Smallholder farmer innovation. 2. Facilitating farmer agency through experimentation and learning about cropping systems.

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Abstract
Learning, and in particular generating new knowledge, appears to have played a role in transforming the lives of poor women farmers on the east India Plateau. Learning and knowledge generation seem to have increased their self-esteem and generated a desire to learn more as well as improving their physical well-being and position in society This paper describes our experience working with resource poor smallholder farmers on the East India Plateau to develop more diverse and intensive farming systems. Our focus is on developing the capacity of individuals for independent innovation rather than their skill in the application of specific agricultural technologies. Facilitating learning experiences through on-farm research on topics chosen by the community is central to our approach. Individual farmers learn from each other in self-help groups that provide a forum for farmer-scientist interaction. Locally developed vegetable cash crops and aerobic direct seeded rice are popular with farmers and adoption is expanding rapidly. Much of the local adaptation and dissemination is being driven by farmer-to-farmer communication and learning. Our experience confirms that despite often extreme poverty, malnutrition and discrimination these communities demonstrate high human capacity for innovation. Rather than a specific technology or cropping system, the real legacy of our approach is cognitive development in farmers, changing their perception of the environment in which they are working and enhancing their capacity for independent innovation in the face of increasing complexity and uncertainty.

Key words
Transformative learning, cognition, communication

Introduction

Many research projects working to improve the lives of small scale farmers start from the premise that poverty is a result of material disadvantage leading to economic disadvantage. From this assumption the obvious solution is to remove the material disadvantage, and on that basis agriculture projects tend to be centred on development and transfer of improved production practices that can assist to overcome material disadvantage. Such projects therefore focus on the potential impact of improved technology on crop production. But, when we put agriculture into a broader development context we realise we are working with a diverse complex situation and attempting to control the situation through a focus on one aspect is not appropriate. Therefore, from a development perspective we need to think about how to produce deep long lasting change to enhance people's lives; that change is not only in the technology they use but also in how they relate to their broader social, political, economic and physical environment. In doing so we acknowledge this is not a situation that we control but rather one in which we can facilitate a process that enables change to develop.

An alternative approach to development focuses on the development of the individual working to build capacity to not only change their practice but to work as innovators who can produce new approaches and practices that suit their needs and resources. One way to achieve this end is to take a learning approach. Learning is generally regarded as a good thing in the scientific and research communities. Learning is often mentioned but not so often described in the development literature (Ramsay, Bellotti, Narain and Kumar 2015). However, there are some issues with using learning as a focus. Firstly, learning is often associated with teaching with the expert teaching the novice. Secondly, when both groups are adults and experienced in life the relationship and association is different to the usual master pupil relationship. However, learning has a major advantage; it is something over which we as individuals can exercise control in comparison to, for example, the broader economic system over which individuals exercise virtually no control.

Learning, the theory behind it and the processes for learning are multiple and often contested (Blackmore, 2007). However, it is generally agreed that learning takes a variety of forms that can be described in a hierarchy (Ellström, 2001). Learning can for example, consist of factual knowledge, a conceptual framework to arrange that knowledge as well as the ability to notice patterns, generate and explain reasonable arguments and explanations and to draw analyses to other situations. An important element in learning is cognition. In this paper cognition is defined as the way in which one perceives, understands and makes use of the interactions between self and the environment to learn. That is, cognition provides the framework through which to make sense of experiences. Cognition can be considered a product of experience as well as a determinant of how experience is perceived and understood, and cognitive development in response to experience forms part of learning but also impacts on learning. This definition of cognition and how it is developed has a relationship to the concept of transformational learning (Merriam, 2004; Mezirow, 2003).

In this paper we describe our experience working with resource poor smallholder farmers in Eastern India. That experience took place at the interface between PRADAN an Indian non-government organisation (NGO) and the communities with which it works and involved various researchers from Australian universities. The experience was located within the approach that PRADAN normally takes to engage with communities. That approach focuses first and foremost on enhancing the capacity and sense of agency of women within those communities. The production aspects of this project are outlined in Kumar et al (2015).

