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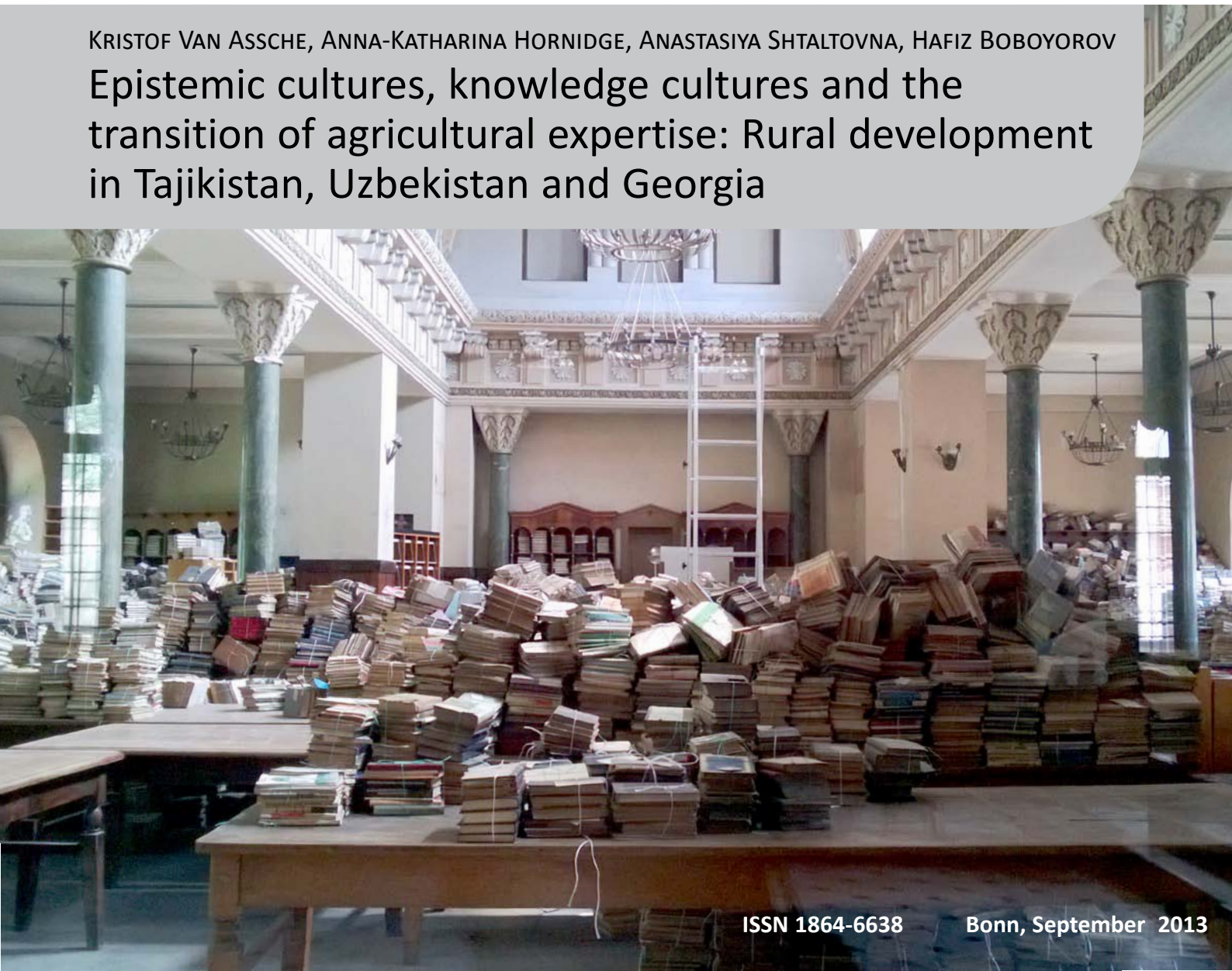

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Epistemic cultures, knowledge cultures and the transition of agricultural expertise

Rural development in Tajikistan, Uzbekistan and Georgia

Kristof Van Assche, Anna-Katharina Hornidge, Anastasiya Shtaltovna, Hafiz Boboyorov

Abstract

In this paper, we investigate the utility of Knorr-Cetina's theory of epistemic cultures and knowledge cultures for the analysis of rural transition in post-socialist countries. We look at the evolution of agricultural expertise in Tajikistan, Uzbekistan and Georgia, with a special interest in the reconstruction of 'extension', a concept we also critically investigate by means of Knorr-Cetina's framework. It is argued that rural transition in the three countries is marked by patterns of convergence and divergence, and that each path can be described as a unique and interdependent combination of epistemic cultures and knowledge culture, leading to unique modes of interpretation, recombination and implementation of both imported and pre-existing models of extension.

Keywords: rural development, Central Asia, extension services, knowledge, epistemic cultures.

1 Introduction

Knorr-Cetina, linking her work to global discussions on the increasing role of knowledge for economic and social development, argues that the transition to knowledge societies implies the growing importance of knowledge-related cultures, specifically of epistemic cultures and knowledge cultures (1999, 2007). She states: "Epistemic cultures are the cultures of knowledge settings, and these appear to be a structural feature of knowledge societies" (1999: 8). And as they are constructed in different cultural and societal contexts, they heavily differ from each other – Knorr-Cetina speaks of "the disunity of science" and of "the diversity of the manufacturing systems from which truth effects arise" (1999: 12). With regard to their outreach, she states that the institutional structures crucially influencing the development of these epistemic and knowledge cultures continue to be geographically bounded. This, she states, further implies "a divide between global knowledge and its expert cultures […] and those areas of practice and mentality which remain local" (2007: 372).

The here presented discussion on epistemic cultures and knowledge cultures in the agricultural sectors of Tajikistan, Uzbekistan and Georgia takes these considerations of Knorr-Cetina as starting point. Rural transition in all three countries is marked by specific patterns of convergence and divergence resulting in unique epistemic and knowledge cultures nurturing agricultural knowledge production, adaptation and use. This also means that the interaction of global and local stocks of knowledge, the mutual shaping of each other and interdependencies differs in quality in each of the three agricultural systems depicted. Yet in all three cases local epistemic and knowledge cultures are in fact co-shaped by Soviet-legacies, after independence tendencies to transform agriculture and global discourses on the allegedly crucial role of 'knowledge' for development and poverty alleviation (Hornidge 2012). The later has also resulted in an increased interest in the countries' systems of agricultural advisory services, or so-called extension systems and respective donor presence in the field (Goldberg et al. 2011).

Empirically, this paper draws on five years of largely qualitative, ethnographic research in the agricultural sector of Uzbekistan, two years in Georgia and two years in Tajikistan, conducted between 2008 and 2013 in the frame of three interdisciplinary projects on knowledge for agricultural development in the respective countries.[1] Precisely this entailed ethnographic research on agricultural service organisations (i.e. machine tractor parks, fertiliser companies and bio-labs) as well as water management practices and institutions in Khorezm province, Uzbekistan; on agricultural advisory service development mainly throughout Tajikistan as well as local epistemic cultures in agriculture in mainly Shahritus district, Tajikistan; as well as on local epistemic cultures in agriculture in Shida Kartli province and agricultural advisory service development in Tbilisi, Kakheti, Shida Kartli, and Guria, Georgia. The research in all three countries included besides other means of data collection semi-structured interviews and participant observation during longer research stays also in form of internships in the mentioned agricultural service organisations. For reasons of privacy, we will not mention names or use direct quotes.

[1] Precisely the research took place as part of the projects 'Epistemic Cultures and Innovation Diffusion in post-soviet Southern Caucasus and Central Asia, Pilot Study: Agricultural Knowledge Systems in Georgia and Tajikistan' and 'Economic and ecological restructuring of land and water use in the Khorezm Region, Uzbekistan', both financed by the German Federal Ministry for Education and Research as well as 'Conversion of Knowledge in Post-soviet Agriculture: The Impact of Local Governance on the Knowledge Management of Agricultural Actors in Tajikistan', financed by the Volkswagen Foundation. The authors thank the funding institutions for making the research possible.

The argument put forth moves in four steps. The introduction is followed by the theoretical frame, Knorr-Cetina's concepts of epistemic and knowledge cultures, by discussing these in the context of (post-Soviet Union) transition, in the agricultural sector, as well as out of the perspective of evolving agricultural expertise under transition. This is then filled with empirical flesh with regard to the three countries, Georgia, Uzbekistan and Tajikistan. The presented suggests to distinguish six models of agricultural advisory services, i.e. 'extension'. This is done in the third part of the text. The fourth part joins the two strings of discussion again by bringing it back to Knorr-Cetina's concepts of epistemic and knowledge cultures. Finally the text ends with a conclusion.

2 Theoretical frame

In the past thirty to forty years, the notion of 'knowledge' has increasingly shaped development discourses worldwide. Forming the main focus of discussions revolving around the 'knowledge society' as well as the notion of 'knowledge for development', different types of knowledge have been identified and discussed as crucial drivers for the economic development of nation-states as well as of international development cooperation and poverty alleviation (Hornidge 2012). Knorr-Cetina (2007) has contributed to these discussions since the early 1990's by putting forth her theory of epistemic cultures (1999), firmly rooted in several theoretical traditions. There are the science and technology studies, among which the line of actor-network theory is important, history of science, a broad and deep understanding of structuralism and post-structuralism, and last but not least the systems theories that marked her academic environment in Bielefeld. We cannot fully summarize her work here, but highlight a few aspects that are useful for the analysis of expertise in rural development.

Knorr-Cetina has been working on knowledge construction, dissemination and implementation in society for several decades, teaching and doing research in Germany and the US. Her concept of 'epistemic cultures' is most widespread, but also often misunderstood. She herself developed the concept over the years, in discussion with a wide variety of authors. She was inspired by both sociology and philosophy of knowledge and science but also by the early anthropologically inspired studies by Bruno Latour on knowledge construction in laboratories and their networks (studies started in the early 1970's). At the same time, her concept of epistemic culture draws on a persistent critique of the concept of 'culture', in anthropology and sociology, her answer being a preservation of the concept but limited to small environments. The initial versions of 'epistemic culture' were therefore similar to early laboratory studies and some historical studies of science, in the sense that they focused on clearly delineated environments in which knowledge was constructed, and clearly delineated conditions under which this knowledge became disseminated and applied (Knorr-Cetina, 1982; 1983).

In a Kantian move, she gradually shifted attention from the construction of knowledge to the preconditions for such construction, to the construction of environments, tools, infrastructures, both physical and conceptual, that enable the construction and dissemination of knowledge. She captures these under the notion of epistemic cultures and defines them as "those amalgams of arrangements and mechanisms – bonded through affinity, necessity, and historical coincidence – which, in a given field, make up how we know what we know" (1999: 1). She demonstrated that it is not always possible to distinguish between production, dissemination and application, as they might be dependent on the same infrastructures or as parts of these infrastructures might influence the quality of epistemic activity in seemingly remote domains (one can think of concepts of method influencing both production and application of knowledge or of organizational structures for knowledge production that also influence the application of knowledge). The interest in infrastructures of knowledge production, and the culturally embedded production of these infrastructures brought her close to Foucault at times.

