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'Follow the Innovation'

– A joint experimentation and learning approach to transdisciplinary innovation research

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– A joint experimentation and learning approach to transdisciplinary innovation research

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Abstract

The ZEF-UNESCO project on Sustainable Management of Land and Water Resources in Uzbekistan addresses the environmental, social and economic problems in the Khorezm province, located within the so-called Aral Sea Zone in Uzbekistan. Currently in its seventh year (third phase), the project aims "to provide sustainable solutions to the Aral Sea region through a holistic approach, combining technology, policy and institutional options developed in cooperation with local and international stakeholders" as stated on the project website. Consequently, the mutually enriching interplay of multiple disciplines is a precondition for a successful project. Inter- and eventually transdisciplinary research, rather than the mere co-existence of different disciplines captured under the notion of 'multidisciplinarity' is the chosen and actively facilitated approach.

A work package is specifically designed to foster the creation of inter- and transdisciplinary research teams around innovation packages developed by the project and identified as possessing 'plausible promises' to take hold in the Khorezm agricultural system. To trigger and sustain this process, a stepwise approach is taken. In a workshop series, four 'Follow the Innovation (FTI)' teams of scientists surrounding innovations were formed, roadmaps prepared and a set of tools and skills for stakeholder interaction taught. A participatory joint experimentation and learning approach was chosen to validate innovations in the farmer's setting. Between the workshops, all four FTI teams are supported and accompanied by a full-time FTI facilitator in their stakeholder outreach and designing and implementing processes of joint experimentation and learning with stakeholders. After the first steps of stakeholder involvement are made and contacts well established, the stakeholders, as partners take part in all following training workshops. Here the further processes of testing, experimenting and jointly adapting the developed innovation packages to match the local needs as well as bio-physical and socio-economic environments are jointly designed with the partners. Additionally this process is continuously monitored, documented, critically discussed and adjusted accordingly by all partners.

This paper seeks to illustrate and discuss the experiences collected so far in nurturing a transdisciplinary process of joint experimentation and learning between researchers and local stakeholders, each in their behaviours, attitudes and actions shaped by the context and culture of their places of origin. These include amongst others the academic disciplines of the researchers, the research project, the local Uzbek setting, shaped by strong hierarchical structures and a post-soviet system of knowledge governance. Thus, diverse forms and contents of knowledge, carried by uniquely socialised actors, shall be mutually exchanged and lead to the joint development of new knowledge, to innovations that 'make sense' in the rural setting of Khorezm/Uzbekistan. The process design, its strengths and weaknesses are outlined and recommendations for improvement discussed.

Keywords:
Follow-the-Innovation, Follow-the-Technology, transdisciplinary innovation research, innovation diffusion, stakeholder involvement, bottom-up, participatory, joint experimentation and learning approach

"Research is good at developing component technologies, such as fertilizers and Bt-cotton. But farmers have designed systems within which these component technologies must provide a benefit. And all too often they do not because research has not bothered to analyse the systems into which the component technologies must fit."

(Röling, 2009: 18)

1. Introduction

The ZEF-UNESCO project on Sustainable Management of Land and Water Resources in Khorezm, Uzbekistan introduced a work package into its third phase that fosters a participatory approach of, jointly with stakeholders, testing, adapting and finalising institutional and technical innovations, which were so far developed by the project and local collaborating institutions. The identified innovations pose a 'plausible promise'. They bear the potential to offer improvements to the agricultural production system in Khorezm. Yet, this potential remains theoretical as long as these innovations are not tested in the real life situation and made implementable, together with real life actors, meaning with local stakeholders, the potential users of these ideas. These local stakeholders, being farmers, water users, water managers and others, possess a stock of highly specialised and differentiated expert knowledge that in its exact details remains hidden to the researchers. Some of this precise system knowledge is made explicit and documented. Most of it nevertheless can be characterised as tacit knowledge, experience based on and gained through action (Nonaka and Takeuchi, 1995). This tacit knowledge based on the experience of the local stakeholders living and working with and as part of the bio-physical as well as the socio-political system of Khorezm is hoped to – when merged with the explicit and tacit knowledge of the project's researchers – enable the 'plausible promises' to actually take hold in the Khorezm system, with the clear purpose of contributing to social and economic development.

For achieving this, the project designed a two-tiered process. In five trainings of four days each, facilitated by an external consultant, the project's researchers are equipped with participatory research methods, skills for stakeholder involvement, communication and facilitation tools. Additionally, a full-time senior project member facilitates the overall process of stakeholder interaction and transdisciplinary research, documents this process and analytically accompanies it. This rests on the conviction that there is not one approach to innovation adaptation and dissemination but instead that each process of innovation transfer has to be designed with reference to and embedded in the precise local context. In order to do this, the development of such a process has to be substantially carried by the local stakeholders themselves.

This paper seeks to elaborate and discuss the experiences collected so far in nurturing this transdisciplinary process of joint experimentation and learning between researchers and local stakeholders. The project is located in the Uzbek setting, shaped by strong hierarchical structures, remnants of Soviet-Russian as well as traditional Muslim culture as well as the effects of rapid agrarian processes of transformation leading to and allowing for change. The process design, its strengths and weaknesses are outlined and recommendations for improvement discussed.

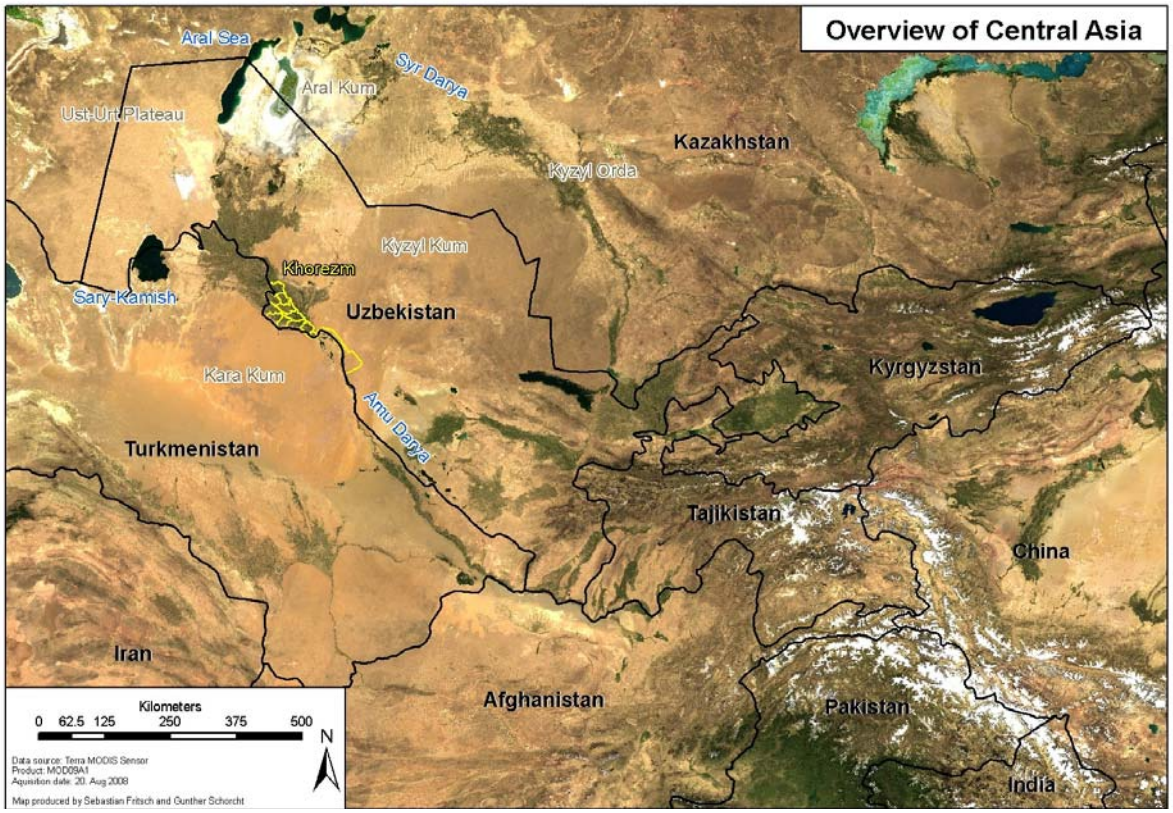
The paper is divided into five main parts. After a short project overview outlining the geographical location and main research foci, this article introduces the reader to the rationale behind the work package 'Follow the Innovation'. Here, the reader is run through the main conceptual approaches to innovation diffusion, their strengths and weaknesses. Some of these approaches substantially contributed to the design of the here attempted approach 'Follow the Innovation', which is outlined respectively. The third part of the paper illustrates the step-wise realisation of the process as done in the year 2008. So far, three training workshops have taken place, four teams have been formed around one innovation each and to varying degrees have begun to systematically interact with local stakeholders. In the fourth part, the experiences collected in the past year are assessed. A number of challenges have been faced ranging from administrative challenges to challenges posed by different cultures of knowledge transfer, beliefs in a linear technology supply push and high-external-input technologies.

The paper ends with an analysis of the challenges faced and an identification of the main lessons learnt for the coming agricultural season 2009.

2. Project Overview

The ZEF-UNESCO project on Sustainable Management of Land and Water Resources addresses the environmental, social and economic problems in the Khorezm province, located within the so-called Aral Sea Zone in Uzbekistan (Photograph 1).

Photograph 1: Study zone of the ZEF-UNESCO Project



During the Soviet Union era, extensive irrigation systems were constructed throughout the study region for the production of cotton - the crop of strategic importance to the region's agricultural production and therewith economic system. The Aral Sea's two main feeder rivers were diverted to such an extent that less than two-thirds of the Aral Sea's surface area is left today. Unsustainable water management and the associated land degradation have caused a decline in economic productivity and ecological sustainability throughout the region, with devastating consequences for the region's predominately rural population.

