (2007). The other four issues were:

- user orientation when setting research priorities. That does not necessarily mean that researchers should work unreflectedly on the research priorities identified by farmers. Only the farmers can express the problems that they perceive to be relevant. But only researchers can assess whether or not their knowledge and methodological approach can contribute to problem solving in a specific case. Many problems may not require strategic or applied research and can be solved by other means (adaptive research, extension/advisory service or development activities)
- make use of the farmers possibilities to supply decentralised experimentation
- formal research should be more open to farmers informal experimentation
- respect opportunity costs if farmers dedicate time to research

In the project period 2003-2007 we used the opportunity to externalise expert farmers’ knowledge by presenting each farm in articles in the Beet growers’ magazine. In each article the farmer together with the advisor reflected over what in the practice on the farm could be changed in order to increase beet yield or reduce costs. However the opportunity to

externalize the farmers' tacit knowledge was not fully used. Therefore this has got a larger focus in one of the projects that started in the autumn 2008.

Intention 4: By performing technological experiments in field scale we should get the possibility to elucidate system effects.

We had a wish to reach results from the whole system, Interest for the whole system is often mentioned as a criteria for AR (e.g. Eksvård p 20, after Conway, 1985, Pretty et al. after Conway, 1987, Greenwood and Levin, 2007, p 57-59, However we fell into the natural scientific positivistic paradigm: we forgot that farmers were a part of the system. Their preference for being efficient and preparing the whole field at the same time made it difficult, or close to impossible to see the expected system effect.

Intention 5: If finding new technology the diffusion to other farmers should go quicker

The fifth intention could be interpreted as if we only had a conventional view upon technology development and transfer: technology emanates from "upstream" activities in the formal research system (i.e. in our case from among others the 4T project) and is adapted by "downstream" research (in our case the Team 20/20 project) until it is ready for dissemination to other farmers. The PLA approach has another view upon both technology development and transfer. Agricultural innovations are derived not only from laboratories and research stations of the national and international centres but from multiple sources (Cramb, 2005 referring to Cramb, 2003). These resources include research-minded farmers, innovative research practitioners at the local level, research minded administrators, non-government organisations, private corporations and extension agencies. In the "multiple source" model technology consists of many old and new components. It evolves and is continually modified over time. Consequently, in contrast to technology transfer, there is no clear-cut, one-way progression from research to extension to adoption.

That SBU initiated the Team 20/20 with the PLA approach, is an indication on that we agreed upon Cramb's description. Also the way SBU is organised, which is mainly built on networking with farmers, advisor organisations, machine holders, field research enterprises, university researchers, industry researchers e t c is based on the worldview described by Clamb. With the mix of intentions from SBU the most correct way of classifying Team 20/20 is as a mix of Farmers First and Learning and Action Research (Probst *et al's* (2003),

The intentions about technology diffusion were also based on the workability aim (Greenwood and Levin, 2007) of action research mentioned earlier. We believed that farmers trust more in workability of farmers solution tested in field scale than on researcher's solution only tested in small plot field experiments or in pot experiments. This was also expressed by some of the farmers in the interviews performed in 2008.

*Problem formulation*

The overall problem with reduced beet prices was already defined by the research preparation group in the autumn 2002. Swedish Beet Research (SBU) had also, already before farmers and advisors were engaged, made an application for money, indicating that the work would be performed at the field level. SBU also brought in the field focus instead of the farm level focus into the project e.g. by using a pre-prepared check list for what could be done to maximize economic outfit in beet growing.

Greenwood and Levin (2007) pay a big focus on the problem formulation process in AR. The participants should formulate the problem themselves. But on second hand they state that (p

1) “all projects are context specific and limited closely to the skills, background and interests of the practitioners”. The EU sugar reform was a big problem both for the industry and the farmers so let us accept that we did not discuss with the participants whether we should work with that or not. However, instead of starting with a brain storming about what to do better in the field technology we could have started with a workshop with less prejudiced opinion that the problems should be solved by better performance in the field work. We may have ended up in a totally different project.