Despite intentions of clear delineations at the micro scale, the larger scale could not be omitted from analysis. In other words: epistemic culture came to include small environments of knowledge production, the environment of these environments, the elements, and the preconditions. Knorr-Cetina

did add precision, we would argue, by introducing a series of distinctions. First of all, she deploys a distinction between system and environment that seems distinctly autopoietic, i.e., in line with the social systems theories developed at Bielefeld University, where she worked for a long time. In her studies of organizations or other small environments of knowledge production, she tried to reconstruct the emic distinctions and the internal operational logic marking these environments. Indeed, the identity of epistemic cultures for her cannot be understood without reference to an internal logic; infrastructures, methods, concepts and tools cannot be understood without their cohesive programming, and such programming can be understood as a logic appertaining to the system. Epistemic cultures she describes in manners often akin to social systems, albeit with a stronger interest in and role for material objects. Still in line with systems theory, environments influence these cultures indirectly; nothing is ever copied from the environment or shared with the environment. Methods, concepts and machines have different effects in different environments, and this is the case because everything is reinterpreted according to the operational logic of the receiving environment. If all was shared, and the boundaries of epistemic cultures would have no implications for the flow of knowledge, then the concept of epistemic culture would be rather pointless.

The autopoietic nature of epistemic cultures is further developed through Foucaultian-inspired analysis of object and subject construction in different epistemic cultures. Even within the natural sciences, object construction varies significantly, and notions of agency, innovation, discovery, method can even differ within the same discipline, veiled under the use of shared terminology. Shared terminology and similarity in organization can enable the dissemination of knowledge, and the formulation of policies affecting a wide range of knowledge cultures, yet the construction of object and subject in different epistemic cultures will affect and be affected by events in larger networks and uses of similar concepts in manners that are unpredictable for others.

This does not mean that epistemic cultures are entirely closed environments. As already indicated, many factors link these environments, factors ranging from policies to organizations, objects, methods, machines and concepts. In a Foucaultian fashion, these linking elements are both enabling dissemination of understanding and the continuous transformation of this knowledge. In addition, Knorr-Cetina sees society as an encompassing environment, and notions prevalent in society at large can pervade a wide variety of epistemic cultures. One could say that society itself, as the encompassing social system, is also the encompassing epistemic culture. Knowledge cultures, a complementary concept in Knorr-Cetina's frame (2007), can be understood best, as a wider concept, as the culture nurturing or hindering the working of epistemic cultures. For Knorr-Cetina, knowledge cultures are "descriptions of society in knowledge terms" which "provide a sort of scaffolding for epistemic cultures" (2007: 362). Following her own logic, these descriptions are also the product of epistemic cultures; and they should be distinguished from ad hoc descriptions in policy, which do not necessarily reflect cultural realities, but rather political or economic opportunity (i.e. innovation discourses and the tropes of 'knowledge societies'). It is these two conceptual foci that we employ for the assessment of epistemic cultures in agriculture in Georgia, Uzbekistan and Tajikistan: first, epistemic cultures of knowledge production – the how do we know what we know; and second, knowledge cultures – the (i.e. nurturing) environment to epistemic cultures (Knorr-Cetina 1999, 2007).

A useful implication of Knorr-Cetina's perspective is that local knowledge and scientific knowledge cannot be clearly separated. That is, epistemic cultures are always localized in some way. Secondly, in

the evolution of epistemic cultures, different blends of explicitly scientific knowledge and other forms of knowledge will emerge. One can add that old scientific knowledge can survive in certain environments as scientific, and that elsewhere new knowledge is produced that has the same production features as scientific knowledge but is not recognized as such. Each epistemic culture, in other words, can be seen as a unique blend of scientific and other knowledge, and this uniqueness is the result of both the unique combination of material and conceptual elements making up this culture and of the unique evolution of that culture. The longer the history of an epistemic culture, the more intricate the blend of scientific and other knowledge will become. The embedded nature of epistemic cultures (environments in environments) will contribute to the stability of certain elements in the mix.

3 Epistemic cultures and 'transition'

Knorr-Cetina's frame, we argue, is useful to look at processes of transition after socialism. In the following sections, we will develop a perspective on the evolution of agricultural expertise after the break up of the Soviet Union. First, however, we need to look at that breakup, and the following 'transition' through the lens of epistemic cultures.

The Soviet Union was marked by a strong cultivation and celebration of scientific knowledge, with special emphasis on the natural sciences and the applied science of engineering. A strong belief in social engineering was coupled with a strong belief in the value of scientific engineering. Being a 'specialist' was and is a compliment in many former Soviet areas, and an engineer is considered an excellent specialist. Education was a way to climb the ladder in the USSR, and natural scientists could become prominent figures in society. The Soviet scientific system was immense, with a wealth of universities, institutes, and specialists working for myriad state organizations.

Universities were for teaching and research, while institutes affiliated with academies of science were focused on research. Yet other organizations also produced expertise: ministries had research departments, administrators were often specialists, and 'project organizations', responsible for the implementation of this or that aspect of the planned economy, were conducting research as well as applying it. State enterprises and farms (sovkhozes and kolkhozes) could be sites of innovation and experimentation. The distinction between fundamental and applied science was drawn differently than in the West, as much of the fundamental research was focused on solving practical problems of the planned economy, and much applied research had a high level of scientific expertise and could yield new expertise easily.

Because of the close ties of many state organizations, the general appreciation of scientific knowledge and the shared goals binding many actors together, knowledge could easily travel within the territory of the USSR, to other socialist states and even to the western countries. At the same time, these close ties and these shared goals introduced a sharp selectivity in knowledge production and implementation. The Soviet ideology added a layer to that selectivity, as certain assumptions were not to be questioned, and certain topics were not considered relevant. Social sciences were not much developed, as their whole existence was placed in doubt by Marxist ideology as the definitive social science. Humanities were tolerated, even fostered, as they could be seen as 'engineers of the soul', and as the Soviet man was as much a product of material circumstances than cultural conditions. As soon as for example writers deviated from the path, there would be repercussions. The power attributed to the arts and humanities also led to a perception of danger; Soviet man could be co-created but also damaged by means of the humanities.

Despite close ties, different organizations could still develop their own epistemic cultures. Ministries were known for their own discourses and methods and approaches, regions, collective farms and so forth with some variations in different parts of the Soviet Union (Hough & Fainsod 1979; Ruble 1995; Ivancevich et al 1992; Kornai 1979; Rutland 2009; Ellman & Kontorowicz 1998). Within each, the

openness for innovation, the path of innovation, the influence of ideology and the interest in local conditions and pre-existing forms of knowledge was different. The same was true for scientific institutes and disciplines.

The breakup of the Soviet Union led to the breakup of close ties between organizations, the dissolution of the conceptual frame offered by ideology and the dissolution of the organizational structures associated with a planned economy supposedly driven by engineering and scientific innovation (Kornai 1979; Solnick 1998; Rutland 2009). Investment in science and education dropped dramatically, and complementarities and specialization within the scientific system were reduced (Fortuescue 1985; interviews in the three case countries). For example the research institutes that were directly subordinated to Moscow have lost faster means for existence than those who subordinated to the republican centers (Interview with the director of the Institute of Tea, Subtropical and Tea production of Agricultural University, Anaseuli, Georgia, April 2013). The USSR had specialized institutes for different topics, economic activities, crops, with per topic a separate hierarchy within the union.

4 Epistemic cultures and agricultural expertise

We cannot give a thorough analysis of epistemic cultures in the Soviet Union and its transition countries, but will focus on agricultural expertise. Agriculture was famously neglected in the early USSR. Farmers were seen as standing in the way of industrial development, because proletarians had to be industrial workers and farmers had to be drawn away from their land into factories (Nikonov 1995). Secondly, farmers were too attached to their land, property, and too much rooted in local communities. This hindered the construction of the Soviet man and communist society. At the same time, the Soviets needed the surplus of agriculture to finance rapid industrial development (Fitzpatrick 1998; Allina-Pisano 2008). Their answer was collectivization and modernization of agriculture, with kolkhozi and sovkhozi functioning as industrial sized farm enterprises, as local governments, and as sites to implement, sometimes generate, expertise (Ioffe et al. 2006; Humphrey 1998; Kandiyoti 2002; Wegren 1989). This expertise, mostly present with the management but also at the level below that, could sometimes be labeled as agricultural in the narrow sense of the word, sometimes more hydrological or hydrotechnical. Usually, there were several agronomists in the management, a hydrotechnician, a bookkeeper, a land surveyor [planner], but there could also be mechanical engineers, soil scientists, etc. depending on the specialization of the kolkhoz/sovkhoz, it had a set of trained experts whose knowledge were regularly updated through the state training programmes (Shtaltovna 2013). Because of the mobility of people within and between kolkhozi, people with a training in one field but accumulated experience in several other domains. In general, the farm enterprises were led by 'specialists', and among those engineers were most appreciated (agronomists and hydrotechnicians were considered as engineers or at least closely akin to them).

Yet the collective farms did not exist in a knowledge vacuum. Research institutes under the Academy of Agrarian Sciences, or under the Academy of Sciences, as well as departments at universities, institutes for project implementation, and the Ministry of Agriculture (depending on the Soviet era and the socialist republic) were involved in the production and implementation of expertise for agriculture, and more broadly rural development. While in the other direction kolkhoz management could contribute to the production of expertise that could be applied elsewhere and kolkhoz brigadiers and workers could find problems and solutions that could flow to management and upwards from there. As said, local and regional differences were substantial, despite the facade of Soviet cohesion and uniformity (Humphrey 1998; Allina- Pisano 2008; Van Assche & Djanibekov 2012). We cannot map the whole network of expertise that surrounded the collective farms. We can say that the areas where certain crops dominated or were pushed strongly by the central government usually received substantial support for knowledge development and application, in the form of research institutes, experimental stations, university departments and implementing organizations (Interview with the former director of Viticulture and Horticulture Institute, Tbilili, Georgia, April 2013). Also the local-regional bureaucracy could be adapted to the knowledge management needs of the local agriculture. However quantitative goals of the Soviet production system were the determining factor (Solnick 1998; Allina- Pisano 2008). This means that innovations and knowledge important for the production were supported and faster integrated into the production. In contract, the novelties for the less strategic production were mostly stored on the book shelves of the research institutes (interview with the founder of Kakhuri wine factory, Georgia, May 2013).

In terms of epistemic cultures, we can therefore distinguish between the epistemic culture of the institutes and that of the collective farms, semi-autonomous units that supposedly followed central plans and applied centrally devised knowledge, but in practice co-decided on internal organization and the application of expertise. Yet, with this independence and with the local differences, the structure of the management was similar, and in that management, experts dominated. The agronomist was always a central figure, and the rais, or chair, often had an agronomical background. In irrigated areas, the hydrotechnician was a prominent figure, and where land had to be cultivated for the first time, had to be reclaimed from nature, the zemlemer or surveyor became more important. Where technical conditions were tough, the various surrounding institutes played a more important role, especially in the initial phases of agricultural development. Within the institutes, one can distinguish between a purely scientific mentality, often based on a natural science approach to agriculture and development and general, an engineering mentality, focused on direct solution of practical problems, without the deviation of more fundamental scientific questions, and thirdly the bureaucratic mentality, where a real interest in knowledge production is absent, and the goal of the organization is to maintain and legitimize itself. The unique mix of mentalities, and therefore the unique epistemic culture of an institute nevertheless was dependent on both internal and external factors, with the power relations and cultures of the regions (and republics) playing an important role.

So, the epistemic cultures of the institutes were shaped by the external environment, yet, for many people the academic networks were also a way to assimilate into Soviet society, to travel, make a career in other regions. In that sense, the larger network also contributed to the cohesion in Soviet epistemic culture, and to the formation of a knowledge culture, in the sense described above.