Since 2001, the ZEF/UNESCO project aims to increase the economic efficiency and ecological sustainability of agriculture, while improving the natural ecosystem and its services. Solutions to regional problems are being investigated at three levels: (a) decision support for improved agricultural policies on the national and regional levels; (b) institutional restructuring aimed at sustainable natural resource use; as well as (c) an integrated 'technology mix' for improving management of land and water use.

Currently in its seventh year (third phase), the project explores and tests alternative policies, institutional arrangements, and integrated technologies. Yet, sustainable solutions leading to a long-term change can only be found through close cooperation among natural, social and economic scientists, as well as direct involvement of local stakeholders. After the end of the project in 2011, the University of Urgench, a strategic partner included from the onset in the project activities, will take the lead in continuing with

the research, implementation, and adoption of technologies that have been developed. Until then, it is the clear aim of the project to successfully provide a comprehensive framework for land and water restructuring in the Khorezm region as well as other irrigated landscapes in Central Asia.

3. The 'Follow the Innovation' Approach

3.1. Background and Rationale

The mainly disciplinary research of phase I and II of the project yielded a number of innovation packages which, to the belief of the researchers and given the so far experimental conditions, entail a 'plausible promise' for out scaling. However, the state and its administrative bodies are excessively involved in agricultural decisions at the farm, districts, regional and national scales. State quota on cotton and winter wheat describe farmers how much to harvest from what fields. Hence this constraints decision-taking by farmers on these agricultural production processes. The window of opportunity within which farmers can actually innovate (Röling, 2009), is therefore in comparison to the situation in other countries, relatively small. The need for research ideas / developed innovations to be tested and refined jointly with farmers (and other stakeholders involved) is therefore especially pressing. The approach clearly rests on the conviction that the farmers are the ones who know best and are well aware of their window of opportunity within which they themselves can exert agency and independently decide to innovate. Röling points out that due to the generally small window of opportunity for farmers to innovate, "much research output is simply not appropriate for farmers conditions" (Röling, 2009: 15). In an environment as the one found in the agricultural sector of the Khorezm region this is more true than elsewhere since the 'window of opportunity' due to strict state control is even smaller than in most other places. Nevertheless, as pointed out by Wall (2008: 122-123), farmers in Khorezm are – within this 'window of opportunity' and despite the state plan and its impediments to innovation – active experimenters, developing local knowledge to improve their cotton and wheat yields. Wall states that "within these conditions there is a surprising level of innovation and experimentation". Nevertheless this knowledge creation takes place only within the space of maneuvering granted by the politically restrictive system. Innovations that oppose state norms (for instance in planting times) or are not possible due to the state plan for cotton and wheat (for example large scale crop rotation) do not occur (Wall, 2008:122).

To ensure the successful diffusion of innovation packages, such as conservation agriculture, agroforestry, or aquaculture, the work package 'Implementing, improving and adapting with target groups: "Follow the Innovation" (FTI)' in phase III of the project consequently focuses on the integration of research with local stakeholders, joint testing, validating and finalizing of the developed innovations. Based on these processes and experiences, the aim is to develop together with the local stakeholders a locally-embedded approach to diffusing innovations. This shall then lay the foundations for later out-scaling for a widespread adoption of developed ideas and research-based innovations by national and international implementing agencies. Via stakeholder involvement, close links to farmers, water managers and members of the local and regional administration are created that will be crucial for later out scaling processes. Within the project team, the work package provides a training ground for staff to be trained in innovation-oriented research, approaches and methodologies.

The central research question of this work package is therefore: What are suitable methodologies for facilitating interactive agricultural innovation processes in the Khorezm region in Uzbekistan?

The work package designed to answer this question (as outlined by Mollinga et al., 2006) critically refers to the pioneering works on the diffusion theory developed by Ryan and Gross (1943), later developed further by Chambers and Jiggins into the Transfer of Technology approach (1986). An approach that is often summarized under the notion 'the linear model' (Kline and Rosenberg 1986). The innovation in question is the end-of-pipe outcome of a linear process that runs from basic research, via applied and adaptive research, subject matter specialists, extension and contact farmers, to widespread diffusion among 'fellow farmers'. The diffusion theory postulates that introducing a new idea, technology/ technique, or method – called an innovation, in a 'recommendation domain' could lead to a wave of

adoption. The adoption takes place along a 'diffusion curve', which is usually shaped as an S, because the diffusion process starts slowly, then gathers momentum and finally peters out when all farmers for whom it is relevant or feasible have adopted the innovation (Röling, 2005). The adopting farmers are categorized as innovators and early adopters, while those who do not adopt are labeled as laggards (Rogers, 2003). The theory also postulates roles and responsibilities of various actors. The scientists have the sole responsibility to innovate, and farmer's role is perceived to be learners and adopters. The role of policy is perceived to set priorities and allocate resources in such a manner that promotes innovation diffusion (see Kaimowitz et al., 1989).

The widespread use of these linear approaches, i.e. the Transfer of Technology (TOT) approach goes back to the seed-based green revolution, during which they seemed to prove successful. Seeds are technologies that have all innovations 'packed in', and therefore their actual use in real-life situations requires relatively few changes in the agricultural production process. The approach was adopted for the spread of a wide range of differing innovations worldwide, some of which requiring far more complex changes in the agricultural production process to make them work. The need to seriously adapt the approach depending on the innovation and specific local settings of the production process was regularly ignored. In many countries the few early adopters made very high profits in the beginning, but as more farmers adopted and produced more, the prices declined and the producer's margins shrunk. As the profits of non-adopters fell much more drastically due to their less efficient and less robust production technology, they also adopted and produced more. Thus, the market forces propelled the diffusion process further - due to so called "innovation treadmill"- but not to the sole benefit of the adopters. Farmers who were too small or too weak to cope with it, finally quitted agriculture, while more efficient entrepreneurs consolidated, expanded and formed unions and cartels, and a network of supporting institutions, to avert market pressures (Havelock, 1986). Consequently there are two main problems with linear approaches, such as the Transfer of Technology approach: (a) diffusion actually does not take place in many cases, and (b) when it does take place, it is not necessarily positive to all farmers.

A wide range of influential critique followed from the 1980s onwards. The often remarked 'lack of fit' of externally developed innovations in local systems argued for the necessity to strongly involve local stakeholders in the process of developing innovations that are thought to take hold in the local system. Röling (2009) offers an overview of conceptual and methodological developments in innovation diffusion redrawing approaches such as the 'Diffusion of Innovations' by Rogers, the 'Agricultural Treadmill' by Cochrane, the 'Transfer of Technology' approach by Chambers and Jiggins (1986), 'Follow the Technology' approach by Douthwaite et al (2001), 'farming systems research', 'participatory technology development', 'farmer field schools' and 'Landcare'. Each of these concepts and approaches in some local contexts and settings led to successful innovation diffusion and in other contexts, involving other stakeholders or lacking facilitation of the process they failed.

Especially the linear, transfer of technology approaches implicitly assume that scientific knowledge is superior to farmers' knowledge, independent of context and universally applicable (Robertson and McGee, 2003). In its extreme form, the TOT perspective regards the role of agricultural scientists as using the scientific method to understand, structure and model reality to develop technologies that benefit farmers. Once innovations are discovered, it is then the job of the extension to 'project' the scientists' knowledge onto the minds of farmers as accurately as possible, and the responsibility of the farmers to receive it. Farmers are supposed to be passive recipients in that they are not expected to adapt the message if it is based on 'good' science and properly delivered. The prescriptive nature of the approach blames farmers as being backward if they do not adopt (Douthwaite et al., 2001). The resulting failures in innovation diffusion (farmers did not take up innovations as 'they should have' according to the Transfer of Technology approach) were ascribed to the 'unwillingness', 'lacking expertise' or 'backwardness' of farmers, rather than to the impediments of the linear approach. Farmers proved not to be the passive recipients who welcome innovations diffused to them, but instead to be active agents and most of the time sole decision-makers on whether to adopt, adopt changed versions of or dismiss the offered knowledge.

At the practical level the TOT approach has been observed to not deliver in many cases because of the 'lack of fit' of externally developed technologies with farmers needs and the undervaluing of farmers knowledge of their own situation (e.g. Biggs, 1978, 1980; Rhoades and Booth, 1982; Richards, 1985). As

a result, the scientists attempted to better understand the problems, contexts and the needs of the potential users of the technology to come up with better-fitting technologies through farming system research movement in mid 1970's (Röling, 2009). However, here again, the role of farmers was merely seen as providers of information, objects of study, and users of technology. The scientists' role was to innovate considering the results of their investigative research about the characteristics of farming systems. The quantitative approaches to understanding farmers' needs, such as structured socio-economic surveys, were the main tools to understand the farmers' context and needs. The scientists hoped that they would be able to produce technologies that would have a better fit to farming systems. The farming system research was essentially an improved form of a technology-push-approach.

Given the disciplinary and scientific nature of the processes through which innovations are discovered through technology-push-approaches, the production of agricultural technologies by research, even if these 'work' in the experiment station, is no guarantee that these will suit the needs of all kinds of farmers who are located in diverse socio-political and ecological contexts. Therefore, a contrasting approach to innovations discovery and diffusion was forwarded by the proponents of "Farmers First", (e.g. Chambers et al., 1989; Jiggins and Zeeuw, 1992). These hypothesized that successful adoption would only happen if innovations are driven by the farmers needs. The approach perceives farmers' role to be changed from mere users of technology to diagnosticians, experimenters and testers of technology together with scientists as colleagues, who co-evolved technologies having better fit to their livelihood systems. This model is also called "demand pull" model, and the key thrust was to innovate what farmers need.

However, the assumptions behind the demand-pull model do not always hold true either. In many situations, the farmers are not the "only clients' as they do not produce for the sake of production alone, but rather for their livelihoods (Pound, et al., 2003). These livelihoods are connected to the dynamics of the markets, credit systems, and overall economy (Bunch, 1999; Naseem, et al. 2003; Cornwall and Pratt, 2003). The importance of the whole range of actors involved in the technology-production-market-use chain, with fast changing contexts due to interaction of various elements needs to be realized (Röling, 2009). Besides, such an approach fails to cater to the needs of ecological sustainability (Fraser, et al., 2006). Innovation discovery, adoption and production are all parts of an 'innovation system' (Hall, 1999) in which all relevant actors need to interact and learn together, including farmers, resource managers, private sector, policy makers and implementers, financial institutions, etc. They need to share their knowledge with each other, and co-generate knowledge, processes and innovations. The policy makers, an integral part of the innovation system, need to provide enabling environment, support systems, and coordination for innovations.