Materials and Methods

This project works with groups of women who farm in rural environments. The groups are not formed by the project but are women's self-help groups (SHGs) developed by PRADAN a non-government organisation (NGO). SHGs are associations of small numbers of women (usually between 10 and 20) who share socio-economic backgrounds and live in the same village. The SHG has several roles including the provision of mutual support, identification and promotion of small-scale enterprises and development of a savings fund that can be used to provide loans to members of the SHG. Most women in rural SHGs are directly involved in agricultural production. These groups are not formed as learning or agricultural development groups.

The project introduced on-farm, farmer-managed agricultural research and built an action learning cycle grounded in agricultural production. The project therefore, provides a further opportunity for women in SHGs to enhance their lives through a focus on learning and research. Farmers are involved in all stages of the cycle (Figure 1). An important part of the approach is the integration of the action research cycle (Figure 1) with PRADAN's approach to build the sense of agency of members of the SHG.

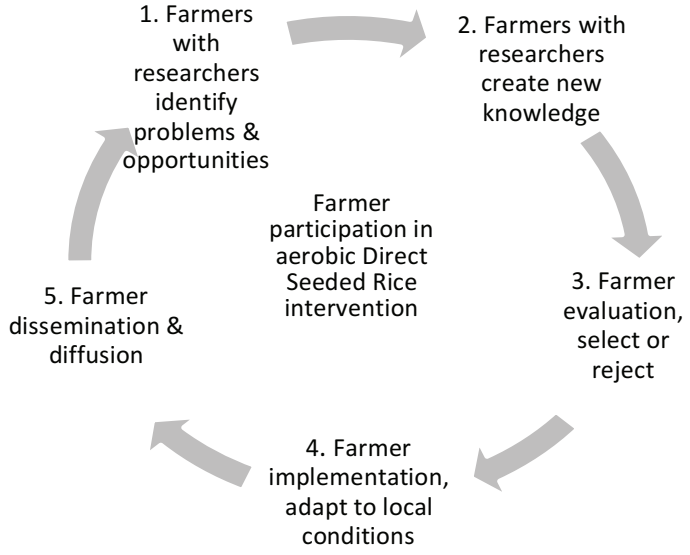

Figure 1. Smallholder farmers are involved in all stages of the innovation cycle.

Results

The results from this work take several forms and include those that can be observed such as changes in practice by farmers and explanations by farmers of those changes in practice and the processes for their

development and adoption. In addition, results also include changes at a higher level and take the form of statements by farmers in relation to how their lives have changed during the time of the project. Linking the results obtained to broader bodies of theory and where appropriate the development of new theory are also elements of the results in this work.

In a structured workshop farmers outlined changes that had occurred in their lives in the last three years to evaluate the role the project had on their lives. Women stated that in many cases their lives had been transformed and they were able to provide concrete examples illustrating that change. The changes were similar at several sites but were not always exactly the same. Both women and men farmers had moved from a day to day survival mode where they were "only able to think about tomorrow and no further ahead" to one that involved planning on an annual cycle with that planning involving flexibility to change cropping regimes due to changes in seasonal conditions. This change demonstrated a shift in their thinking processes that can be considered as cognitive shifts; that is shifts in the way in which they make sense of and react to their environment. Further examples of such shifts demonstrated in the workshops are provided in Figure 2. The shifts suggest that learning processes are related to the cognitive position of the individual and that experiences are interpreted in relation to that position.