The networks of organizations that made Soviet agriculture possible was in fact more complicated than just sketched. We did not mention the agricultural service organizations, such as machine tractor parks, biolabs, fertilizer companies, and we did not mention the series of organizations devoted to the study and management of land (Shtaltovna 2013; Shtaltovna et al. 2012). Especially in areas under difficult climatic conditions, the web of organizations that was needed to make agriculture work was complex. That does not mean that every organization nominally active and supposedly providing or producing expertise actually did play a role. As said, local and regional variation was substantial.

The role of ‘the farmer’ as supposed in western models of extension was in fact spread over a large number of organizations, and within the kolkhoz, it was spread mostly over the management. This scattering of roles and scattering of expertise had consequences for the role of expertise in Soviet agriculture and it has consequences for the transition after socialism (Trevisani 2010; Veldwisch 2008). During the Soviet Union, it allowed for the concentration of very much expertise within agriculture, but it also posed severe coordination problems and transaction costs. Besides the motivation problem often diagnosed in kolkhozi, one can say that even if all would work, the intricate system of organizations would pose a problem in terms of transaction costs and complexity of coordination. The de facto solution, as has been observed many times, was a semi- autonomy of the kolkhoz, a selectivity in the implementation of plans and expertise at the local level. Kolkhoz management played a key role in this. This accommodation made local adaptation possible, but one should also say that much of the agricultural expertise system was unused, and in many cases ballast. Plans, reports, analyses went

unheeded and moved to dusty shelves quickly after production (Wall 2008; Humphrey 1998; Ioffe et al 2006).

We prefer to speak of expertise systems, and not 'extension', as this concept usually assumes an independent farmer-entrepreneur, one person endowed with autonomous decision- making. Such a person could then be educated by means of extension, and he/she could also find problems him-/herself and bring them to extension services. For the Soviet situation, this role of the individual farmer did not exist. But at the same time it is useful to repeat that this does not imply there was no expertise present in the system, that there was no system or that nothing survived of it (Hornidge et al. 2011a; Djanibekov et al. 2012b; Shtaltovna forthcoming).

Bringing back the concept of epistemic cultures, we can say then that the different delineation of roles in the agricultural system has implications for the variety and functioning of epistemic cultures. We can speak of mechanisms of convergence and mechanisms of divergence in epistemic cultures. An important mechanism of divergence was the fact of scattering itself: if many organizations and their expertise contribute to agricultural production, this creates spaces for many different epistemic cultures. Organizations and their cultures tend to perpetuate themselves, are easier to create than to erase (Solnick 1998; Rutland 2009). Once certain soil maps are the core business of a project organization, these maps will be produced and their importance reasserted over and over again, whatever the actual role. A second mechanism of divergence is the semi-autonomy of the kolkhoz, allowing for different epistemic cultures to arise per kolkhoz, different mechanisms to analyze the situation on the farm, to deal with official plans, to let information flow within the organization and to decide what is relevant for decision-making.

There were also mechanisms of convergence. People moved around between organizations and this structure of career paths disseminated certain discourses, concepts and practices throughout the agricultural system. Since most people moved around within the same region or republic, this was also a source of regional cohesion. Yet university education, and uniformity in organizational structures also brought similarity into patterns of discovery and expertise. The general method of defining plans and targets for everything, and defining norms for many steps in and aspects of organizational processes, further created similarities in epistemic cultures. Also the informal ways to deal with norms and targets and plans were disseminated in the same networks of people moving around in formally similar organizational structures (Van Assche & Djanibekov 2012).

Thinking in terms of plans, targets and norms can introduce an epistemic culture where fact finding, local analysis and local adaptation becomes less important, and where practices will fail because of it (cf already Kornai 1979; Fortescue 1985, 1986). If the plan becomes reality, reality fades away. It can also introduce an epistemic culture where the plan is followed or targets are reached by means of plain cheating (water instead of wine) or stealing (from other organizations for example). The goals are then taken seriously, but the quality of the product and the nature of the methods are not considered. In this second case, local analysis is present, at least in the sense that it is understood, after analysis, that following the assumed steps to the assumed goal would not lead to the expected results in the given conditions. This requires a certain understanding of these conditions. A third variation is that of selectivity in the plan implementation hiding largely self-serving behavior of kolkhoz management or kolkhoz community (Shtaltovna et al. 2012). This version can be accompanied by an epistemic culture

where officially promoted expertise is silently dismissed, but it can also be associated with a culture where the pervasive engineering perspective on rural development is embraced, yet turned to the service of the few. This also implies a de facto disconnect with the ruling ideology. A fourth variation we can distinguish is an embrace in principle of the goals behind plans and norms, but combined with a strong local knowledge and an awareness of the fallibility of plans and policies more broadly, leading to an awareness of a necessary selectivity in plan implementation. In many cases, engineering- minded and pro-Soviet kolkhoz managers were aware of many limitations of the system, and complemented formal with informal coordination (including selectivity) to deal with these limitations (Oberkircher 2011; Hornidge et al. forthcoming).

The engineering metaphors that marked Soviet ideology pervaded every part of agricultural production and rural development. Society was considered a machine that could be engineered and re-engineered, the rural economy was a machine, the kolkhoz, and the natural environment agriculture operated upon, was similarly considered in machinic terms. For fixing machines or building machines, you needed tools, mostly other machines. 'Electrification of agriculture' was therefore an essential component of the agricultural curriculum (interviews at agricultural and technical universities, Tbilisi), and referring to an optimal use of machines and mechanical infrastructure, to optimize the functioning of the landscape machine for agricultural production.

This prevalence of engineering metaphors also led to the widespread assumptions of cohesiveness, predictability, transparency and malleability of both natural and social systems, to the idea that most targets could be reached after better scientific analysis. (One can notice here a combination of engineering metaphors with a mixing up of wish and reality, of analytic and normative orders; cf Ellman & Kontorowicz 1998; Westerman 2010). The assumption of cohesiveness in systems led to the search for more and more comprehensive designs of rural economies, and to the search for parameters that could summarize the state of the machine, and of the natural system subjected to the functioning of the Soviet development machine (Djanibekov et al 2013; Ruble 1995).

This was accompanied by a belief in the existence of an optimal organization of agriculture on a given spot and an optimal spatial organization of an area, both to be determined by scientific means. And norms and standards were there to codify several states of natural and mechanic systems: existing, desirable, possible. Sets of norms and standards were further supposed to be condensable to smaller sets summarizing the state of the system. In agriculture, a special role was assigned in this regard to the concept of 'bonitet', an indicator of soil quality that was much more than that. 'Bonitet' was supposed to be a summary of all scientific knowledge available regarding natural systems and their susceptibility to reworking in agricultural systems (van Assche/Hornidge 2012). This number indicated, in its unfolding interpretation, the suitability of the soil for certain crops, and, in a local/regional interpretive frame provided by data and plans, it showed what ought to happen in a certain place to create 'optimal' agricultural use. From a western point of view, this does not make much sense, neither economically nor scientifically, yet in the epistemic culture of Soviet agriculture it seemed logical. The bonitet was supposed to determine where villages could come, where cotton needed to be planted, how the irrigation system should be designed, how targets should be set and accounting carried out.

Summarizing the analysis of epistemic cultures of Soviet agriculture we can say that there was clearly an engineering-oriented epistemic culture, associated with certain tools, metaphors and discourses, but that in the complex network of organizations and roles providing expertise for agricultural production, there were many distinguishable epistemic cultures. Mechanisms of divergence and convergence between epistemic cultures could be observed, and in many cases, these mechanisms were associated with local/regional power dynamics, often in turn linked with the construction and reconstruction of social identities (Verdery 2003; Trevisani 2008). In general, the reliance on plans, norms and targets reinforced the existing engineering- orientation, and encouraged in many cases a mixing of wish and reality that blinded the system for local knowledge useful for local adaptation (Solnick 1998; Kornai 1979). That local knowledge itself was often tinged with scientific knowledge trickling down the kolkhoz hierarchies.

Embedded and overlapping networks of organizations and mobility of people in and between organizations created the environment where specific forms of convergence and divergence could occur. Ideology and plans emanated from the center, were modified at lower levels, and this hidden flexibility also extended to the modes and tools of knowing that can be described as epistemic cultures. The structure and functioning of networks, and their epistemic cultures, that actually contributed to agricultural production, was different from the structures officially promoted, but at the same time that vast network of organizations supposed to work in a unified and coordinated manner towards optimal agriculture was very important as a matrix for the formation of networks and epistemic cultures that had an impact (cf Verdery 2003). As mentioned before, it created a wealth of resources that could be recombined in different local/regional selectivities, creating different upward and downward flows of expertise in the agricultural system.

5 Epistemic cultures and the evolution of agricultural expertise under transition

If we want to understand the changing role of expertise in the agricultural systems of post- Soviet societies, and grasp the potential for the introduction of western models of extension in more or less privatized environments, we need to understand first and foremost that transition is not one thing. One cannot speak of a path from A to B, since socialism was more diverse than often thought, and since the goal, a combination of democracy and capitalism, cannot be reduced to a formula(Ruble 1995; Allina-Pisano 2008). There are many markets, and many forms of democracy, not as variations or deviations from a single ideal concept, but as structurally different alternative models. Markets are embedded in and structured by societies, and the same applies to political structures and their relations to markets.

This applies to agricultural markets as well and it applies to political organization of the rural areas. In most cases, some form of privatization took place, of land and other assets, and a reconfiguration of roles in the rural economy. This does not mean however that 'the farmer' as it is assumed in American-inspired extension models or agricultural economic treatises, appeared or is under way as the inevitable result of rural transition. If there is an autonomous entity that appeared during transition as 'the farmer', this figure usually does not have the means and expertise, agricultural and management, to play the role ascribed to him and desired from him by western agricultural economists and many development specialists (Lerman 2008, Djanibekov et al. 2012; Bliss, F. 2012; Beniwal et al. 2010). Often, he does not have the autonomy either. In Uzbekistan and Tajikistan, privatization is incomplete, land tenure insecure, and access to inputs and expertise partly controlled by surviving fragments of the old expertise networks (Boboyorov 2013). Thus, one can speak of either powerless autonomy or autonomy bounded by networks. These networks are not merely exploitative, but can also consist of individuals and organizations that see themselves as providing essential services to farms and to the community at large. For western extension models, the farmer as funnel for western expertise, or even as central learning point for the modification and later implementation of such expertise, usually does not exist.

Many of the western extension specialists are hampered by a lack of interest and/or insight in the survival and transformation modes of at least parts of the Soviet expertise networks, and their epistemic cultures. These legacies can have both positive and negative effects on rural development, and at least they ought to be analyzed before articulating policy recommendations. They can negatively function in a number of ways: they can hamper innovation, local adaptation, they can foster false expectations or fears, direct expertise and investment in directions proven to be less fruitful etc. They can also foster reinvention of agricultural expertise and networks: if key individuals might be open and cooperative, they could offer the most realistic organizational and institutional frame to serve a starting point for a reinvention of the rural economy. Where this does not seem appealing, these networks can still lodge much expertise that could be harnessed for a reinvention in a different pattern.

We need to speak in more detail however about the breakup of the Soviet agricultural expertise networks and its implications. In the next section we discuss three transition countries from this angle: Tajikistan, Uzbekistan and Georgia. Now, we would like to highlight a few processes that seem typical for post-Soviet transition processes in general.