### *Stakeholders*

Both farmers and advisors were included in the group. The advisors were both from independent advisory organisation and from Agricenter in DSAB. Not only the farmers but also the advisors were clearly stakeholders in the meaning that the problem that would be expected by the sugar reform was of importance for them and also to find solutions. However, the roll of the advisors was unclear and is needed to be further discussed, and developed. In the new project cycle, starting within Team 20/20 in the autumn 2008, the advisors are more practically engaged as a part of the research team. They have as their clearly outspoken task to be engaged in the process of externalizing the farmers’ tacit knowledge about soil tillage and seed bed preparation.

In a wider perspective the SBC boarder and all SBC members were stakeholders: whatever the results of the project would be it could influence not only the single growers but also the collective as the results could be used e.g. in negotiations between DSAB and SBC about sugar contract. It was therefore a big strength in the project that the idea germinated in a research preparation group were both DSAB and a representative from the boarder of SBC was present. During the whole project period 2003-2007 I reported results and progresses and had a dialog with the SBU boarder, with Agricenter at DSAB and with a group including the SBC boarder and sugarbeet growers closely connected to the SBC boarder. I also had a specific decision group with the aim to decide about issues concerning project economy, quality and time. The decision group consisted of two persons: the president and the vice president from the SBU boarder. The only one was the chief of the Swedish and Danish Agricenter and the other one was a farmer. Thus both industry and beetgrower were represented in a good directly or indirectly in the prokect.

We could have invited more stakeholder categories: the sugar reform was of big importance also for machine holders. Also farmer’s family could have been engaged, especially in the cases where both partners were engaged in the business. Also farmer workers could have been engaged, or farmers union. That had probably caused a tension in the group. The sugar industry wanted farmer to be more efficient so more sugar could be produced per man hour. Also many of the farmers intended to solve their problems by reducing the amount of bought working hours. On second hand Schusler et al. (2003) found that social learning is fostered by a constructive conflict.

An approach with a wider representation in the group would have needed another initiator and financier – especially if farmers labour would be included. From a societal point of view, and from the AR point of view with empowerment and democracy that might have been more interesting than what we did.

In our project SLF was an important and powerful stakeholder but not included in the project group. However, the project may have had an impact on the learning within SLF. This would be an interesting topic to go deeper with.

### *Supporting the learning process*

One of the aims with PLA is to learn. The facilitator has to support the learning process (Eksvärd, 2003, Pretty et al, 1995) and to enhance participant's ability to think critically (Greenwood and Levin, 2007, referring to e.g. Brookfield, 1987). Many of the activities in Team 20/20 were used with this purpose. However most was concentrated on the iterative learning and reflection about the experimental part, and later in the management development part. In contrary learning and reflecting about the PLA methodology was avoided. Reasons were mainly that a blind cannot lead a blind. However I had an introduction at the first meeting in 2003 explaining some ideas about PLA including the learning cycle approach (Kolb, 1984) and the seven degree of participation from passive participation to self mobilisation (Pretty et al, 1995 adapted from Adnan et al. 1992). In the summer 2003 I wrote a short article in the Beet growers' magazine about the PLA. In the summer 2004 we invited a Swedish action researcher (Magnus Ljung) to give a presentation about participatory approaches. The presentation was followed by a discussion. At that occasion also one of the farmers in the boarder of SBU was present.

In august 2007 I was co arranger in a 1-day workshop about self mobilising PLA at the University of Alnarp. For several reasons the workshop was held in the end of September which was a bad timing for farmers. Only one of the farmers was present at the workshop and he really appreciated the day. One of the advisors was present half of the day, mainly because I had personally contacted her, as none of the other advisors had the opportunity to come. During the work with the group in 2008 it has been expressed as a fear for the work that there should be too much focus on the process. Nevertheless participants have several times expressed that they think that it is necessary for the group to have a facilitator. I make the conclusion that most of the participants are convenient with being engaged in the process but they are 1) not interested in talking about it and 2) mainly interested in doing experiments or discuss realities concerning their daily practice, but not discuss the PLA practice.