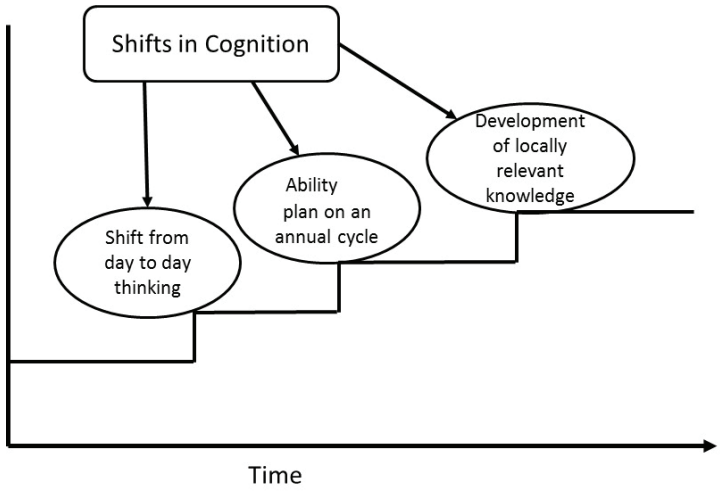

Figure 2. Conceptual model of cognitive transformation over time in smallholder farmers

At the initial stage farmers were only able to work on a short planning time frame, they started, as a group in association with the project team, to develop alternative views of their resources and cropping activities producing a shift in their cognition and how they viewed their situation, following further development they became able to understand and work with an annual planning cycle a second step in cognition, the third step related to their becoming adept at developing research questions and carrying out field trials to the stage where they can independently develop their own locally relevant knowledge. Therefore, introducing concepts that require annual planning to a person who is still focussed on day to day survival will not be taken up by that person because they are not able to work with those concepts.

Because the external environment (including physical, social, economic and political environments) has changed over the time it is difficult to make definitive statements on causal links between the project and people's lives. However, the evidence that supports the impact of the approach is building. Evidence that the whole approach is important rather than some element of the approach alone is also developing.

Discussion and Conclusions

In this project we are developing people rather agricultural technology, or even farming systems. However, as a result of participating the people are positioned to modify, adapt and monitor their farming system in line with their needs and resources. Farmers involved with the project demonstrated transformative change. The change was expressed in various ways including:

- Changes in participants approach to their lives including their ability to meet and communicate with people from outside the community
- Changes in how they viewed and made use of the resources they held, demonstrated through changes in agricultural production systems

- Major shifts in thinking including the ability to plan in longer time periods – moving from only being able to plan for the next day to an annual planning cycle
- Development of the ability to develop and carry out on-farm trials to evaluate alternative approaches to their production systems and develop their own locally relevant knowledge, illustrated through trial work carried out by farmers

The project did not focus on the provision of additional physical resources but rather on the way in which people functioned, understood and made use of the resources they held. The project outcomes provide important evidence that the change in the people needed to come first and that change was not just in the farmers but also in those who were working with them. Our experience reinforces that the poor and disadvantaged can be highly innovative, provided they are appropriately supported through a process of relevant learning that builds their cognition. On-farm agricultural research provides a context for transformative learning to take place.

An important element in our learning from this project is that there is no short-cut to farmer learning, it is not a quick fix. The learning needs to be aligned with the point at which farmers are starting in relation to both their cognitive and affective states. In addition, the learning needs to be transformational and as we know from our own personal experience transforming ourselves, our knowledge and how we apply that knowledge takes time. However, the benefits justify the higher costs. Once transformed through this learning process, farmers have demonstrated enhanced capacity for independent innovation. They become more resilient to future complexity and uncertainty, and less reliant on government welfare programs.

As part of the project work is being carried out to determine the mechanisms behind the learning and its relationship to learning and development theory. Individual learning can be explained in relation to cognitive development and cognitive development appears to have a path dependency, that is, some forms/elements of cognitive development are required before others can occur. Learning can be cognitive and lead to a shift in the way in which a person perceives and relates to their experiences (inquiry based) or their technical skills enabling development of a higher level of skill in the performance of an activity such as the planting of rice. Individuals learning in various ways but most learning can be considered to be based on an experience or collection of experiences. Learning is generally regarded as an individual activity though almost all learning takes place in a social context and within groups. While the learning is taking place in a group the implementation of that learning is individual or in another group, usually the household or family. Therefore, where field trials are carried out the field belongs to the farmer but the learning belongs to the group.

The work outlined in this paper is preliminary but compelling. It is not possible at this stage to attribute the proportion of the change that is due to the project and the approach being taken in that project. There does appear to be a difference between community members who are involved with the project and those who are not; more evidence is required to support this observation.

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