First of all, in most post-Soviet countries, collective agriculture has collapsed, and the kolkhoz disappeared as a site of integrated management of agriculture, as well as a site of local government (Kandiyoti 2002; Veldwisch 2008; Trevisani 2010). The various functions of the kolkhoz, and the various pieces and sorts of expertise it integrated, are usually not fully replaced. Sometimes, this is because the expertise was not actually useful in the past, sometimes because there is no carrier left to bring it into agricultural enterprises, sometimes because ideology supposes it to be less interesting or useful (Wall 2008; Wall/Evers 2006). There can also be an ideological assumption that the farmer himself has to figure out what to do, and to find or buy missing pieces of expertise himself. And, as said, these new farmers in most cases had to be invented from scratch, as there were no clear predecessors in the Soviet system when it comes to the role expected from capitalist or quasi-capitalist farmers. What came the closest to the expected role, and what offered the most advantages in terms of reinvention, was a position in kolkhoz management, because this implied some expertise, some overview of agricultural operations, and in many cases some connections with political actors. Thus, in many places one can observe a move of former kolkhoz managers into local government and/or new agricultural enterprises (Eichholz et al. 2012).

Since the kolkhoz disappeared, the most important site of policy integration and knowledge integration disappeared (Van Assche & Djanibekov 2012; Eichholz et al 2012). The networks surrounding the kolkhoz, even if intact in a hypothetical case, would have little effect on actual agriculture and rural development without the kolkhoz. In most cases however, these networks unravelled as well, with certain fragments surviving under a different form (cf Ioffe et al 2006; Rutland 2009). One reason for survival was obvious necessity and difficulties in replacing it: one can mention certain agricultural service organizations. Another reason (sometimes combined with the first) is that some organizations are still useful for the powers that be, either as milking cows, or to support agricultural activities that serve as milking cow. Thirdly, one can mention the continued prestige of certain activities, topics, institutes, or forms of expertise under a successor regime. Fourthly, one can mention a latent attachment to the previous regime, and its organizational structures. Irrigation engineering can e.g. maintain its prestige and therefore position in the institutional framework of a successor state, even if de facto little new projects take place. Another factor for survival can be the strength of certain network structures in and of itself: certain organizations can be closely linked, and capable of mutual support even in absence of the kolkhoz.

Yet more often than not, change was the paradigm, and even if a network of organizations survived that could provide farms and farmers with certain forms of expertise, this network did not look much like the Soviet version. Possible, many organizations still exist nominally, and also the linkages between them in terms of expertise development and implementation might still be formally there, but very often, this appearance of comprehensive knowledge management is misleading (Selim 2009; Wall 2010). This also means that the epistemic cultures of these organizations do not affect much what is happening on the farms. The farmers themselves, if coming from kolkhoz management, might still embrace to a certain extent the engineering ideology pervading Soviet agriculture, but they were forced to and became used to new modes of decision- making, and new and stricter selectivities in the use of knowledge. Local adaptation in general became more important, quick adaptation to technical conditions, the often unstable and opaque markets and political environments (Djanibekov et al 2013; Humphrey 2002). In

many successor states, commercial agriculture depends on alert and quick interpretation of these volatile environments, and such interpretive skill can be considered an important new form of expertise (Humphrey 1998; Eichholz et al 2012). In general, the more volatile the environment, the harder to embrace long term perspectives, and to invest. This includes a strong hesitation to invest in developing new skills or knowledge, or even finding old knowledge that might be useful under new conditions.

Acknowledging that regional and national differences are substantial, we try to list a few features of the transformation of several types of organizations in terms of knowledge loss and transition.

The agrarian academies of science in most places were relegated to a marginal position. Soviet academia knew universities and academies, with many, but not all, research institutes related to agriculture falling under the umbrella of agrarian academies, existing at republican level, and at union level. Almost everywhere, universities fared better than academies during transition, and many of the institutes were either abolished or consist of a crumbling building, a dusty library and a few aging yet respected scientists. Where new regimes tried to distance themselves strongly from the Soviet past, this usually implied a distance from the academies, and rapprochement with the anglo-saxon academic model.

Universities with agricultural departments, or hydro-engineering departments, or agricultural universities, in many cases fared better than agrarian academies but worse than other universities and departments, since agriculture was not considered a hot topic for westernizing countries and their young people, and also because in many places, the rural areas were considered a mess that would be difficult to clean up, areas where making a career was virtually impossible. Also here, aging academics, crumbling buildings and unraveling knowledge infrastructures are the norm. In places where the economy rebounded, and increased revenues did not disappear into the pockets of elites, some investment in academia took place, but also in these cases, agriculture was not considered a sexy or interesting topic. More often, economics, management, law, sometimes natural sciences, computer science, would receive support and were considered more attractive doors to a career (UNESCO 2010a; 2010b).

With regard to the agricultural service organizations, one can only say that the pattern of transformation is extremely diverse. In some areas, where agriculture fell back on a subsistence level, not much was left of this web of organizations. In others, some were kept alive by a state still interested in certain aspects of agricultural production. In yet other cases, a somewhat reinvigorated commercial agriculture led to the revival of certain service organizations (such as machine tractor parks), while agricultural revival can also lead to richer farmers becoming less dependent on such service organizations (Shtaltovna 2013). In that case, some of these service organizations will be replaced by commercial enterprises (Shtaltovna et al. 2012).

Local governments often took over some kolkhoz functions, sometimes under the same people that used to run the kolkhoz. This can also bring back or maintain certain knowledge within the local community. Land surveyors and planners can now be part of the local government, and doing things

similar to their old activities. Local politicians can still envision the territory as a whole, and discern shared interests and forms of expertise that might benefit the whole community. Conversely, they might also overlook the autonomy in decision-making that is necessary for commercial farmers to survive and thrive. National governments usually have less interest than before in having a comprehensive overview of and integrated organization of agriculture, and in most cases, the belief in the possibility of and benefits of such far reaching integration are seriously doubted by higher level politics and administration. There are however important exceptions to this; in the following section, we will discuss Uzbekistan as such exception.

Another category of Soviet organizations that transformed in complicated patterns are the so called project-organizations. (Van Assche & Djanibekov 2012) We can speak of implementation-oriented government actors, usually with a strong background in some form of natural science and engineering science, and usually participating in the materialization of some aspect of planning. At the kolkhoz level, the larger, richer and more influential farms had their own internal small versions of such project organizations, and they were also capable to give stronger signals in the direction of regional or even state level implementation organizations, translating local desires as scientific necessity. One can think of hydro-technical implementation organizations (making detailed plans up to actual construction), organizations for road construction, for land reclamation, canal construction and so forth. If construction was the focus, the ending of the name was often -stroi; if detailed technical planning was the essence, the ending was often -project. Less technical planning was often designated as -plan in organization names. A special category of organizations was called 'expeditions'. Sometimes, these organizations indeed had their roots in temporary organizations, destined to explore certain territories or solve specific problems there. Many expeditions expired as soon as the trip was over, or the results processed, but some acquired more stability and organized a series of travels, and others became very stable project organizations in the territories once considered remotes and in need of exploration.

Certainly, these are generalizations. One can notice that translating the categories of Soviet organizations into English is not an easy task; this is not due to the English language but to the very different conceptual and organizational framework of the Soviet union, in which organizations and their categories received their meaning. For these various project organizations, we cannot articulate a general transformation pattern or even a few main paths or options. The only general observation we deem possible is that their number and level of coordination is on average much lower now than under the Soviets (cf Allina- Pisano 2008; Ioffe et al 2006). The small versions at kolkhoz level are obviously gone, the larger ones, associated with regional or republican administration, had many different fates.

New actors with certain agricultural expertise are NGO's, international organizations and sometimes directly the donors. Certain countries saw much more investment and activity than others by these new actors, and the level of coordination between these actions, as well as the degree of institutionalization and generalization of their projects and proposals, differed widely. The reception of these actors also differed widely, and in some cases, their activities were severely restricted by laws or simply a less than welcoming environment.

The sum of all these transforming organizations and their linkages was in most cases, as indicated, a significant shrinkage of state investment in agricultural expertise, a reduction of organizations and expertise, and shattering of many linkages that allowed for a certain level of knowledge integration under the previous regime. The farmer that resulted from the same transformation process differed from place to place, and his susceptibility to innovation, to new expertise differed accordingly. Thus, new farmers in a new economic environment and a new landscape of expertise, started to appear as lacking in expertise, as requiring new models of agricultural knowledge management. It is in that general context that discussions of extension models appeared about a decade ago (Shtaltovna forthcoming).

Coming back to the concept of epistemic cultures, one can say that the multiplicity of epistemic cultures that allowed for both knowledge integration and local adaptation in Soviet agriculture, was reduced in existence and impact (Allina- Pisano 2008; Verdery 2003; Humphrey 1998). By which we mean that even in surviving organizations the epistemic culture could be broken, and that where it persisted, or transformed itself, its impact on agricultural practices is usually lower. The farmers, varied as mentioned, are in most cases not organized in new manners, and it is hard to speak of an epistemic culture of the post-Soviet farmer or even to find it within a region. Sometimes, if one can discern an epistemic culture, it is heavily influenced by new factors: continuing instability (reducing learning incentive), or acquiescing in subsistence farming as a long- term perspective (also reducing learning incentives).

In the following section, we will study some of these generic patterns more in detail for the countries of Tajikjistan, Uzbekistan and Georgia. We discuss agrarian transition, and transformation of expertise networks, and will try to deepen the analysis of epistemic cultures. We discern patterns of convergence and divergence between the three transitional paths. After this analysis, we bring back the discussion of extension, and demonstrate how epistemic cultures, and their modes of adaptation and transformation, affect not only the need for and usefulness of certain models of extension, but also their local interpretation, adoption, and modification.

6 Three countries: divergence and convergence

6.1 Georgia

In Georgia, not all land was collectivized under the Soviets and not all collectivized land was under recognizable kolkhoz and sovkhoz structures. Soviet Georgia did however display – for Soviet standards – a remarkable variety of crops. The Soviet government cherished the mild climate and rich and varied soils of Georgia, and tried to cultivate a variety of prized crops there that had few other places to go in the Soviet empire. Wine was the most important one, at a certain point counting for almost 25% of GDP, but there were also many different fruits (including citrus), tea, tobacco, wheat, vegetables etc. In the mountainous areas, sheep and cattle were subjected to quota systems (interviews at agricultural university and academy of agricultural sciences).

Moscow invested heavily in expertise, not so much in infrastructure. This was also less necessary than in the Central Asian republics, since irrigation, drainage and land reclamation projects were less required. Also processing was very diverse, with a variety of factories producing wines, fruit juices, canned foods, and more. There was a Georgian branch of the Academy of Agricultural Sciences and it formed the umbrella of a unique combination of institutes, due to the variety of crops and the importance the center attached to Georgian agriculture. The Georgian institute for wine [Viticulture and Horticulture, in Tbilisi] employed at its heyday ca. 600 people, and was for a while the main wine institute in the USSR, while the tea institute [in western Georgia] was equally sizable [ca. 800 staff] and directly subjected to Moscow, attesting to the importance attributed to tea production. The Agrarian University trained agronomists and other specialists that could be employed on the kolkhoz and at the institutes, while the institutes conducted mostly research, albeit of an applied nature.