Since the 1980s researchers repeatedly stress the importance of innovations being deployed in the specific social, political and cultural context for getting them to work (MacKenzie and Wajcman, 1985, Bijker, Hughes, et al, 1987, Bijker, 1997; Bijker and Law, 1997; Oudshoorn and Pinch, 2003; Duncan and Barnett, 2005; Rath and Barnett, 2006; Hall, 2007). Innovation diffusion is therefore and through the involvement of the local stakeholders "a process of simultaneous creation of new material and social order [...] a process of embedding, in which both the technology/artifact itself, users, and the social and institutional arrangements for their functioning are reconfigured in an iterative process till a degree of 'closure' or consolidation is reached, or the innovation is abandoned" (Mollinga et al, 2006: 179). Bijker and Law (1997) frame this with the words of innovation being about simultaneously 'shaping technology and building society'. On a more practical level for research design as well as processes of innovation diffusion and policy-making, Röling (2009:30) stresses the importance to distinguish "between technological change at farm level that leads to higher productivity *within* existing windows of opportunity, and institutional change at higher system level that *stretches* these windows".

3.2. Design

Drawing on these lessons learnt, the ZEF/UNESCO project on Sustainable Management of Land and Water Resources for the third project phase designed one work package explicitly looking at developing a context specific approach, together with local stakeholders, to jointly test, adapt and finalise as well as then spread the innovations (technical and institutional in nature) developed within the first two phases

of the project. This work package was thought to be supported by a work package looking at the national, regional and local governance structures, decision and policy-making procedures to offer models not only for innovations *within* the existing windows of opportunity of farmers to improve their agricultural production processes but furthermore models and research-based recommendations on the policy and institutional levels in order to *stretch* these windows. Yet, due to the sensitivity of conducting governance research in an centrally–regulated, authoritarian system as Uzbekistan, there is a clear mismatch of the levels of governance research needed and research conducted.

As a starting point, the project chose the 'Follow the Technology' framework as developed by Douthwaite et al (2001). Like almost all participatory approaches to technology development and innovation, it is composed of a set of steps or stages. The basic idea is that once there is a technology with a 'plausible promise' that may work and raise interest of users, innovators engage in a process in which the technology is experimented with in real situations by a group of users ('product champions' and 'partners'). The process itself is one of trial and selection, leading, finally, to a point where the technology is sufficiently robust to be released more widely (if that has not happened already during the process) or abandoned because it has proven to be non suitable for the situation. The methodology "follows the technology, using this intervention as the entry point into a complex situation, and then allowing what is discovered to determine what is important" (Douthwaite et al, 2001; Hall and Nahdy, 1999).

This idea of following the technology, we adapted according to the specific context of our project and widened it from its technology orientation to cover all kinds of innovations, including technical and institutional innovation packages. Consequently, we named it the 'Follow the Innovation' approach.

As main steps the following were planned (Mollinga et al, 2006): (a) basic supportive research; (b) early adoption of suitable innovations by innovators or champions; (c) the eventual adaptation through additional research; (d) and promulgation/out-scaling of successful innovations.

4. 'Follow the Innovation' – A stepwise Realisation

The 'Follow the Innovation' work package was put into operation at the beginning of 2008. The first two steps taken were the employment of a full-time facilitator of the process as well as together with an external consultancy the planning of the first training workshop. As originally planned, the full-time FTI-facilitator stays in Urgench/Uzbekistan for 8 months/year, in Germany 4 months/year in order to continuously facilitate the overall process as well as scientifically document it. Additionally, an external consultant with strong expertise in participatory, bottom-up approaches to innovation diffusion was hired for conducting a series of five trainings in order to build the required capacities within the project staff for participatory testing, stakeholder involvement and transdisciplinary research. Besides and due to the professional expertise brought into the project, the external consultant adds an immense degree of legitimacy to the process; legitimacy that helps to underline the importance of this process of jointly testing and adapting the innovations with the local stakeholders especially within the project team and the project coordination, but also within the research institute. The expertise of this external consultant as well as his position as an outsider helps to justify the process and convincing critics.

4.1. Training I: Concepts of Agricultural Innovation and Inter-/Transdisciplinary Research

Training I 'Concepts of Agricultural Innovation and Interdisciplinary Research' took place in Bonn, Germany from 11th to 14th of February 2008. It was facilitated by two consultants from ETC EcoCulture; 18 junior and senior researchers of the project participated.[1]

The main objectives of this workshop were to enable participants:

[1] After the training, a detailed report on main objectives, methodology, program, decisions made was shared with the whole project team (see Wettasinha and Bayer, 2008).

- to have a clear understanding of the concepts of innovation, its different aspects or characteristics and the various approaches used to stimulate this process;
- to develop an understanding of concepts of technology adoption and adaptation;
- to include users and technology characteristics as these influence the diffusion and adaptation processes;
- to distinguish between multi-, inter- and transdisciplinary research – the hard and soft systems thinking - and be equipped to work as a collaborative inter-disciplinary team in partnership with local stakeholders.

The four-day program comprised of the following blocks:

- gallop through the history of science, technology research and agricultural system research
- multi-, inter- and transdisciplinary research approaches were discussed, defined, worked through
- What is innovation? What are the existing approaches of innovation diffusion?
- Who are the project's stakeholders and how do they differ from partners?

The workshop induced a clear and joint understanding of the concepts of innovation, various approaches to stimulate innovation processes, and to include stakeholders and innovation characteristics as these influence the adaptation processes. As a result, the participants were able to distinguish between hard and soft systems thinking and had reflected on the meaning of working as collaborative interdisciplinary teams in partnership with local stakeholders.

To create a common understanding of terminology, the overall project team was invited to together reflect on the project's definition and conceptualisation of 'inter- and transdisciplinary research', 'innovation' and the project's 'stakeholders'. The simple exercise of bringing the team together and reflecting on these basic conceptualizations of the key parameters of their work was a great achievement of the training workshop. After controversial discussions on the project's conceptualization of 'innovation' the researchers present in the workshop agreed on two definitions of innovation:

> "All ideas and 'plausible promises' developed by the project are as of now merely 'inventions' which after a process of testing, adaptation and acceptance by stakeholders become 'innovations'" (formulated by workshop participants, documented in Wetthasinha and Bayer, 2008: 8).
>
> "…the use of new ideas, new technologies, or new ways of doing things in a place or by people where they have not been used before" (Hall, 2004).

During intensive work in small groups on identifying our stakeholders, it became obvious that this varied depending on the innovation at hand. While for most developed innovations, farmers and water users were identified as main stakeholders, for other innovations, the national research institute in charge of assessing salinity levels in the region and providing these data to the national government for further decision-making was identified.

With regard to each group of stakeholders, i.e. farmers, water users, local researchers, representatives of the national Ministry of Water and Agriculture, the mode of selecting the future cooperation partners had to be discussed, an exercise for after the workshop.

Overall, the training was successful in initiating a conducive atmosphere within the project team for the attempted process of innovation diffusion and creating one common level of understanding of the topic, the approach and next steps. Main drawback of the training was the absence of some key members of the senior project staff, key also for motivating younger staff and attaching the required level of relevance and legitimacy to the process.

Following the first workshop, a series of research meetings took place to review, discuss, and reflect upon a number of critical literature sources related to participatory technology development and innovation systems research. These research meetings were organised in Bonn as well as in Urgench, the location of the project in Uzbekistan. They generally met the interest of project staff and had middle-range participation rates. The discussions were quite active with the level of understanding of the topic at hand still being quite low but continuously rising.

Regarding the selection of stakeholders, a line of discussion led to the formulation of a list of criteria for selection. While for some innovations, the group of stakeholders was clearly defined, consisting of a limited number that no selection was required, for other groups, i.e. farmers and water users, criteria for addressing some rather than others for the purpose of collaboration were required. This discussion was mainly driven forward by the research team looking at socio-technical aspects of water management. They later formed the FTI team on strengthening water user associations through capacity-building. Based on the following four criteria, five WUAs with different biophysical, social and institutional conditions were selected for a first exchange of interests. The four criteria included (i) remoteness from the water sources; (ii) relative water scarcity; (iii) social situation, living standards, diversity of agricultural activities; and (iv) institutional strength and type of water management (Abdullayev et al., 2008:92-94). The five WUAs differed in the degree to which they matched the four criteria and consequently together formed a representative picture of the Khorezm region. In order to collect further details on the precise situation in each WUA as well as to assess the level of interest of the farmers to collaborate with the project, a qualitative interview survey with 90 randomly selected water users (farmers) was conducted. Based on expressed interest to collaborate, one WUA (with 2116 ha of irrigated land) located at the tail end of the canal battling severe water scarcity and problems of salinity, was selected for close cooperation.

4.3. Training II: Operationalising the 'Follow the Innovation' Approach

Training II 'Operationalising the "Follow the Innovation" Approach was organized in Urgench, Uzbekistan from 01st to 04th of June 2008. It was facilitated by a consultant from ETC EcoCulture and co-facilitated by the project's FTI facilitator. 22 junior and senior researchers of the project participated, including one senior project staff member who is affiliated to the German Aerospace Center.[2]

The main objectives of the training were to enable participants:

a) to have a clear understanding of different stages and possible activities of the FTI approach;
b) to learn participatory research methods and tools that could be applied during the FTI process at all levels and develop their skills in using these tools; and
c) to organize themselves in FTI teams with an agreed mandate and agenda

The four-day program comprised of the following blocks:

- Review of previous training and participant expectations;
- FTI Approach and its operationalization into three components;
- Component 1: Starting up, identifying and engaging with stakeholders and learning and practicing relevant tools;
- Component II: Design, implementation and evaluation of joint experimentation and learning;
- Component III: Sharing of results and sustaining the process; and
- Preparing a road map for FTI implementation

Several participatory tools were introduced to the participants who practiced these tools in group exercises and feedback sessions. The tools included SWOT-analysis (Strengths, Weaknesses, Opportunities and Threats – SWOT), Venn Diagrams, Participatory Rapid Appraisal, Transect Walks, Resource Mapping, Scoring and Ranking, Meta plan, and conscious listening.