### *Classification of the work*

Greenwood and Levin (2007, p 205-206) express some critical view upon the practise of PLA often used in development projects in developing countries. They mean that PLA then normally is avowedly short term, whereas AR is generally conceptualized as a longer-term relationship between insiders and outsiders. PLA projects have often been insensitive to power relations and gender relations, both key elements in AR approach. PLA practice has not focused enough on building sustainable relationships that will keep innovations from deteriorating back to the original situation. PLA practice has not had enough focus on dealing with intragroup conflicts that it identifies. The critic may be relevant for the practice but in theories about PLA expressed in Pretty et al (1995) the critic is more a signal that practice and theories are not always the same.

On contrary to the critical attitude to PLA practice Greenwood and Levin (2007 also states that all AR projects are context specific and limited closely to the skills, background and interests of the practitioners. It is a real process, happening in real-time contexts with real people, and it has the contingencies, defects and exhaltations of any human process (p 113).

Vernooy (2005) suggest a constructive approach to the quality discussion: they encourage researchers to critically reflect over what kind(s) of participation that is appropriate to the different stages of the research cycle. He suggests three complementary entry points for investigating these questions: the decision making process, the research context and the aims of participation. For the decision making process he suggests a typology adopted from Probst et al. 2003 with increasing degree of active involvements in decision making: contractual <



consultative < collaborative < collegiate. Consultative participation is when most key decisions are made by one social actor, but emphasis is put on consultation and gathering information from others, especially for identifying constraints and opportunities, priority setting and/or evaluation. Collaborative participation is when different actors collaborate and are put on a more equal footing, emphasizing linkage through an exchange of knowledge, different contributions and sharing of decision-making power during the innovation process. In collegiate participation, different actors work together as colleagues or partners. “Ownership” and responsibility are equally distributed among the partners, and decisions are made by agreement of consensus among all actors. With this typology only the collegiate participation should be classified as action research according to Greenwood and Levin (2007).

The degree of participation in Team 20/20 2003.2007 was a mix of collaborative and collegiate. During the project most decisions were made with the collegiate approach. However, the research program was developed to suit into the sugar beet funding program at SLF and the program was written by SBU before inviting the farmers and advisors participants. This together with the initial emphasises of SLF to generate generalizable knowledge ensured by properly used statistics limited the possibilities for collegiate decisions. However, the power of SLF was also used to introduce persons with more professional knowledge about action research to the project. The most important effect of the formative evaluation was actually that it empowered me in my roll as the project leader and facilitator of an action research project in contrast to the leader of a conventional field research project.

The aim of participation was initially to find cheaper ways of producing sugar. The attempt to generate generalizable knowledge instead of context specific knowledge is contrary the aims of AR. However, during the project period we presented the farms and results from the farms one by one in the Beet growers’ magazine. At the end of the project we presented the results in a more generalizable manner. In that way we tried to combine the context specific approach with the demand of producing some kind of generalizable knowledge.

If only technological innovations are the goal participatory methods may not always be the best choice. Sumberg et al. (2003) suggested that the need and usefulness for farmers’ participation depended on (i) need for specification of the technology before releasing it to the users, (ii) how sensitive the technology is for environmental differences, and (iii) how big solution space there is when using a fully specified technology. As an extreme they mentioned development of vaccine against livestock disease as less suitable for farmers’ participation, except from a limited role in problem identification. According to that soil tillage that Team 20/20 will work with from 2008 and forward should be very suitable for farmers’ participation.

SBU had no democratic or social aim with the project, and neither any expressed ambition to develop a longer-term relationship between insiders and outsiders. Nevertheless the group has started a new period of collaboration. During the year 2008 new goals has been formulated and one new project has been started and two more are under preparation. A reason for that the farmers want to go on may be that they get recognition for their knowledge which contributes to a good self respect and self confidence – a prerequisite of a social sustainable working situation (Nordström Källström & Ljung, 2005).

## **Conclusions about the project as it actually worked**

### *Action research or not?*

The project Team 20/20 can in the period 2003-2007 not in all parts be called an ideal action research project. However it seems as if it is developing in that direction in the new phase starting in 2008.

Although the knowledge of AR was limited for all stakeholders and mainly based on the small but extremely comprehensive book of Eksvård (2003) studied by the project leader the practice developed to something that is not too far from Greenwood and Levins (2007) idea about action research.