Georgia had already been part of the Russian empire since 1801, and Georgian agriculture, as the rest of society, had been thoroughly transformed already in that period. Russian agronomists were active in the area since the beginning, and some [as in Borjomi] were given free hand to try new forms of agriculture. Also Tsarist Russia was aware of the agricultural possibilities of Georgia. Tea, citrus and wine cultivation were intensified and transformed already in the 19th century, with the Russian market and Russian-European expertise in both production and marketing having a transformational influence. Also forestry saw such influence. Behind the applied sciences were the natural sciences, also imported from Russia and Europe, with botany taking a special place (Interview with the former director of the Institute of Viticulture and Horticulture, Tbilisi, Georgia, April 2013). Russian botanists were equally interested in Georgia since the early days, and the earliest nature reserve in the empire was Lagodekhi Park, in the Georgian Caucasian foothills, an initiative of a Polish/ Russian botanist, Ludwik Mlokosiewicz (Shtilmark 2003).

Rural areas were already used to agricultural expertise in the western sense, as scientific knowledge intended to improve productivity and quality, and Georgian elites embraced the combination of large markets, big investment and expertise to make money off wine, citrus, and tea. Tsarist Georgia had an Academy of Sciences and several universities, so also the Soviet infrastructure of institutes did not appear totally new and foreign (Interview with the expert of the Institute of Viticulture and Horticulture, Tbilisi, Georgia, April 2013).. At a more basic level, serfdom had been abolished as in the rest of the empire, and de facto, it seems that peasants had been relatively free long before (Suny 1994). In other

words, there was a tradition of relatively autonomous farmers, with some possibility and motivation to experiment, learn, and innovate. The education level was relatively high as well [compared to other parts of the empire].

When the Soviets collectivized property and imposed their system of production quotas and techno-scientific control and optimization [in line with the general engineering metaphors mentioned above], it did not come as something totally new. The most traumatic aspect was the collectivization, but also in this regard, Georgia was allowed a degree of freedom not observed in many other places. Peasants were allowed more land of their own, and more freedom to market and process their agricultural products (Interview with the farmer, Gori district, Georgia, May 2013). Wine [desirable in the whole USSR] seems to have played a catalytic function: some leeway was given to local initiative, property and profit, as long as it boosted wine production. A complex symbiosis of private and collective actions and properties can be found in the production chain of wine. And this seems to have formed the model for other private-public 'partnerships' in other parts of the agricultural sector.

One can speak of a process of intensification: more education for more people, more knowledge infrastructure, more physical infrastructure, more investment, larger scale production, and distribution in larger networks. But none of these aspects were entirely new. Tsarist legacies, in other words, made the introduction of the Soviet epistemic culture of agricultural production easier. The general absorption of Georgia into the Empire and the special interest in agriculture already shown by the Empire are, in summary, distinguishing features. Georgia was perceived as unique within Russia, and with unique opportunities for agriculture -and, we might add, recreation and tourism, tea and citrus (Suny 1994).

Pre-Russian traditions did survive, but were already hard to recognize in the time of Soviet ethnography (interview Paul Manning, anthropologist). In mountain areas, the distinctive features of communities, ethnicities and their forms of agriculture were preserved more, but even there, even high in the Caucasus, Soviet interventions changed the patterns of land use, the size of flocks of sheep, and the migration patterns (interviews in Tusheti and Vashlovani national parks). In the lower and more fertile areas, Russian and Soviet agronomists and other specialists did learn from existing practices and traditions, but because also local elites saw the future in scientific optimization, not so much was preserved of traditional or local knowledge going back far in time. One can say that wine, again, took a special place, since both Russian and Soviet elites and specialists acknowledged a notion of 'terroir', of unique location and traditional preparation, as important for the quality of the wine -and they acknowledged the importance of quality as such- (interviews with wine makers in Kakheti; Manning 2012). In the central region of Gori, fruit was grown for centuries, but after WWII, the Soviets drastically changed the scale and method of production, without much reference to older traditions; citrus and tea in the west were largely Russian-imperial projects, and even wheat [in the east] was cultivated very differently under Soviet rule.

After independence, agriculture did not receive much attention (Van Assche et al 2012). One reason seems to be that the political elite in Tbilisi considered it too difficult, since much of the countryside was not under central control for years, and since the radical privatization, with small parcels handed out to many people, for reasons of food security, made any modernization difficult. Moreover, maintaining the

knowledge infrastructure of the institutes under the Academy of Agricultural Sciences and the Agricultural University, proved unaffordable. In 2010, the Agricultural University was privatized, and many of the institutes, in much reduced form, were moved to this new university (Interview with the expert from the Agricultural University, Tibilisi, Georgia, May 2013). The wine and tea institutes were reduced to almost nothing, and several others were abolished (Interview with the expert from the Academy of Agricultural Sciences, Tbilisi, Georgia, May 2013). Most rural areas lost population, agriculture became mostly subsistence agriculture on the small farms formed after privatization. Fallow lands became abundant in most regions. One exception was, again, wine production. For wine, pre-Soviet expertise survived, as did Soviet expertise, and land holdings were kept together or reassembled quickly. Even if the total surface of wine production shrank after independence, activity, investment and expertise application and innovation never stopped. The closure of the Russian market in 2006 proved a strong motivation to orient towards other markets, i.e. towards Europe, and also to innovate (interview with geographer at Tbilisi State University and wine maker in Telavi).

In the case of the wine sector, that innovation entailed a harking back to older traditions and 'traditional winemaking'. In some cases, this means unearthing nearly forgotten local knowledge, but in most cases, many traditional techniques survived openly in parallel with or within the Soviet wine 'factories'. We highlight the wine sector once more, a sector subjected to larger market pressures than other Georgian agricultural products, and a product deeply embedded in Georgian culture (Manning 2012). Wine shows a more intricate pattern of survival of older expertise and traditions and a stronger pattern of innovation & investment than other products and sectors. And yet, even there, the survival of expertise and production of new expertise is institutionalized in a more vulnerable manner than in Soviet days. As said, the wine institute is very small now and largely dependent on foreign aid and external grants, while few people study viticulture at the university, with the intention to become a wine grower (Interview with the expert from the Institute of Viticulture and Horticulture, Tbilisi, Georgia, April 2013).. The expertise however is widely and finely distributed in rural society, and is a remarkable hybrid of pre-Russian, Russian, Soviet and post-Soviet knowledge that became local in and through the embedding in local networks. Georgian expertise transformed Soviet viticulture, and Soviet viticulture transformed local expertise, in networks that later fragmented.

'Tradition' does become more valuable now, not only as a niche product for Soviet elites, but as a marketing strategy in an already saturated international wine market. The hybrid, or amalgamated epistemic culture of Georgian wine, tied to fine-grained local networks, therefore highlights the elements that suggest couleur locale, ancient tradition, or, in short, terroir. One can speak of a partially invented tradition, and of an approach to the international markets that is at odds with another approach observed: that of de-linking wine with locality and emphasizing grape varietals, to make the product more recognizable, easier to market [Merlot, Pinot Noir etc.]. Similarly, we observed attempts to present local practices as traditional and 'organic' (Interview with the expert from the NGO 'Elkana', Tbilisi, Georgia, May 2013). A local NGO proved quite successful in this regard. In some cases, what qualifies as organic can indeed be seen as traditional, and linked to traditional knowledge, but in many cases, the organic quality is mostly the result of the breakdown of Soviet agriculture and its support systems, including the delivery of fertilizers, pesticides and new seed varieties. A third way of repackaging the product is to make it part of a larger package. Also here, wine is the most clear example, with some wine-makers clearly seeing the possibilities to make wine production part of a tourist experience including wine tasting, local foods, landscape and heritage exploration. In each of these

cases, the traditional knowledge is highlighted and reinvented in a different manner, in a different pattern of linkages with cultural and economic practices in the countryside.

The epistemic culture of wine production in Georgia was thus embedded in the Soviet knowledge culture, and after this knowledge culture largely crumbled locally, with much of the infrastructure, much of the expertise, already in symbiosis with older knowledge, survived thanks to intricate local networks. These networks allowed an easier reinvention of wine production and marketing in new environments, and they gave ground for various claims to traditional and traditional value. As said, wine is largely an exception in Georgia, since the same networks of production, marketing and expertise are not present [anymore] for other crops, either Soviet introductions or older ones. So, one cannot say that Russian or Soviet introductions were not embedded enough locally, and therefore forgotten more easily afterwards. Also activities with a very deep local-regional history can be forgotten, can miss the networks of reproduction and remembering that also keep the door open for innovation and reinvention. The fragmentation of land holdings, the loss of the Russian market [now maybe opening again, but also used to different channels and products] and the lacking pressure towards production targets all contributed to the collapse of agriculture.

And this general collapse has many negative feed-back loops which make a restart of agriculture very difficult. Once agriculture has lapsed into the subsistence stage again, bringing it close to a science-intensive market-oriented agriculture requires rebuilding of physical infrastructure, processing capacity, reassembling land holdings, reinventing extension, bringing in a new cohort of farmers, reinventing agricultural education, finding new funding channels and manners, reintroducing forms of cooperation and cooperatives. The new government has announced major initiatives for the agricultural sector, and there is a draft law on cooperatives [and land consolidation] presented to the parliament (Ministry of Agriculture of Georgia, May 2013;USAID 2013) . The tangle of issues is extremely dense however, and e.g. banks are barely interested in cooperation, in inventing new lending schemes that would make credit more readily available in the countryside. The general perception of a generally messy state of agriculture does not provide many incentives to maintain and create expertise, and, with the exception of wine, Georgian agriculture survives at a very elementary level of development.

Moreover, Soviet legacies with parts of the population and of political elites contribute to the formation of expectations which strongly deviate from western agricultural expertise: bringing back agriculture is seen immediately in terms of production quota's and plowed acreage, in terms of a return to what was known. But what was known made sense within the frame of Soviet agriculture. In a western market system, the same intensity of investment, expertise and the same level of production in agriculture would probably not have occurred. Much of the Soviet Georgian wine was of poor quality, most of the Soviet agricultural institutes could, in terms of innovative capacity, have been replaced with much smaller western institutes, and the quota system was generally much less efficient than market systems in providing incentives and allocating resources (Manning 2012; interviews with geographers at Tbilisi State University). Yet imagining a revival of agriculture in different terms is very difficult for many people, for many voters, so the pressure to make populist yet unrealistic promises is consistently high for politicians wanting to represent rural areas. 'Extension', as a modification of the expertise systems, will have to be part of a general strategy for the reinvention of Georgian agriculture, as none of the elements that can make an expertise system successful, are in place, starting with the presence of a

class or group of people wanting to farm. It is possible to think 'ahead of demand' and invest in a new expertise system, but also then, the requirement of a general strategy for rural development remains in place.

6.2 Uzbekistan

Uzbekistan had a very different history than Georgia, within the Russian empire and within the Soviet Union. This is still visible in its current trajectory and the state of its agriculture and agricultural extension systems.