During the final session, the workshop participants listed and ranked the project's prospective innovations for choosing four key innovations that in their opinion held the highest plausible promise.

An initial list of 14 possible innovations was prepared by a group of participants before the start of the training. During the final session it was expanded to include 17 prospective innovations.

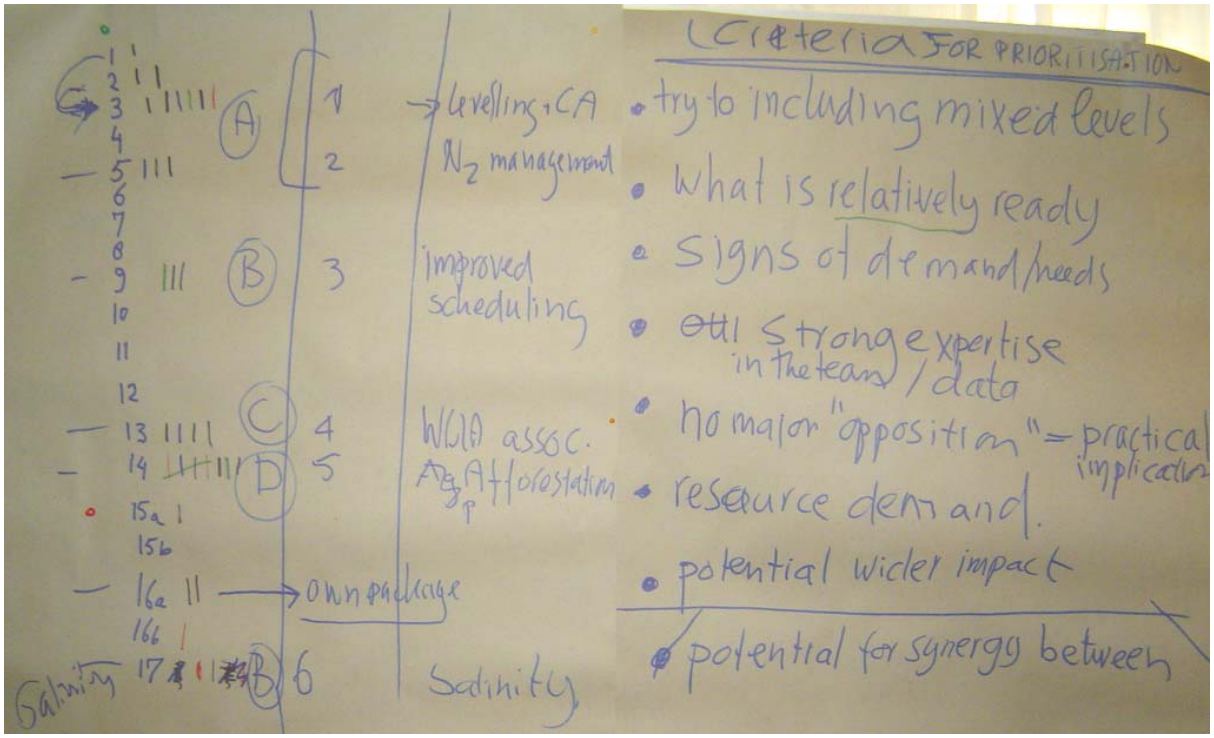
The participants considered the following criteria to rank the innovations (Photograph 1):

1. Maturity – is the innovation ready? For which level (field, farm, system, regional, national)?
2. How much supportive research has been done?
3. Availability of suitable sites

[2] After the training a detailed report on main objectives, methodology, program, decisions made was made available to the whole project staff (van Veldhuizen, 2008a).

4. Potential wider impact
5. Anticipated political support from policy makers and implementers (opposition/ neutrality/support)
6. partners/ stakeholders' willingness and readiness to cooperate
7. Project's internal (human and material) capacity to implement the innovation

Photograph 2 Ranking criteria and ranked innovations for FTI process



The following four innovations (Photograph 2) were selected through a ranking exercise:

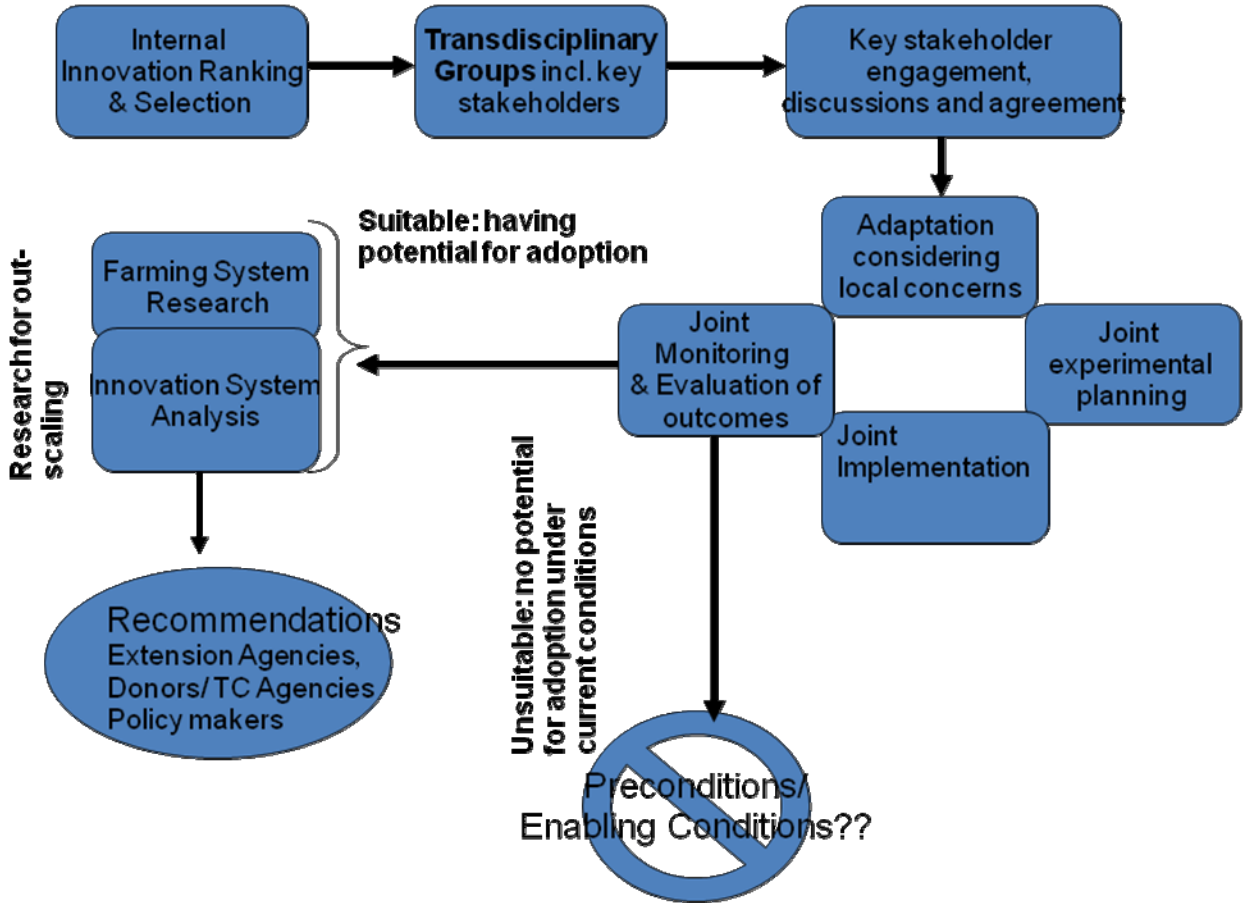
1. Conservation Agriculture (including precision leveling, intermediate tillage, permanent beds, residue and nutrient management)
2. Advanced tools for rapid salinity assessment and improved Irrigation scheduling
3. Strengthening Water Users Associations through capacity-building
4. Afforestation on marginal/ degraded lands (field and policy levels)

Around each of the selected innovations FTI teams comprising the scientists from various disciplines, such as hydrology, soil science, agronomy, economics, and social sciences were formed. These FTI teams should later on together with their stakeholders merge into transdisciplinary working groups (TWGs). Each of the so far merely interdisciplinary FTI teams comprised of a mix of scientists from the appropriate disciplines that formed the core of the group. Besides, considering the limited number of available staff, the disciplinary gaps were also filled by the Ph.D. students as supporting members, who had an interest in the specific innovation. A scientist from the core discipline of the innovation led the group. Reason for this separation between core and support members was the belief that PhD students, due to their high workload and focus on their own PhDs, could not be asked to act as main carriers of the process.

Since the second workshop, similarly to the first, still largely designed for the researchers scientifically accompanying the FTI process, it also provided an opportunity to the participants who had not attended the first one to catch up and involve themselves in the FTI team process. Most participants felt that the methods and tools discussed were very applicable and could be used in the local context.

Furthermore, the overall FTI approach and its separate steps were discussed and agreed on. Fehler! Verweisquelle konnte nicht gefunden werden. illustrates the outcome.

Diagram 1: Evolving FTI Approach



Source: Ul-Hassan, 2008.

Once the interdisciplinary FTI teams had identified their key stakeholders and had mutually agreed on a collaboration (formed the transdisciplinary working group), the precise steps of joint testing, adoption and adaptation of the innovations would be identified. Concrete roles and responsibilities were to be distributed amongst project scientists as well as interested stakeholders. By continuously involving local stakeholders the teams become transdisciplinary, internalizing local and global expert knowledge for validating innovations. It is expected that some of the innovations will be drastically changed and might no more offer the benefits as envisaged at their scientific design stage. The project scientists will make necessary amendments to the innovations as agreed with the partners and the validation experiments will be jointly implemented.