### *Field focus contra management focus*

Even if we would have started with a more correct collegiate problem analysis we may have ended in a similar approach with a field focus during the first years. Both farmers, advisors and researchers were interested in working with the field focus. The choice of actions that were added into the action program in the beet fields was a result from discussions about suggestions from the participants. There were no big disagreements about what actions to test in the action program. Even if we had had economy consultants in the group we had probably started in the same way.

If some of the actions in the tested action program had been more successful the conclusion would have been that the field work for the beet crop better could be done by a machine holder who could use a more expensive but more efficient equipment on a larger acreage. This would have meant less work for the farmer himself. In the end of the project it was obvious that many of the farmers were quite relieved about that their own growing program was as good as, or even better than, the new tested beet field Action Programs. This can be understood from findings in the management part of the project: the farmers had high priority on being their own manager in the crop production branch of their farms. They could easier accept, or even look upon as an advantage, to go into a company partnership concerning new production branches in their enterprise.

My conclusion is that it was good to start with the field focus and as a second step continue with the management focus. It is not plausible that the second step would have been taken if the project had not been performed with the PLA approach.

### *Did we do the actions in the right way*

In the final interview the farmers expressed that they appreciated that the experiment were performed in a field scale. As they were highly engaged themselves in conducting the actions they knew that the work was performed as good as possible under the existing circumstances. One of the reasons for having quite big acreage for the Action Program was to get a high engagement level from the farmer. However, as we always had to hire machine holders for drilling the beets with placement of fertilizers there was a feeling that some of the farmers had their own drilling machine in a better shape than the hired machine holder could perform.

Some of the advisors, on contrary, expressed that it was easier for them to make conclusions from reductionistic small-scale field experiments rather than from our field scale Action Programs with many added actions being inseparable.

### *What did we learn thanks to the working form?*

There were speculations that the farmers, that normally performed beet yields that were 15-20% better than their neighbours, put too much effort in some of the soil tillage work. However it was clear from the results that one of the most significant issues for succeeding with the new action program was too succeed with the establishment of the beet plants. When the beet price falls it is important that the whole group of advisors, researchers and farmers are of the same opinion: don't try to save money while preparing the seed bed or performing the drilling. With a more traditional method this message to other farmers had not been so strong.

Another important result was that it became clear that a fast increase in farm units size as not a relevant solution for quickly reducing sugar production costs. Both market economy with soil as a limited resource and psychological factors, such as farmers wish to keep working hours within the company, counteracts a fast increase in farm size. Sustainability of the enterprise within the farmer's active working life was one of the most prioritised tasks in decision making. When new enterprise branches were considered farmers interest, personal skills and social values were important. Risk minimizing was, if possible, performed by starting in small scale and by sharing the risks in a companionship with a colleague. To make those and other considerations explicit for the farmers themselves, their families, the crop advisors in the group and for other crop advisors and beet growers, was an important result that had not occurred if the project had not been in the PLA form.

Most advisors and researchers in plant and crop husbandry, plant nutrition, biogas technology e t c have little knowledge about farmers' actual decision making process. Nevertheless they are often engaged as advisors to political decision makers. Knowledge is not only "having been informed" but is also "really meaning that it is so". Through the management focus in the third learning cycle in Team 20/20 all participants, presumably also including the farmers themselves, got a deeper understanding for farmers' actual decision making process.

For me personally as a PhD student in a natural scientific environment the most important value of the project is the understanding for the different scientific philosophies in the scientific world leading to very different view on what is useful scientific research. In agricultural sciences and is possible but not easy to combine those philosophies in the same project. Everybody cannot be good in everything. As also researchers learn best by action it has been extremely valuable to mix the experiences from the AR world with the experiences from the "conventional" natural scientific research environment. It gave me an interesting distance to different research paradigms.

### *Usefulness for participants*

AR has its focus on empowerment and democracy. Our project had the focus on innovation and farm specific adaptation. There were no big innovations with big impact on farm practice during the period 2003-2007. To create technological innovations takes time. If that will occur we will see within the coming research cycles. For the farmers, this far, the working form may have had its largest benefit in getting their knowledge recognised. For technology researchers the aspect about getting their work recognised by the end user may be as important as for the farmers.