More than Georgia, Uzbekistan was not a unity before the Russian empire came to the area, in the late 19th century. Several khanates vied for prominence in the area, and the cities of Samarkand, Bukhara and Khiva each had different combinations of ethnic groups and different economic and cultural activities (Varentsov 2011). Agriculture was nomadic in some areas, settled in others, while in some regions, a combination of sedentary, nomadic and semi-nomadic life styles could be observed, often tied to different ethnic groups. After incorporation in the empire, in the 1860's and 70's, its unity was still very loose. The Khanates were internally not very cohesive, with local emirs and bays exerting almost full authority, and the combination of several khanates in shifting versions of 'Turkestan' was mostly a paper exercise. The Khanates that later made up Uzbekistan were not fully integrated into the Russian empire, and neither administration nor investment were comparable to the Georgian situation. The empire did see the opportunities for cotton culture already in the 19th century, and some experiments took place, but Central Asia was perceived as a margin and a buffer zone, and did not invite much attention in terms of economic or scientific development (Varentsov 2011). Local law remained in place for most aspects of life, and Russian administration was restricted to military control, exploration, and a very elementary court system. Also the landscape and climate were perceived as formidable obstacles for development, just as the mentality of the people and their religion. The locals were seen as unhealthy, lazy, used to a barbarous regime, not taken to individual initiative, superstitious (Abdurakhimova 2002; Cole and Kandiyoti 2002). In other words, both landscape and people were seen as very hard materials to work with in terms of development. Towards the end of the 19th century, the empire was also internally corroding, and development projects of the internal colonies lost impetus.

Uzbekistan was assembled as unity in the early Soviet Union. The 'Uzbek' ethnic identity, with the spatial boundaries of the country, was a Soviet construction, an interpretation of the history and ethnic diversity that would change a few times over the years (Collins 2006). Since the very early Soviet days in Central Asia, its potential for irrigated agriculture, especially for cotton, was highlighted. And cotton was seen as an essential commodity for the industrialization of the entire Union. American cotton was dominant on the world market, and the USSR did not want to be dependent on it. Soviet cotton could fuel Soviet textile industries, turning more and more peasants into industrial workers, the natural ideological base for the communist state [according to Marxist-Leninist ideology]. Tashkent, a small place, insignificant next to Samarkand and Bukhara, a place with a weak pre-existing identity, would become the new capital of the Republic of Uzbekistan, and it would be the capital of its knowledge infrastructure. A cotton institute was established, and a series of water-related scientific and implementation organizations, most importantly SANIIRI and TIMI (Van Assche & Djanibekov 2012).

Cotton culture and hydro-technical engineering, for irrigation and drainage schemes, and political power could not be separated, so the new capital looked like the logical place to base both cotton and irrigation expertise.

The water came from the Amu Darya and Syr Darya rivers, and large scale irrigation culture for cotton meant large scale digging and leveling, for canals and fields, for roads and villages, for virtually anything, because most of the eyed areas were sparsely inhabited dynamic landscapes, where every part of a modern rural economy had to be created. That meant large scale interventions, physically, socially, culturally, and it meant that the engineering ideology could be employed and tested to the fullest (Varentsov 2011). It also entailed that expertise in many disciplines was required, and a far-reaching combination and integration of different forms of knowledge. The Soviet techno-scientific culture dominated the restructuring of society, as local knowledge and traditional knowledge was barely acknowledged and used. People were moved, into new villages, in new landscapes, and they had to be taught virtually anything related to the management that could make these new surroundings productive for the Soviet economy (cf Westerman 2010).

The new collective farms were harder to run than in other places, since they had more functions in these completely new physical and social environments. They were places to create and transfer more knowledge, to transform social identities, to learn about local governance, to adapt soviet plans and expertise to local characteristics, to learn how to navigate the Soviet system (Eichholz et al 2012). Gradually, the landscape became slightly more multi- functional, as the demands of the new Soviet citizens were slowly moving up the ladder of bureaucracy, and able to transform the cotton monoculture. Food production became more important, as result of this growing lobby, but also as a side-effect of a side-effect of the Soviet development project: populations exploded in the new irrigated landscapes, they had to be fed and educated, which led to a stronger lobby by these new groups (Humphrey 1998; Hough & Fainsod 1979; Kornai 1979).

The Soviet ‘extension’ system, or system of agricultural expertise, was very dense and elaborate in the area, to make this societal transformation possible, and to manage and maintain these landscapes (Kalna-Dubinyuk and Stanley 2005; Nikonov 1995). Within the kolkhoz, one could find a complex learning environment, with local families bringing in local knowledge about this or that field, with kolkhoz management bringing in scientific knowledge and knowledge about organization, management, and navigation of the bureaucracy. The distinction local/management could be bridged with relative ease, as a kolkhoz also represented a career ladder with many sports (Humphrey 1998; Allina- Pisano 2008). Dozens of different positions were available within a large collective farm, each with other responsibilities but also different classes to be taken, different degrees that might be required, different possibilities to take more classes, study, and different skills to be learned onsite. A career could easily span a dozen functions and three or four kolkhozi; moving out could be a good way to come back to the original kolkhoz [the ‘old’ village] in a management position later. And working in a kolkhoz in different positions also offered the opportunity to interact with ‘specialists’ from other organizations, research and implementation organizations for water, irrigation, land reclamation, construction of buildings and roads, service organizations, machine tractor parks, crop specialists, etc. One could maybe distinguish between an epistemic culture of the network of kolkhozi, and an epistemic culture of the surrounding organizations, usually more marked by the general Soviet technoscientific epistemic culture. From the

kolkhoz, one could easily look up and down in the system, i.e. learn about local conditions and traditions, and about the Soviet system as a whole. The diversity of positions within the kolkhoz, and the possibility to move between them, to learn, in combination with the relative autonomy of the collective farms in interpreting and modifying policies and plans emanating from higher administrations, created this possibility to look in both directions, and to create an epistemic culture with relative closure, although borrowing from many organizations in its surroundings, and many disciplines present in these organizations.

After independence, the collective farms were gradually 'privatized', i.e. their organizational infrastructure and knowledge infrastructure was dismantled and the land was distributed over farmers who were still tied to cotton and now also wheat quota. Two waves of land consolidation after initial privatization changed the group of farmers, and created a group of 'fermers', large scale cotton or wheat farmers, who hold de facto sway over many families of peasants, or 'dekhqans' (Djanibekov et al. 2013; Eichholz et al. 2012). Most of the service organizations, the water and land research organizations and the project implementation organizations are either gone or withering away, while the internal expertise in the kolkhoz is partly moved to the newly powerful local administration [under the reinvigorated 'hokims'], partly gone, and partly to be found in unexpected places, with people supposedly in different roles (Shtaltovna et al. 2012; Hornidge et al. 2011b).

The functions of the kolkhoz were not fully replaced by the local administration, and also the new farmers cannot offer the same level of expertise, and of integration of policies and expertise at their farms and for their people. One consequence of the new situation is that the fragmented expertise is harnessed on a regular basis by coercion, since the regime does have an interest in keeping the highly technical irrigation agriculture going, without maintaining its management system or replacing it in a systematic manner. Expertise thus becomes personalized, a more fragile part of the agricultural system, and the difference between localities, each marked by a different scattering of expertise, increases. Simultaneously, the old function of the kolkhoz to modify top-down plans and policies in a silently accepted manner, is gone, and now the only remaining storyline is that of a top-down command and control system. An argument of authority [the will of the president] is combined with a persistent belief in the engineering capacity of the regime. The obvious limitations to that capacity are not often ventilated, sometimes out of fear, sometimes because of complicity (Hornidge et al. 2013).

What one can also observe is an apparent return to older structures of clans, lineages, extended families, and personal networks to cope with scarcity and uncertainty and with the unpredictability of law enforcement. These coping strategies often work, but in the long run tend to undermine the functioning of organizations, the definition of roles, the possibility of accounting, and the differentiation of politics, law and economy. In other words, they make it hard for people to stick to a role, for organizations to do what they are supposed to do, for businesses to function as a profit-maximizing organization, for the legal system to administer justice irrespective of the person, and for everyone to follow rules and resist corruption. The return, we argue, is an apparent return. The form of clans and patronage networks, as a form of societal organization might be old, but we argue that the actual clan structures and other social identities involved, as well as the rules of the game, are largely the product of soviet histories and their recent transformation (Hornidge et al. 2014 forthcoming). The Soviet reconstruction of Uzbek society was so thorough [as opposed to Tsarist reconstruction], the success of

the initial engineering project so pervasive [in shaping society and its elements] that any traditional Uzbek method of coordination has to be largely a reinvention based on Soviet practices. The same applies to the role of expertise in that coordination, and in the rural economy in general.

What is 'Uzbek' is thoroughly a Soviet product, and even the current methods of mythologization of Uzbek history and ethnicity, supposedly in distinction with Russian and other histories, follows Soviet practice. One can loosely distinguish a category of 'masters' at the local level, a group of people, usually men, who hold some form of authority over others in the community, but this seems a distinction that will naturally emerge under similar structural conditions, and a tradition of hierarchy (Wall 2008). Even at this level of abstraction, it is hard to say whether the principles of hierarchy and male domination are actually traditional or a Soviet legacy. First of all, 'traditional Uzbek' has little meaning, because of the situation sketched above; secondly, the USSR was marked by the same features. Old travel accounts of the silk road cities talk about women involved in trade, in forms of banking, etc. When it comes to expertise in the rural economy, one can observe that Soviet era expertise and connections can form a basis for a position as 'master'. Family connections to the new hokim can be another basis, but as hokims are replaced every now and then, positions of power by association can also change. The elders in the village can also have a special claim to authority, or are assigned authority because of an assumed quality of judgment, but also here, age does not bring one closer to some form of authentic 'uzbek' society; rather, it brings one closer to the heydays of the project of Soviet re-engineering of society.

Talking about 'extension' in this context is talking about a reconfiguration of scattered knowledge and about a careful navigation of both official hierarchies and of the clan structures that both pervade and resist these official hierarchies. Every attempt at 'extension' is interfering in a rural economy that is highly politicized, and which cannot be understood without referring to the interests of the ruling elites in the cotton economy. At the same time, it seems clear that the ruling elites are also much more interested in stability, and realize that some level of economic development, including the diversification of the rural economy, is desirable, or at least has to be tolerated. This double motivation has implications for agricultural expertise as well: what is needed for a continuation of the Soviet agriculture has to be kept alive [in cheaper form, personalized, and coerced], yet other forms of expertise have to be allowed to emerge and their further development, merger with older knowledge stocks and uptake should be nurthered. NGO activities are highly controlled, yet in projects, cooperation with foreign partners can be appreciated, and a contribution to the rural economy can be perceived.

The epistemic culture of the kolkhoz is gone in most places, and in the surrounding organizations, it is languishing in shrinking institutes with aging scientists, engineers and administrators. The engineering mentality with many players is still there, but seems decoupled from distant time horizons, from long-term planning. One can also say: decoupled from development concepts and strategies. Tactics have replaced strategy, and this, we argue, does constitute a strong deviation from Soviet practice and mentality. Tactics were always needed to mold and modify plans, policies, machines and tools and production systems to the realities of place a nd people, but the plans were never abandoned. Now, the engineering metaphor is still prevalent, but the belief in somehow improving or developing the machine seems gone. (people speak of 'correct land use', of 'following the correct paths among organizations', of 'collecting all the signatures' -interviews with project organization experts in Khorezm- but a discussion on content or vision is absent) There is a rhetoric of development, indeed, with the central government,

including ambitious schemes to resettle once again large parts of the rural population into slightly more urban villages, but this time it seems another attempt to increase the financial control of the center over the countryside [where people are 'hiding their wealth'].