The validation loop (middle right in Diagram 1) is thought to ensure that local knowledge and the concerns of partners are included into the modified design of the innovations at hand. Through Participatory Monitoring and Evaluation (PME) of the implementation cycle it will be verified if the innovation in its revised form still holds a plausible promise, or needs to be shelved. In the former case, further research will be required to understand the entire innovation system and eventually form recommendations for the extension and technical assistance agencies for further out-scaling. In case the innovation fails to yield the anticipated benefits, enabling conditions that are precondition to the successful implementation of the respective innovation shall be identified.

Overall, the second training acted as kick-start for the FTI process in the field. The innovation packages to focus on in the beginning were selected, teams were created, tools and methods for the next steps to take were taught and the next steps of the process were discussed.

After training II, the FTI teams held several meetings to plan their activities, identify, and involve stakeholders. Using Venn diagrams, the groups were able to discern between the important stakeholders for the innovations in question and relevant stakeholders for the FTI process. The groups held structured

as well as unstructured consultations within the groups as well as with key informants and resource persons not directly involved in the FTI process to list and rank the stakeholders.

The internal planning of each FTI team proved to be rather time consuming as there had been tendencies amongst some of the groups to plan for the entire experiment as scientists and experts rather than planning the process of stakeholder engagement and joint experimentation. The FTI facilitator held several individual and group discussions with team leaders to clarify. Finally, with some delay, the groups prepared their internal plans and started stakeholder engagement activities.

The level and type of stakeholder engaging activities varied strongly between the groups. They ranged from individual meetings with key stakeholders and possible partners to participatory situation analyses. Amongst some FTI teams a tendency for individual and face to face discussions related to rather simple and more "technology oriented" innovations (i.e. advanced tools for salinity mapping) could be observed. In contrast, for innovations that originated from social science disciplines, the tendency was to carry out more complex but participatory processes, like problem and situation analysis.

4.3. Training III: Deepening the Understanding of the 'Follow the Innovation' Approach

A third training workshop was agreed to be held before the end of the year to take stock of the initial experience in FTI implementation and provide additional insights, methods and tools. Awaiting this third workshop the project itself organized two internal FTI related training days focusing on facilitation skills and team building.

The third training workshop 'Deepening the Understanding of the 'Follow the Innovation' Approach' took place in Urgench, Uzbekistan from 17th to 21st of November 2008. It was facilitated by a consultant from ETC EcoCulture and co-facilitated by the project's FTI facilitator as well as the coordinator of the social science work packages in the project (ZEFa).

It brought together 21 participants, the core of which were senior researchers based in Urgench, several research assistants as well as 3 representatives of the Ashirmat Water Users Association (WUA) and 1 representative of the Forestry Research Institute in Tashkent, two partner organisations. This third FTI workshop was thus the first training event in which project stakeholders actively participated. By and large this was a success. Not only did the three representatives of the WUA decide to participate almost to the end, rather than just the first one day as foreseen, but they contributed considerably, also in the more conceptual, process oriented discussions. The drawback was the need for plenary translations of most formal presentations leading at times to delays and decrease of active participation.

The specific objectives of this workshop were to enable participants:[3]

- to review and reflect on initial FTI implementation and increase the understanding of its potential and relevance in Uzbekistan
- to learn additional participatory research methods and tools for use in the FTI process and develop skills in using them;
- to re-assess how FTI teams are organized and operate and take measures to improve or re-strategize where needed.

The four-day program comprised of the following blocks:

- Welcome, introductions, participant expectation, background to FTI process and the workshop programme
- Recap of FTI training II
- Review of FTI approach: FTI Implementation and main lessons learnt
- Participatory Monitoring and Evaluation
- Field study on Participatory Monitoring and Evaluation (PME)
- PME Facilitation

[3] After the training a detailed report on main objectives, methodology, program, decisions made was made available to the whole project staff (van Veldhuizen, 2008b).

- Process documentation
- Working in teams: Food for thought for FTI groups
- Organisation and planning of further FTI process: *Plenary review of FTI groups: focus and composition*
- Review of FTI communication and support mechanisms:
    - Way forward, next workshop
    - Evaluation of training and closure

While the workshop was a success in terms of participation, topics covered and the level of engagement of participants, it also became very obvious that the progress of most FTI teams until November 2008 had been less than expected. Three out of four transdisciplinary FTI teams had prepared roadmaps until Training III. Yet, out of the four groups, only one highly involved the key stakeholders of the innovation at hand for jointly designing the roadmap. Two of the remaining three FTI teams had – at the time of the training – had only just begun to involve stakeholders; one was still in the planning process.

By some participants, mainly full-time scientists and researchers, this process of taking the developed ideas and critically reviewing them together with the stakeholders seems to be perceived as an extra task, separate to their main research and does not find the attention and focus that purely scientific research in laboratory conditions might receive. This process of testing and adapting the developed ideas in a real-life context together with the actual end users of the innovation packages is regarded as 'outside' the actual research work rather than as a research approach assuring the sustainability of the developed ideas and research results. Furthermore, the rather late introduction of stakeholder involvement in relation to the overall time span of the project puts special stress on the process and leaves even less room for the yet unconvinced to familiarize themselves with it. This may reflect the realities of the situation in Uzbekistan and the position of the project itself.

Nevertheless, initial interaction with stakeholders at various levels has led to a number of important issues and lessons related to the proposed innovations. This has resulted, for example to the strategy to "unbundle", un-pack, certain innovations, such as flexible water management and conservation agriculture, to allow stakeholders to experiment with (combinations of) selected components. Furthermore, it is encouraging to note that after some initial hesitations participatory interaction seems to be appreciated by some of the stakeholders, as well as project members, and new methods such as focus group discussions and visualization of group analysis have started to find their way.

The last day of the workshop was committed to plan the way forward. Here in particular issues of team composition, team meetings, financial and human resources for FTI, the relevance of selected innovations as well as FTI communication and coordination were discussed. In detail this can be found in van Veldhuizen, 2008b. Yet a small summary of the main points shall be given:

1. Roadmaps: All four FTI teams committed to finalize their respective plans in collaboration with stakeholders where needed (to be prepared before Dec. 5 2008, submitted to FTI Faciliator) and work with their stakeholders for a considerable period (Agreements of Cooperation have to be jointly prepared).
2. Team Composition: Division into Core and Support Members does not make sense and was abolished.
3. Team specific strategies to strengthen team functioning: additional members, facilitation of team meetings, divisions of tasks, etc.. Two more staff members will join the afforestation team to actively pursue the team's progress.
4. Geographical concentration of work by various FTI teams in one or few locations involving partly the same stakeholder (WUA): (a) share all information and documentations of meetings with stakeholders with the group (mailing list prepared, folders on servers structured and regularly updated by FTI facilitator, FTI Facilitator sends a summary & translation of workshop report to stakeholders); (b) coordinate work / invite stakeholder to coordinate in order to avoid too many meetings etc. for stakeholder.
5. Regularly practicing of facilitation skills: Monthly FTI group meetings organized by FTI facilitator will serve as training ground. Facilitation of these meetings will be circulated (Urgench: 1st Monday of Month, 10am; Bonn, 1st Tuesday of Month, 2pm). Meetings serve the reviewing of

progress and discussion of FTI Literature. Additionally specific skills training events will be organized by FTI facilitator.

6. In May 09, an internal workshop will be organized by the FTI Facilitator to review the progress of each team and offer a platform for planning the next steps.
7. Process Documentation: events, meetings and processes have to be documented more thoroughly. FTI Facilitator prepares to be filled in format and circulates it by Jan. 09.
8. Translation needs for stakeholder interaction: during meetings and translation of written documents. One staff member was assigned.
9. Financial Resources for FTI: each FTI team prepares draft budget as basis for discussion with project management. Furthermore, cost sharing arrangements with stakeholders, loan mechanisms, and external fund raising are options that need to be discussed transparently. The willingness for stakeholders to invest (finances, time and work to write external proposal together) in the proposed innovation is an important indication of their interest.
10. Project's strategizing of interventions towards policy levels: In Uzbekistan, all proposed innovations have important policy dimensions that need to be addressed. This is to be taken-up in further discussion on the new work-package on governance.
11. FTI Training IV will take place in Urgench in Nov. 09. Focus: Review of progress & PM&E.

By the end of 2008, finally all four FTI teams had prepared their respective work plans and road maps for 2009 for applying, testing and adapting the selected innovations. As outlined above the degrees of actual stakeholder involvement still highly vary with one group acting as strong front runner, two groups slowly taking their first steps, and one group still being in the planning phase and hoping that a recently assigned PhD student will accelerate the process for the overall team. According to all four roadmaps, the teams are planning to use the concepts, methods and tools learned during the three workshops.

In November 2009, a fourth FTI workshop training will review the implementation steps taken during 2009 and offer inputs on methods of participatory monitoring and evaluation. This workshop will include all stakeholders involved in the FTI process. Additionally, the project will meanwhile organize internal skills training and other learning events to support FTI implementation as requested by participants of FTI 3. Besides monthly meetings, an internal experience sharing workshop will be organized in May 2009 to take stock of performance and issues facing various FTI teams and learn from these. The final and fifth training workshop will then be organized towards the end of the project in order to assess the entire process from a scientific and operational perspective.

5. Key Challenges

The process of 'following the innovation', meaning to introduce project innovations to local stakeholders, letting them experiment with them for a period of time (laissez-faire), rejoining the stakeholders and jointly evaluating the outcomes, adapting and finalizing the innovation, calls, one year after its start, for a critical review. The challenges faced in the past year can be assessed by differentiating between (a) knowledge creation and dissemination in rural Uzbekistan, (b) administrative challenges, (c) scientists' versus farmers' knowledge, (d) team composition and organization, (e) contested transdisciplinary cooperation.