For individual commercial advisors, the working form may not be the most efficient form for learning about plant husbandry technology. A reason for them to engage in a new research

period is rather to look after if the working form can create new branches in the extension service business.

#### *Connections to my research about beet root and biogas digestion*

From the experiences in Team 20/20 I have come to understand that the results from my traditional research with beetroots and biogas residues are mainly useful for advisors. The advisors can make some example calculations but they have to add many assumptions about energy prices, N-prices, rate of interest e t c. The farmer will process the information in an intuitive way. Preferably he/she will visit somebody that has already made a similar investment and then intuitively add all information into his/her own enterprise- and social situation. Societal efforts to inspire farmers to invest in biogas reactors for better energy- and nutrient conservation must take farmers use of intuitive decision making into account.

Investing in a biogas reactor is a so called unique decision. Unique decisions are of the extremely complex. AR are said to be a tool for solving complex problems. If the society wants to stimulate unique decisions it may be one tool among others to stimulate AR.

#### **References**

- Cramb, R. 2005. Rethinking the development, dissemination and adoption of agricultural technologies. Chapter 18, 6 p. In: Participatory research and development for sustainable agriculture and natural resource management: a sourcebook. Volume 1: Understanding Participatory Research and Development. Eds. Gonsalves, J. Becker, A. Braun, D. Campilan, H. De Chavez, E. Fajber, M. Kapiriri, J. Rivaca-Caminade and R. Vernooij. Perspectives with agricultural research and development. International potato center-users' perspectives with agricultural research and development, Laguna, Philippines and international development research centre, Ottawa, Canada.
- Ekstrand, K. 2003. Tillsammans kan vi lära och förändra - deltagardriven forskning för svenskt lantbruk. Centrum för uthålligt lantbruk, SLU. ISBN: 91-576-6554-0, 116 p.
- Greenwood, D.J. & Levin M 2007. Introduction to action research: social research for social change. 2nd ed. Sage, Thousand Oaks, Calif. US. 301 p.
- Hoffmann, V., Probst, K. & Christinck, A. 2007. Farmers and researchers: How can collaborative advantages be created in participatory research and technology development? *Agriculture and Human Values*, 24, 355-368..
- Mutsaers, H. J. W., Weber, G. K., Walker, P., and Fisher, N. M. A field guide for On-Farm Experimentation. 1997. IITA/CTA/ISNAR.
- Nordström Källström, H.N. & Ljung, M. 2005. Social sustainability and collaborative learning. *Ambio*, 34, 376-382.
- Pretty, J.N., Guijt, I., Thompson, J. & Scoones, I. 1995. A Trainers Guide for Participatory Learning and Action. *IIED Participatory Methodology Series*. Published by the International Institute for environment and development, London, UK., 267 pp.
- Probst, K., Hagmann, J., with contributions from, Fernandez, M. & Ashby, J.A. 2003. Understanding participatory research in the context of natural resource management - Paradigms, approaches and typologies. London, UK: Overseas Development Institute, *AGREN Network Paper*, No 130.
- Schusler, T.M., Decker, D.J. & Pfeffer, M.J. 2003. Social Learning for Collaborative Natural Resource Management. *Society & Natural Resources*, 16, 309-326.
- Sumberg, J., Okali, C. & Reece, D. 2003. Agricultural research in the face of diversity, local knowledge and the participation imperative: theoretical considerations. *Agricultural Systems*, 76, 739-753.

Vernooy R (2005) 2005. The quality of participation: critical reflections on decision making, context and goals. Chapter 4, 9 p. In Participatory research and development for sustainable agriculture and natural resource management: a sourcebook. Volume 1: Understanding Participatory Research and Development. Eds. Gonsalves, J. Becker, A. Braun, D. Campilan, H. De Chavez, E. Fajber, M. Kapari, J. Rivaca-Caminade and R Vernooy. Perspectives with agricultural research and development. International potato center-users' perspectives with agricultural research and development, Laguna, Philippines and international development research centre, Ottawa, Canada.