6.3 Tajikistan

Just as Uzbekistan, Tajikistan is a Soviet construct with a shallow Russian imperial history. Parts of present-day Tajikistan were under the sway of the Bukhara, Samarqand and Kokhand khanates now associated with Uzbekistan. Drawing borders was one of the strategies deployed by the Soviets to dissolve existing political entities and reconfigure ethnic identities. In addition, under the USSR, people were moved around to settle the territory in places of strategic importance and places with economic potential. The economic potential was, once again, cotton, and the strategic importance was the proximity of Afghanistan [and the British sphere of influence] what was called the Great Game (Jonson 2006; Kreutzmann 2005). The ethnic composition of the area was even more complex than in Uzbekistan, but a simplifying element for the Russian and Soviet ethnographers and administrators in their efforts to delineate a republic was the presence of the Tajik language, an island of Indo- European language [Persian] amidst Uralic-Altaic groups. Present-day Tajikistan was indeed the farthest corner of the ancient Persian empire, and, probably due to its geographic isolation, retained more of that heritage. [Also in Alexanders empire, Tajikistan was the farthest corner, and Alexandria Eschata the most eastern truly Greek city.] Tajiks were however not tied to the area of the current republic, and in fact the present Tajikistan was also for the Tajiks a marginal territory. They themselves saw their core centers of activity as the Silk Road urban trading centers more to the west – such as Bukhara. [In this regard, it is similar to Armenia, where a formerly marginal area became the Soviet Republic of Armenia later.]

Much of the country is mountainous and of limited economic importance. Mining took place under the Soviets, but even in that case, accessibility was a major problem. Ethnic complexity was even higher than in Uzbekistan, while the impact of the Silk Road on the area was much less outspoken than in much of present-day Uzbekistan. Contacts with far-flung areas were traditionally less, and traditional cultures tended to be more traditional than in Uzbekistan, also for the 19th century Russian travelers and ethnographers. Because the Soviet project of development was markedly less ambitious in Tajikistan, more of these traditions survived the Soviet era into the present day.

Yet, also in Tajikistan it is tricky to underestimate Soviet influence in shaping categories of the traditional, the ethnic, the historic, and returning to the roots is in many cases a return to modified roots, albeit less of a reinvention than in the Uzbek case (Mandler 2013; Tiller and Herbers 2013). The southern valleys were transformed by cotton agriculture, and this led to a cotton elite consisting of players that are still in place, while in many mountain areas, kolkhozes were established that still form the frame of local governance. Interestingly enough, in the Tajik mountains, the old kolkhoz elites are involved with the local state officials in control of current governance (Boboyorov 2013) than their counterparts in Uzbekistan, where local and regional hokims [sometimes but not necessarily related to old kolkhoz management] are clearly in charge. For the cotton areas, one can observe a game similar to

the Uzbek one, with proceeds of cotton being very attractive for the government and its clans because of easy control and easy sale for international currency. A variety of other local governance structures and institutions is in place, more than in Uzbekistan, but this complexity seems to signal first of all a series of attempts to deal with the failure of other structures. The resulting layering of governance structures produces on the one hand an inconsistency of governance that makes western- style 'rule of law' [and resulting development models] hard to implement or impose, but on the other hand it creates the possibility of local bricolage and hence adaptation (Sehring 2009).

As a Soviet project of political consolidation, Tajikistan was less a success than Uzbekistan, and the post-Soviet state-building project was accordingly less successful. The ruling elites seemed much less apt in creating a new sense of identity and unity. At the same time [as said], more local traditions survived, in transformed form. Besides Soviet legacies of this sort, another reason for the more fragmented state of the state is the legacy of the civil war in 93-97, not so much the result of tensions between pre-existing cultural/ethnic/ religious groups, but rather the result of elite clan competition gone awry. This might look surprising, since the assets to compete for are much smaller than in Uzbekistan, but there, the president was capable to find an accommodation between rivaling clans, to divide the spoils of the cotton economy and find a regional distribution of power. In Tajikistan, such compromise was not found, and the country descended [as Georgia] in a bloody civil war, with the central government controlling only a small portion of the country.

What emerged in the late 90's was a situation of fragmentation and contested authority, a situation in which a cotton elite formed, consisting of elements of older clan groups, and siphoning off the profits of the southern cotton region, but not entirely in control of that area (Heathershaw 2005). Even for the cotton elite, a group controlling government and industry, it is not easy to keep the cotton economy going. Mobilization of labor for picking cotton, weeding, for maintenance of infrastructure, is decidedly harder than in Uzbekistan. Various mechanisms are used to mobilize, including reference to family and village honor, and to older Islamic traditions. In other words, this is already an example of not only reinvention of tradition but also strategic use of it by elites. Reference to traditional forms of group solidarity is also used by elites' contestants to climb the social ladder and to get access to resources. The revived family and Islamic inheritance is an important institution of the post-Soviet redistribution of public properties in the agricultural sector (Boboyorov 2012 and 2013). The process of group formation and strategic use of [layers of] institutions is a process of co-evolution, in which rules and roles, or in this case, social identities and resource competition rules, shape each other. I can become a good muslim and an honorable villager, and the group of honorable muslim villagers will consolidate and delineate, if this gives access to land and water, and conversely, the 'ancient' rule of competition for land and water will become more engrained if the newly delineated groups become more established. History, identity and rules are rewritten and mobilized continuously in the process, and the process can be fast and locally diverse in absence of a strong nation-state.

The same situation of fragmentation of political entities, incomplete grip of the center over the rest of the country, and layered institutions created a policy vacuum in many places for many extension topics. The strategic interests of western governments and international organizations, and the impoverished situation of the country, led to an outpour of support. Donors gave directly to the country, but a lot of resources went to a flourishing NGO sector (Kazbekov and Qureshi 2011). Since much of the country is

rural, many of the NGO's were and are active in many forms of rural development, including fostering of agricultural expertise. Because of the situation just sketched, the alliances these NGO's have to form to get an impact on actual production are complex, and different per region and locality. Because of the political instability, and the lack of effective governance and predictable governance in many areas, also for NGO's, having a lasting impact is very hard. The extra pressure on the rural economy by climate change and international competition for water [with Tajikistan often on the losing end] make it even harder to operate and think beyond the horizon of the next project.

What we can say in general is that small-scale social structures and identities are even more essential than in Uzbekistan to get anything done, to produce anything, and to give effect to ['to implement'] projects and policies. Yet these identities are often even locally contested, as are their positions of power, the hardness of their rules, and the alliances with other identities. The mere fact of layering of identities can have opposite effects in this regard, ranging from rendering a place virtually ungovernable, to creating a situation of flexible governance and conflict resolution. In this last case, closely related to Machiavelli's case for layered social identities as sources of conflict resolution and constant reinvention of the state, more perspectives exist locally on the usefulness of NGOs, and more possibilities for the organization to find a local niche. This of course assumes that the NGO is willing to find such nice, to analyze the situation, to modify its process and content locally. In cases where the local branch is tied to centralized policies or tied to rules and approaches imposed by donors, such local adaptation might be hard. Working with 'the government' is usually not an option for most NGO's, since they find few reliable and knowledgeable partners within government structures, and since it is tough to know what the actual power of a certain actor is and will be at the local level. Many government actors, on their part, remain thinking and working in the old Soviet style, meaning top-down working approach, giving commands, controlling and reporting (Interview with the head of the National farmers' association, Dushanbe, Tajikistan, May 2012). They are willing to leave the NGO's alone, in exchange for a share of the project budget or resources. The best one can expect from the cooperation with the local, district or regional government is non-disturbance of the NGO's activities (Interview with the agricultural expert of agricultural advisory service 'MMK/ATAC', Kulyab, Tajikistan, May 2012). With a general absence of government policies emanating from higher levels, and with a strong western interest in the region, this created a large playing field for the NGO's and a large freedom in writing the rules of the game. Yet, NGO's cannot replace the state, and they cannot create an environment of stable institutions and predictable law enforcement needed to create anything resembling a capitalist democracy [allegedly the overarching aim of the NGO community]. It is important to mention, that NGOs provide a number of agricultural functions and services like machinery, milling, linking to the market, linking to the agricultural inputs, with salesmen and processors, etc. in rural areas. In this way, they are filling the gap of all services which previously were provided by the government and through the system of kolkhozes and sovkhozes (Shtaltovna forthcoming). Moreover, the NGO community is in many respects not a community, with organizations vying for power, for resources, and representing different models of governance, of economic development, and, logically, of agricultural extension. Similarly, the common interest transcending the interest of the NGO community, i.e. the common interest of Tajikistan, is often forgotten, as NGO's often fail to make themselves superfluous, to create a situation in which they are not needed anymore.

If they find ways to achieve more influence, e.g. in the extension sector, it is often through alliances that are not openly acknowledged or understood. In many cases, allies and clients of local or regional elites

become the beneficiaries of services, expertise, inputs [e.g. seeds] the NGO's eager for implementation deliver (Observations, Tajikistan, April-May 2012). The effects on power relations and resource distributions are often not fully understood. Often, it entails a consolidation of existing power relations, either at the regional level [the cotton elite and its clients] or at the local level [in case of working through the mahalla, or the village council, or a few respected elders or masters, or a particular clan].

Consolidation of power in this fragmented political environment can lead to a selective embrace of the NGO proposals for extension and rural development, but it can also, just as well, create a situation in which the local community closes even more for anything coming in from the outside, in which every change is interpreted as a disturbance to a fragile balance of power. And also for Tajik villagers, knowledge is power, and bringing in new perspectives on agriculture entails potentially upsetting power relations (Mandler 2013).

Generally, new approaches to agriculture can affect distribution of water, land, can create new economic entities, new social identities [e.g. a new class of farmers or processing business owners or service organizations, or service business owners]. They can also change the accessibility of labor for the elites, the level of critical scrutiny of existing practices and relations and they can erode the value of the products and services provided by the current elites.

Thus, knowledge is more dangerous than in even more autocratic regimes, such as Uzbekistan. There, new knowledge can be more easily assessed by the regime for usefulness and risk, and the effects on power relations are likely more marginal, as control is more secure, and channels of law enforcement and profit siphoning are stronger and more tested. And, on the part of western donors, knowledge even in friendly local environments is less likely to have much effect (Shtaltovna forthcoming). Beyond the overtly political government players, there are also few local experts or specialized organizations to rely on. Compared to the two other countries discussed, Soviet institutionalization of agro expertise was weaker to begin with, and, compared to Uzbekistan, even less was left after independence. With the general collapse of the authority of the state, also its resources dwindled, and with the general closure of local minds and communities, the potential impact of agro expertise in general decreased. Thus, the resources for, support of, and demand for even locally produced agro expertise all dwindled, and what was left was largely expertise of the former kolkhoz management. As far as we could observe, the government has little interest in a general development strategy for rural areas [beyond rhetorical lip-service] and little interest in some form of reinvention of the agricultural expertise system. Neither are the activities of the NGO sector interpreted as a basis for such reinvention. New seeds in this context, or sessions with foreign extension experts, become favors for clients, not part of a development strategy; and even these favors are qualified: not too much can be told or taught, since clients have to remain clients.

In absence of a strong centralized state, and of organizations where they can survive, the engineering-minded Soviet epistemic culture is clearly weaker than in other countries discussed. At the same time, survival is tougher. In Georgia, one can survive with a little piece of land, or even when one does not use the land much, and sees it more as a symbolic validation of importance in the local community, or of rootedness in the countryside. In Tajikistan, the stakes are much higher, and are being raised, and yet the tools for coordinated action are very rare and weak. Soviet engineering is not replaced by entrepreneurial thinking, and not, in reality, by an implied model of a tradionalist, Islamic rural economy

with a prescribed idea of expertise and expertise use. The attitudes towards agro expertise and its usefulness are very strongly determined by the complex, fragmented and unpredictable governance situation, leading to uncertain control over land and water, uncertain access to markets and services, to capital, etc. If in a given community, of the more closed type, new people, new practices, new knowledge, new products, accumulation of capital, are seen as alien as 'foreign', as a proof of disloyalty to local identities or Islamic tradition, then a personal investment in learning and experimentation is not only useless, it is also a potentially fatal risk, since it can lead to ostracizing from the community. This in turn, in an impoverished and unstable environment relying on mutual assistance all the time, can amount to the impoverishment of the whole family.