5.1. Knowledge Creation and Dissemination in Rural Uzbekistan

The process design of jointly with stakeholders testing, adapting and finalizing innovation packages developed by the project stands for an immensely different approach to knowledge diffusion as commonly done and known in Uzbekistan. It therefore poses a great challenge and offers new opportunities. Uzbek policy thinking about the diffusion of innovations is heavily dominated by the linear model of technology (knowledge) supply push. This can be explained with the authoritarian political system and an amalgamation of Post-Soviet and reviving Uzbek, Muslim influenced culture, resulting in a hierarchically organized society used to receive rather than critically question and adapt the knowledge provided by the state. The authoritarian system of state control over knowledge production that can be

assessed in the realm of high-level research commissioned by the government (Selim, 2009:80ff; Wall, 2008:141ff), leads also in the realm of local, agricultural knowledge production to a high level of self-censorship. Wall (2008:85ff) identifies 5 key characteristics of the local knowledge system of Khorezm. First, local 'masters' with very specialized knowledge, embedded in the patriarchal and hierarchical Khorezmi culture, are central to the local knowledge system and often hold positions of political and economic power due to their expertise. Second, in terms of knowledge dissemination, family based modes of knowledge reproduction and transfer seem to be most common. Accessing external forms of knowledge and the reproduction of those in the local knowledge system exist, but to a lesser extent. Third, in sectors of immediate importance to the state agricultural production system, i.e. cotton and wheat production, indigenous, local knowledge lies at the interface with formal, university taught knowledge. Wall (2008: 110ff) assesses a linear, top-down approach to knowledge diffusion with little, if any, mutual exchange of ideas or participatory forms of knowledge production. A bottom-up approach, such as FTI, involving the ideas, experience and knowledge of local stakeholders as experts concerning the issues at hand therefore is rather uncommon to the specific setting of Khorezm/Uzbekistan. This also interlinks with Wall's fourth point. He argues that 'collective knowledge' which is rather unitary in nature, prevails in the Khorezm agricultural knowledge system, leaving little space for creativity-fostering diversity. Fifth, this unitary nature of knowledge is, according to Wall (2008: 123ff), further exacerbated by ongoing 'knowledge loss' and a 'growth of ignorance' in the post-Soviet era of Khorezm .

The participatory, transdisciplinary approach of involving farmers as the main agricultural experts, as innovators in the process of testing, adapting and jointly finalizing the ideas developed in the project, therefore meets several challenges that are specific to the local Uzbek setting. The bottom-up approach is continuously challenged by, and at the same time challenges itself, a little developed culture of openly voiced criticism. This lack of communicated critical reflection can be assessed with regard to the scientific (external) knowledge that is offered by the project as starting point for discussion as well as with regard to locally tested, often superior ideas that could enrich the scientifically developed innovations.

The FTI-process, as attempted in this project, is a process of exchanging forms of explicit and tacit knowledge between project-employed researchers and local stakeholders. While explicit knowledge refers to knowledge documented and made available in books and databanks, the notion of tacit knowledge focuses on experience gained through action (Nonaka and Takeuchi, 1995; Evers et al, 2009). Neither project-employed researchers, nor local stakeholders hold either explicit or tacit knowledge, but instead all actors hold different kinds of explicit and tacit knowledge on the subject matter. Yet, if we believe Botkin and Seeley (2001), the later, tacit knowledge, forms the bigger group. The authors argue that roughly 80% of all knowledge is tacit in character, bound and expressed in action. In this estimation, Botkin and Seeley leave out how much this tacit knowledge, increases in relation to explicitly expressed knowledge in the situation of an authoritarian, hierarchical system with mechanisms of repression focusing at the explicit, rather than non-explicit knowledge. Locally determined tacit knowledge is therefore crucial to the process of 'following the innovation'. The systematic exchange of the different forms of knowledge shall yield the creation of new and made explicit knowledge, manifested in the finalization and outscaling of the innovations suggested.

Trust as basis for any form of cooperation, and precondition for the mutual transfer of tacit knowledge, has to be built. While this importance of trust might not be unique to the Uzbek setting, experience shows that the level of trust needed as well as the input required to build this trust is substantial. Continuous cooperation, meetings, workshops, seminars, material and immaterial concessions and kept arrangements become crucial to the overall process. This very time and work intensive process requires staff continuously in the field, with the necessary language and communication skills, as well as the scientific qualifications. PhD students as well as project staff mainly based in Germany can valuably contribute to these processes, but on a daily basis the process has to be carried out, trust built and maintained by well trained and highly committed staff members in the field. While this appears logical in terms of the process design and its longed for achievements, it is not always easy to recruit the required staff and to get the required financial means approved.

5.2. The Administrative Challenge

The original design of the FTI process planned for an FTI facilitator to be continuously present in the field (8 months/year in Khorezm, 4 months/year in Bonn) to facilitate each FTI team in their cooperation with stakeholders as well as one/two external consultants with specific expertise on participatory methods to conduct the training series of five trainings. Yet, before these could be hired another detailed work package proposal had to unblock the already approved but blocked funds. Only then the project could start with recruiting. The external consultancy group was found and hired relatively quickly. Nevertheless, for recruiting the FTI facilitator, unfortunately three recruitment cycles were needed to find a candidate with the required profile in participatory methods, facilitation skills, experience in stakeholder involvement, the willingness to stay eight months of the year in Urgench/Uzbekistan and the remaining time in Bonn/Germany on a basic academic research position without bonuses, perks or extra allowances. This resulted in a delay of almost a year in kick starting the actual implementation cycle. Furthermore, the first FTI training had to be conducted before the recruitment of the FTI facilitator in order to not lose one more year due to the calendar of agricultural seasons. The training was supposed to take place before the beginning of the agricultural season in order to enable a large part of the project team to participate. Consequently the continuity of facilitation was hampered at the start of the progress. This was even more so since the main external consultant, due to different understandings on quality and content of the training series, had to be exchanged and the coordinator of the social science parts in the project (responsible for the coordinative part of the FTI work package) went on maternal leave and was replaced for six months. Overall, these organizational problems in staff recruitment caused a delay of one year in starting the process and affected, at the beginning of the process, the continuity of facilitation and training design, scientific support from the social science coordinator and the overall support from the main project management in the process. It therefore negatively dampened the creation of a pro-FTI atmosphere within the project team.

5.3. Scientists' versus Farmers' Knowledge

The initial attitude of the scientists, who are trained and selected by the scientific supervisors of the university to carry out in-depth disciplinary research or get a scientific degree in a disipline, to engage in an interdisciplinary and eventually a transdisciplinary dialogue on adapting their respective innovations, to address concerns from other disciplines and stakeholders is another issue that some of the teams faced. The attitude of a number of team members within each of the four teams was that being scientists, their role was to come up with the cutting edge "best bet" technology/ innovation that addresses the economic and/ or environmental issues prevalent in the Khorezm region. Many believed that their discipline offered "the best" solution to the problem and that the context should change to fit the innovation, rather than the innovation to fit the context, as then it might not remain the theoretically possible best bet anymore. Several teams had gone through internal debates and discussions about the "right things to do", and the "right way of doing things". The perceptions amongst some of the team members that the answers to these questions were rather imposed by the senior group members, point to the difficulty interdisciplinary teams face in acknowledging the validity of the knowledge from other disciplines.

Another similar challenge the teams faced was to understand the value of local knowledge. The team members of almost all groups while preparing their work plans to implement FTI activities came up with a scientific work plan first, that intended to "raise the awareness" of stakeholders about the importance of the scientifically identified problem, the innovative solution that was designed by the scientists, and finally to "convince" the stakeholders that the approach chosen by the scientists was the best. In an ideal transdisciplinary and participatory process, the teams should focus on the situation analysis first, rather than tell the stakeholders what the scientists regard as the stakeholders' key problem and what the ideal scientific solution could be. A typical example for this issue is the reluctance and disappointment of some of the teams in unbundling complex innovations, like conservation agriculture. For example, the conservation agriculture team was disappointed to know during the first meeting with stakeholders that all of the farmers were keen to implement laser leveling alone, and rather cautious to proceed with all elements of conservation agriculture. The farmers' reasons for opting for laser leveling immediately, was

that the state had no objection to leveling. Its potential benefits of saving water, which is critically short in the area are unquestionably proven. Other elements of the conservation agriculture innovation package, such as reduced tillage, might attract state sanctions for violating the state recommendations on the production norms.[4] Consequently, the farmers reacted with more caution.

Some of the teams, especially the one on afforestation and to some degree on conservation agriculture, have difficulties in discerning between the validation of innovation through the FTI process and adoption and out-scaling through extension. The teams appeared to design an approach whereby the phase of jointly experimenting, validating and finalizing the innovation together with the stakeholders was considered as one step amongst many. Yet, the steps following this phase of finalization together with the stakeholders were already planned in detail, disregarding the possibility that the phase of joint testing could lead to results that would require a set of completely different steps afterwards which so far had not been anticipated.

5.4. Team Composition and Organisation

After forming the four FTI teams in training II, the idea of core and support members, where the former refers to the senior scientists employed by the project and holding supervisory responsibilities, and the latter refers to the PhD students and research assistants having a more focused job description, in some teams negatively affected the team spirit. It was understood as a hierarchical organization of the teams that additionally was not even kept in all teams, i.e. while some teams thought that only core members should participate in certain meetings, other teams sent all members. This resulted in a not always understandable balance of information sharing. Some of the groups tended to strategize within the core members first and then pass on the outcomes to the support members. The support members perceived this as stating that their inputs were neither needed nor welcome. Besides, most of the Ph.D. students kept on wondering about their role within the group. They expected more concrete job descriptions or a clear task list rather than limited participation in group discussions. Besides, many times the FTI meetings and activities conflicted with the work schedules of PhD students who were carrying out their own field research, a clear priority for them. Once such tendencies were noticed, a small perception survey was carried out amongst the Ph.D. students from various groups and the perceptions were documented and shared with the FTI groups with an appeal to address the root causes of such perceptions. The FTI group on water management addressed this issue by itself through broadening its support membership by including the research assistants who were more directly and intensively involved in the field activities into the team as support members. Furthermore the distance between Bonn and Urgench posed a challenge to some of the teams: Some core and support members of FTI groups are based at two locations, Urgench, where field activities are carried out and Bonn, where most of the scientific writing and analysis is done. An interesting issue faced by the FTI group on water management, and at times by some other groups, was that when the group had internal meetings or meetings with stakeholders, it would share minutes, ideas and plans for receiving inputs with the remotely located members through emails. Yet, in many cases the inputs from the colleagues in Bonn were merely more questions, issues, and opinions, or suggestions so far off from local reality that they meant more work without adding much value to the process. Securing an internal agreement on questions and issues would thus take much more effort, time and energy than what could be achieved through face to face meetings and discussions. On the other hand, the group on salinity and flexible irrigation scheduling also had a similar setting, but did not experience such difficulties. This might be interpreted due to the nature of innovation in question. The innovation for the water management group is of socio-political process nature whereas the same for salinity and irrigation scheduling is more of a technical nature. In the former case, the terminology and language used by the scientists and group members to describe innovation and processes varies widely due to the involvement of various disciplines, training background, and scientists' own cultural background. In the latter case, technical

[4] Reportedly, the state does not only dictate the area that farmers need to plant under cotton and wheat, but also the frequency, level and timing of agricultural operations and inputs. Any farmer reported to not follow such recommendations might be liable to state sanctions, such as fines and penalties or cancellation of the land lease by the state.

terms related to the innovation, its operation and validation are rather reflecting the homogenous character of the group composition.

Furthermore the assignment of roles within the teams based on research experience rather than experience in facilitating stakeholder involvement or team leader skills posed an even greater challenge. Several FTI teams, due to the complexity of the innovations at hand, decided that the teams should be 'led' by an experienced scientist from the discipline of the innovation. Innovations like conservation agriculture comprise a bundle of rather complex technological sub-packages from engineering, agronomy, soil science, social sciences, etc.. The leadership by a senior scientist, understanding all scientific complexities of the innovation was chosen as a key strategy of the FTI process so that the scientific challenges and issues are tackled in an expert way. However, not all good scientists can be good group leaders or facilitators. Consequently the respective FTI groups experienced / and still are today experiencing a considerable tendency of being overly scientific in their approach to identify and engage with stakeholders. Besides, instead of preparing a roadmap of stakeholder engagement activities, the group went through an additional planning cycle where it prepared a scientific work plan on "how the conservation agriculture should be implemented in a scientifically sound fashion" rather than "how conservation agriculture should incorporate stakeholder concerns and knowledge into its design". This was subsequently addressed through a formal training in facilitation skills as well as an informal one-to-one coaching by the FTI facilitator. The difficulty experienced by the experts and natural scientists in assuming a facilitator's role can be considerably minimized by training and coaching in facilitation skills. Nevertheless, it also has to be stated that some very good researchers and scientists might actually never be – even after a considerable amount of training – good facilitators. As part of the third training, one afternoon all participants visited a Water User Association, partner of one of the FTI teams. Here, all participants were split into four groups and asked to each discuss a certain topic with parts of the farmers present. The groups internally assigned roles like facilitator, translator, minute taker etc., thought of questions to ask and different modes of interaction (interview, focus group discussion, actor mapping, etc.) Nevertheless the actual moment of interaction turned out to be far more difficult that anticipated beforehand. In the evaluating discussion afterwards the following problems were raised: big rooms with farmers sitting at one end, project team standing at the other, difficulty to catch attention of farmers, questions asked far too long, often entailing several sub-questions, interviewer reading out questions by looking at book – no eye contact, during answer, interviewer writing – again no eye contact, etc. This is just a small selection of problems faced but it mirrors the difficulties encountered although the assigned facilitators and interviewers had gone through two official trainings looking at methods of stakeholder interaction (for more detail see van Veldhuizen, 2008b).

5.5. Contested Transdisciplinary Cooperation

The FTI team aiming at the strengthening of Water User Associations through capacity building realized the importance of trust as precondition to any further collaboration very early on in the process and strongly emphasized the building of it. Water User Associations in Uzbekistan, while officially being farmer organizations, were created by the state, lacking farmer ownership and are therefore regarded by many as state rather than their own collective organizations. Therefore, the FTI group on water management initially envisaged social mobilization and awareness creation as an innovation for strengthening collective action and improving governance and accountability within the WUA. The group originally consciously turned against technological improvements, or improvements in the infrastructure, believing that those would distract the focus of the WUA from management issues to mere equipment. However, after several rounds of dialogues and discussions with the WUA management, the group realized that a minimum level of hardware inputs was necessary to actually enable the WUA to do their work, as well as to demonstrate the seriousness of cooperation from the project side,. Part of the aim of the cooperation was to strengthen the institutional functioning of the WUA as an organization. Yet, during the discussions it became obvious that the Water User Association hardly is enabled to be present in the land that it is responsible for since the means of transport required to get from one end to another simply do not exist. Consequently, the WUA staff could hardly be present at several places a day and therefore also be present in the minds of the farmers as an organization serving them. Contrary to the original scientific design of the innovation of only "soft" interventions, the agreed participatory

innovation design kick started with hardware (equipping the WUA with bikes) while at the same time and from then onwards increasingly offering software inputs (i.e. training workshops, visits to best-practice WUAs in Ferghana Valley etc.).

The FTI team on innovative salinity assessment tools faced the 'salesman' challenge in its interaction with local stakeholders. The innovative idea the group is pursuing addresses one of the critical constraints faced by Uzbek policy makers. The way salinity maps are prepared and the techniques deployed to make such maps, currently result into considerable delays in time regarding the advancement of the process. By the time such maps are made available to policy makers, these are partly already outdated. The use of advanced tools is foreseen to overcome this, but the limitation is that these are interpretative tools, whose scientific validity is questioned by Uzbek scientists. Therefore, many of the potential stakeholders did not show keen interest in the innovation during the first interactions. The group member responsible for introducing the innovation felt as if he was being treated by the stakeholders as a salesman of the manufacturing company rather than a colleague scientist discussing the potential for an innovative way of preparing salinity maps.

Furthermore, the group had identified primarily three key stakeholder groups that could benefit from the use of the innovation at hand: a) policy makers who could get on time salinity maps to help them formulate policy actions but who would not directly be interested in how the maps are prepared; b) technical institutions that are mandated to prepare salinity maps, and ideally would benefit the most by the use of the innovation, but lack equipment; and c) educational institutions that carry out research on the science of salinity mapping. Here the interest of the educational institutions would be only to test the validity of the innovation in a wide range of environments, but would not be interested in the actual use of the innovation for the purpose it is designed. Therefore, the group targeted the institutions whose mandate was to make maps as their primary stakeholders. The group leader had meetings with directors of such institutes, who treated him with respect, spared time to listen to him, but did not show much interest in experimenting with the tool. The group got frustrated and started wondering if the idea of using this equipment should be shelved as the most relevant stakeholders did not seem interested. The question of when the project would decide that a certain innovation at hand would not be valid and could be neglected in the future arose. Hence, how and when should the group decide to shelve the innovation declaring it "invalid" and "having no potential" under current circumstances?

The conservation agriculture team currently faces the problem that the required technology for getting the developed innovation to work (i.e. adjusted seeder) is cost-intensive, cannot be explicitly financed by the stakeholder or the project. Consequently, cost-sharing arrangements and jointly written proposals to third-party donors are discussed. This rather often encountered problem of high- versus low-external-input technologies (Röling, 2009: 25ff) poses an immense challenge on inter- and transdisciplinary research teams. For the – often international – scientists, the level and technological equipment for their research lies substantially above the technological equipment of the local stakeholders. The researcher therefore finds him/herself pulled between two aims: international fame as researcher in his discipline or local fame as truly transdisciplinary researcher developing innovations that require little or no external input and make sense for the local end-users.

6. Discussion and Outlook

The process of 'following the innovation' started to take off after the second training in June 08. From then onwards, the four FTI teams, facilitated and accompanied by the FTI facilitator, dived into the process of identifying their main stakeholders, establishing cooperation and identifying the seemingly suitable paths of jointly testing the innovations at hand. The speed and eagerness with which the teams moved this process forward, varied strongly. Yet all four teams actively reflected on their mode of conducting this process and took the first (bigger and smaller) steps.

The purpose of this paper is to document the process and critically review our progress. Which challenges did occur and how did we (successfully and less successfully) face these? This reflection leads us then to the identification of the main lessons learnt and further open questions before continuing the process in the coming agricultural season 2009.

The challenges we faced and the lessons learnt from those can be categorised into five groups. *First* of all the common system of knowledge creation and dissemination in rural Uzbekistan is rather top-down in nature, with hierarchic and authoritarian organisation. As such it poses a direct contrast to the bottom-up approach chosen and attempted by this project. Little openly voiced criticism, critical discussion and instead a mentality of first mainly listening to and potentially adopting presented knowledge rather than critically working with this external knowledge to develop it further, were encountered. Partly these were overcome and partly continue to pose a strong challenge in day-to-day interaction. Yet, it became obvious that a form of interaction in which the project FTI teams are active presenters of their knowledge while the stakeholders are passive listeners cannot lead to any successful form of mutually enriching each others tacit and explicit knowledge. It cannot lead to the creation of new knowledge, innovations that scientifically possess a real improvement and at the same time make sense and work in the real-life setting of Khorezm, Uzbekistan. In terms of lessons learnt, this means, that the bottom-up approach attempted by the project faces an immense challenge in the Uzbek setting. But at the same time it seems to be the only possible approach for assuring that the developed innovations make sense in the local setting and thus the challenge has to be faced. *Second*, we encountered administrative challenges that might appear less important or interesting but did pose a substantial challenge especially to getting the process started. One lesson nevertheless learnt is that substantial finances have to be provided. In order to attempt such a process properly, it is crucial to have a continuous facilitator in the field as well as to bring in external expertise that is not present in the project team and – and this point should not be underestimated – legitimises the process. The internal facilitator is crucial in advising and mentoring the interdisciplinary project FTI teams in how to plan, address and conduct the process of stakeholder interaction. Roadmaps have to be designed and discussed, concrete questions of how to communicate with the stakeholders, organising meetings (i.e. who is invited, where does it take place, who finances it, will minutes be taken, will these minutes be shared, in which language does the meeting take place, etc.) have to be addressed. And finally, the teams have to be continuously coached on different approaches to knowledge transfer (linear versus non-linear thinking). The external expertise is very important to justify the design, time and resource intensiveness of the process facing criticism within and outside the project. Furthermore, very well trained staff is needed to continuously interact with the stakeholders for building and maintaining a level of trust necessary for successful interaction. The respective resources to train and finance this staff have to provided. *Third*, it became obvious that the clash of two highly differing cultures of knowledge creation and dissemination between researchers and farmers (the stakeholder group we mainly interacted with so far) has to be faced with continuous discussions on the value of each type and form of knowledge. Thus, implicit views on one type of knowledge being superior to another are very present and require a longer and continuous process of reflection, attitude building and learning. It is a process that requires a high level of personal self-reflection, openness and egalitarian values. *Fourth*, internal issues of team composition and organisation played a role, especially also for the level of motivation amongst the different team members to devote time and effort to the process. This then also very much affected the design of each team's roadmap, including the time schedule, and especially drive that was and still is invested into it. Here, it was also interesting to see, how very linear and hierarchical thinking dominated the composition of the project internal FTI teams. Basically, hierarchical thinking that was regarded as counterproductive in the interaction with the stakeholders was employed to a comparable degree in the organisation of some of the project teams around a selected innovation. An important lesson learnt therefore is the realisation amongst the project internal FTI teams that an egalitarian team structure, organised along horizontal lines of organisation plays an important role not just within the teams themselves with regard to motivation etc.. Additionally, each FTI team as soon as it goes into the field and interacts with local stakeholders acts as an example. The team with its team specific form of team composition, organisation and communication (including questions such as are decisions taken in meetings with all members present or in the realm of a private office excluding some members? Are these decisions documented and then also implemented, or not?) acts as a role model for the trans-disciplinary team, the team consisting of the project staff and the local stakeholders interested in one specific innovation, that is about to be established. The successful mutual knowledge transfer requires a horizontal team composition and participatory forms of communication within the transdisciplinary innovation team. In order to achieve this, the project's own internal FTI teams have to outlive and demonstrate this type of participatory communication and organisation to the stakeholders. *Fifth*, we faced a number of challenges in the

direct interaction with stakeholders that made us question our innovations. First of all it became obvious that the crucial basis for any form of stakeholder cooperation is trust. This trust had to be built and maintained through means of regular meetings, transparency, openness and more so through some actions that we had not encountered before. We were faced with the situation that we had to offer something of immediate importance to the stakeholders first in order to gain their trust and consequently be able to raise their interest for the innovations at hand. The team looking at institutional empowerment in a Water Users Association realised that the WUA had to be technically enabled to perform its tasks, before any type of institution building measurements could grasp. Hence, we learnt to be open to the direct needs of the stakeholders, in order to contribute to the building of trust, so essential for the further cooperation. With regard to the salinity assessment tool, another innovation, questions regarding the innovation itself and the degree to which we should pursue the interaction with the stakeholders, even if the stakeholders repeatedly showed little or no interest (salesman challenge). When would be the time for us to decide to shelve the innovation due to the lack of interest on the side of the stakeholders? We learnt the necessity to regularly reassess our innovations selected as 'plausible promises', but just as much also the stakeholders that we identified. Furthermore, the problem of high-external-input technologies was faced. How could costs connected to a certain innovation be financed? Here, modes of drafting proposals together with the stakeholders etc. will have to be discussed more systematically in the future.

Of these challenges, the most interesting and at the same time the most difficult that was and continuously has to be faced, is the high degree of linear thinking, further strengthened by hierarchical and authoritarian structures, amongst the project researchers and the local stakeholders. It reflects mainly on two areas: the composition and distribution of roles and responsibilities within the interdisciplinary FTI teams within the project as well as in the *confrontation* of the external, scientific knowledge and the local, stakeholders' knowledge. We consciously here speak of a confrontation. The prevailing linear thinking within the project internal teams as well as in the interaction with stakeholders, leads to a polarisation of the different types and forms of knowledge that we are actually trying to merge for the enrichment of the overall knowledge stocks as well as their carriers (actors) involved. This for example resulted and/or was expressed in questions like "how can we convince the farmers to adopt our innovation?" or in practical plans on how to outscale the production of an innovation at hand before having at all tested the validity of the innovation in a real-life setting with farmers.

The linear, hierarchical thinking furthermore substantially weakened all kinds of agency. Designating one researcher in each team as the 'team leader' had in some teams the effect that the rest of the group leaned back and waited for the team leader to move. If he/she did not, hardly any own agency was developed. Hence, designating a leader seemed to be quite de-motivating for the non-leaders, especially as long as the leader did not take any concrete action that would involve the rest of the group. Action independent of the action of the leader was hardly taken.

In the interaction with the local stakeholders, here water users (farmers) and water managers, it nevertheless became obvious that despite the present culture of top-down management, very hierarchically organised society and authoritarian system, bottom-up approaches proved most successful. Attempts of establishing cooperation that were influenced by images of scientific knowledge being superior to farmers' local, explicit and tacit knowledge did not succeed in establishing the basis of trust needed for continuous collaboration. This impression was also supported during a visit of the project FTI teams during the third training workshop to the water users association that stands in close contact with one of the teams. During small discussion rounds with the farmers, researchers who managed to create an egalitarian, horizontally structured atmosphere, showing signs of respect with regard to the farmers' experience and knowledge were by far more successful in receiving open, seemingly honest answers that could form the required basis for cooperation. In opposite cases, farmers did not give answers at all, became insecure and obviously feeling uncomfortable. Accordingly, the FTI team explicitly opting for a very participatory, transparent bottom-up approach in interacting with the stakeholder group was now, roughly one year after starting the process, the first to sign a formal agreement for cooperation, including a concrete 12 step plan, with the respective water users association. Besides relating it to the bottom-up approach chosen, this of course can also be traced back to this FTI team indulging into the process more actively than others, continuously following up with their roadmap, and

fostering a very close contact with the stakeholders. Yet, overall, the so-far success of this close, transparent, continuous and participatory cooperation suggests a clear superiority of non-linear thinking and participatory approaches in terms of stakeholder interaction over linear thinking that polarises knowledge stocks and their carriers and therefore makes the interaction and successful exchange of knowledge for together developing new knowledge a lot more difficult, if not impossible. This finding is especially interesting in the very hierarchical setting of Uzbekistan, where linear thinking and approaches have dominated the overall knowledge transfer, education and agricultural extension systems since early Soviet-times. It consequently combines all lessons learnt that were outlined above: this process attempted by the project is the only possible way to test, adapt and finalise our innovations to a degree that we can rightly argue that they make sense and pose the potential for real improvement and development in the real-life local setting of rural Khorezm, Uzbekistan. Yet, it is a difficult, time and resource intensive process that requires the energy and openness of every project member and stakeholder involved. It requires a degree of openness that allows and encourages every single member of the overall FTI team (project and stakeholders) to pull down boundaries, give up feelings of superiority or inferiority and meet with 'the other side' on an equal level that allows for truly mutual exchange of explicit and tacit knowledge to a degree that new knowledge is formed (innovations finalised according to scientific rationale and local sense). It requires the openness and eagerness of all parties and actors involved to continuously learn from each other. We will continue tackling this great task in the agricultural season 2009.

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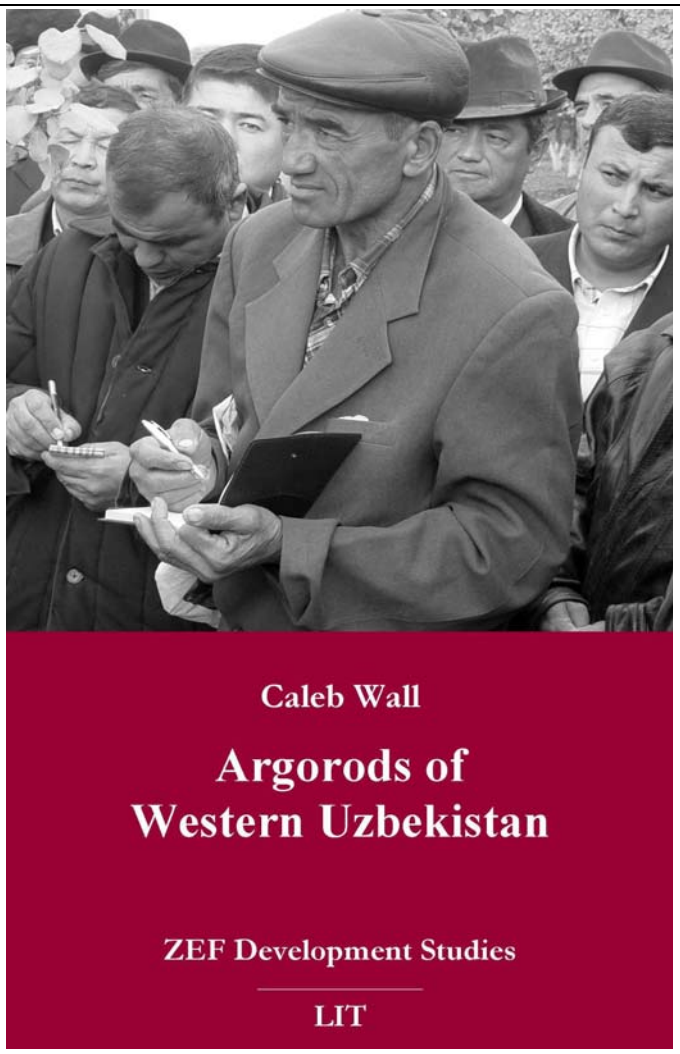
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