7 Transitions and models: what epistemic cultures do to models of extension

In the following section, we bring together many of the observations made above in a more focused discussion of extension models in a post-Soviet context, and the linkages with evolving epistemic cultures and knowledge cultures. We start with a short typology of extension models, a typology based on the extension and agricultural communication literature, but modified based on our own experiences and research (Beniwal et al. 2010; Kalna-Dubinyuk and Johnson 2005; Nagel and Heiden 2004). Other typologies are possible, and existing, but we opt for this one as it does not limit extension to a capitalist context, and not to a mode of organization formally labeled 'extension'. This is important, as we argued before, because almost every form of rural economy has an expertise system and because what is often called 'extension' in the literature and the international organizations and NGO community is based on an historically and geographically rare model, i.e. a rural economy with autonomous 'farmers' capable of simply absorbing 'expertise' delivered mostly from one organization, an extension organization.

7.1 Models of extension

In order to overcome this bias in much of the literature and policy-making, we revert to a simple typology of agricultural expertise systems. In empirical reality, few places will perfectly embody one model; most communities or societies can be described as a combination of different models. Entertaining a typology after analysis we deem useful because the analysis reveals the multiple pathways and multiple models of transition in general and of agricultural expertise in specific. Entertaining a typology at all seems useful because it can sharpen the final phase of analysis, and can help elucidating the options and risks for possible interventions in more different directions.

We distinguish between six models of extension: purely individual initiative, cooperative extension, professional association extension, university extension, capitalist state extension, communist state extension. Each has different variants and can be combined to a different degree. The individual model is per definition very localized, while the others can have more centralized and more localized versions. Each model can be infused with different epistemic cultures and can in turn contribute to the reproduction of epistemic cultures. Each can be marked by different degrees of professionalism with the players involved. We do not assume the existence of an ideal model of extension, and do not intend to come to generic prescriptions for intervention. Our three post- Soviet countries show different transitions from communist state intervention to a hybrid state.

Individual initiative can still be compatible with an expertise system. It can be part of a capitalist society, but one can also think of very communal societies elsewhere where still possibilities exist for the individual to 'modernize' his or her own agricultural practices and where no cooperatives, universities etc. have a systematic presence. We do not refer here to purely traditional knowledge and/or purely local knowledge, as we do reserve the label 'extension' for activities which somehow intend to insert expert knowledge into the rural economy to modernize it in one way or another. The

experts can be local, the knowledge can be local, but point is that there is a decision, a choice, leading to the designation of this person, not that, and this piece of local knowledge, not that, as useful expertise in a particular case. Thus individual initiative, including a measure of autonomy, can be the basis for a form of extension, a form of shopping in local and other forms of knowledge available in the area, even when no systematic attempt has been made to organize extension there. The model is thus a combination of organizational fragmentation and individual autonomy and drive.

Cooperative extension emerges when several individuals team up to organize extension or the purchase of extension services. That is, the cooperation can focus on the acquisition of expertise somewhere else, or on the production of expertise, or on the dissemination among the members. The model does not necessarily rely on cooperatives sensu strictu, but assumes a group of rural actors that sees a common interest in learning and modernizing agriculture. Cooperatives can be larger or smaller, rich and poor, can have employees or not, can hire professionals or not, and the effects of the extension efforts will vary concomitantly. Cooperatives can be focused on one crop or on the rural economy in an area. The boundary with the next model becomes less clear when cooperatives merge and acquire more power and influence. Cooperatives can be also supported by government, as it is in Japan and play an important role in Japanese agriculture (Agbamu 2000; Gereads 2009). Such cooperatives provide marketing, banking, insurance and health care for farmers and get quite close to the role former kolkhozes used to play in our empirical contexts.

Professional association extension can be seen as the organization of expertise production and/or dissemination by associations assembling similar professionals in a larger area. The most common example are farmers associations, often with regional/local branches, but one can also think of vet's organizations, and more specialized associations such as cattle breeder groups, and horticultural associations, or, for that matter, business organizations in greenhouse construction, or food processing. Here, professional association blends into industry association. In historical evolution, many professional associations of farmers have spawned industries and industry groups that became more influential [economically and politically] than the farmers' associations themselves. In many European countries, the professional association model was very important, marked the evolution of extension, and in most cases, a set of national organizations evolved which became involved in educating their own members, in doing research themselves or ordering research with other partners, e.g. universities, state research institutes, or bureaucratic experts (Nagel and von der Heiden 2004). This already points at the possibility of a coexistence of several models (Kalna-Dubinyuk and Stanely 2005).

University extension exists in many western countries. Both North America and Europe have many versions of university extension. Sometimes, the universities themselves took the initiative to become more involved in the development of their region [especially recently], but historically, it was usually state intervention which forced universities to play an active role. In the US, land grant universities received land and funding from the federal government in exchange for such an active promotion of the rural economy (McDowell 2001; Kalna-Dubinyuk and Stanely 2005). Later, agricultural extension grew into a more comprehensive regional development package, including also, among other things, environmental education and design, economic development assistance, and public participation courses. University extension, as the others, can have many different faces, and because of the nature of the university, the level of community involvement, and the degree of adaptation of scientific questions/

answers to local needs, desires and understanding, varies significantly. In some cases, universities defined issues and solved them, after which they told local communities they did it, while elsewhere, state organizations observed issues or thought in pre- defined solutions; yet elsewhere, farmers or local governments or cooperatives or professional associations got in touch with universities, or came together with them in a systematic fashion. The signals, the communication, could of course go in different directions, and situations occurred in various European countries in which universities defined issues, discussed with administrations and farmers associations, tried to implement, hit the wall with local governments and individual farmers, and many different patterns can be discerned.

Capitalist state extension can include many of these patterns, within a capitalist organization of the economy. In this model, governments can enlist the service of universities, of specialized institutes, of their own expert-bureaucrats, and they can sponsor, subsidize, support professional associations and cooperatives in their extension activities. If government is the driving force in the game, we would use this label, even when universities etc. are involved. In other cases, when many players play a substantial role and can take initiative, one can speak of a hybrid model. In the US, one can speak of capitalist state extension, since the federal government initiated the university extension model and also established county extension services with federal government experts posted at the local level (Van der Ban and Hawkins 1996). Some version of the capitalist model is usually assumed in the extension literature, and the picture of modernization often includes a gradual introduction into global markets, while the long term goal is often seen in terms of macro- economic indicators.

Communist state extension is the system of state farms and the expertise in and around them as described above. It does not start from an individual autonomous farmer taking decisions of an enterprise and its resources, and it does not see extension as the activity of one actor. The goal of extension was often seen in economic indicators, yet different ones [targets]. The reliance on scientific expertise was greater than in the other models, but the actual impact of scientific expertise differed between paper and reality. The communist extension model offered a vision of optimal productivity and optimal spatial organization based on correct mapping, testing, organization, and usage of tools, but the level of expertise integration and policy integration promised by science and bureaucracy alike, proved not very realistic [see above] (Morgounov and Zuidema 2001; Nikonov 1995).

7.2 Models of extension and the three cases

Our three case areas were all part of the Soviet Union, and thus had a communist state extension system. In our case analyses we already intimated that such systems were marked by very strong interdependencies between various organizations, with a central role for kolkhoz [management] in ordering, providing and implementing agro expertise. Similarly in three countries, present day extension systems are built on the previously available Soviet infrastructure and organisations developed for kolkhozes and sovkhozes, rather than starting from scratch (Goldberg et al. 2011; Shtaltovna 2013). Also extension systems mainly hold on to the former Soviet experts. We also indicated that path dependencies of various sorts marked the evolution of the agro-system, including the production and use of expertise. Pre-Soviet legacies and regional differences within the USSR left their marks, and so did

the contingent (geo-political) power-games after breakup (Heathershaw 2011; Jonson 2006; Kreutzmann 2005; Subodh 2003).

International organizations and NGO's often promoted a capitalist state extension system, but got little impact in the rather closed centralized state of Uzbekistan. In Georgia, they could easily get in, but had little impact because of the de facto abandonment of agriculture by government, since it was deemed too difficult or considered too old-fashioned a driver of economic development. In Georgia, the co-presence of US and European NGO's led to a competition between models of development and associated models of extension, with the US in general driving for a more free market and a model of capitalist state extension, and European actors acknowledging more cooperative and professional models, and in general a more social-democratic version of capitalism. In Tajikistan (bordering with the US-presence in Afghanistan), one could observe a similar competition, with a stronger preponderance of US-inspired philosophies, and a low impact because for many purposes, there was no central government with real policies at all [i.e. extending beyond rhetoric]. In Tajikistan, but especially in Georgia, with easier mobility and higher education levels, this created de facto an individual extension model: many services and forms of expertise were available, but they were not organized in systematic manners, so entrepreneurial individuals could take advantage of the extension 'buffet'. In Georgia, the geo-political situation [Russia] made integration into international markets difficult (Juraev 2012; interview with the manager of Khatlon Livelihood support project, Dushanbe, Tajikistan, April 2012; Shtaltovna forthcoming); and a lack of government interest aggravated the difficulties, while in Tajikistan, the space for entrepreneurship [within the 'individual' model] was limited by the various revived and reinvented traditions, as well as government control over cotton production that diminished in many ways individual autonomy.

Cooperative models are rarely observed, in any of the three countries, and the reasons for this show the combination of divergence and convergence mentioned above: there are Soviet legacies of passive waiting for orders, self-censorship, shared anti-Soviet sentiments of suspicion towards any form of common good and cooperative behavior, and there are is the shared legacy of a crumbling kolkhoz and extension system which offered a form of coordination that is not easily replaced. Meanwhile, new forms of coordination [e.g. cooperative models of extension] are hard to get off the ground in the context of short-term survival strategies, suspicion, parasitic or powerless governments, and the presence of hidden forms of coordination [in clan-like structures e.g.] that are either not acknowledged or not interested & equipped to generate agro-expertise models. When a return to a mythologized and localized [and possibly religious] past becomes a prominent part of a new ideology, extension as such can become even harder to imagine, while cooperation as such might become easier to imagine. The result, in terms of the possibilities of cooperative extension, will be hard to predict, will hinge on a delicate balance between different elements of tradition that are highlighted.

What was said about cooperative models applies to a large degree to professional association models. Such associations cannot exist in a vacuum; they cannot exist without a more or less functional state, some form of rule of law, and their extension activities rely on a somehow intact education system. Foreign expertise cannot systematically replace state education and research, and expertise ordered and produced by professional associations will vary in quality depending on the general quality of education. In the case of professional associations, their impact on the balance of power in a country

can be more considerable than in the case of cooperatives, and in Uzbekistan and Tajikistan, this was almost certainly a brake on their development. In Georgia, it seems rather that lack of interest from bottom and top, from farmers and government, was a major cause of their present absence; a root cause in the Georgian case out of our perspective is the extreme fragmentation of land ownership. Cooperative and professional association models in all three countries are further hindered by the newness of the farmer as a role, as an actor, after a history of collective agriculture. In Uzbekistan and Tajikistan, this newness is accentuated by the arrival of many non-farmers into the profession: because farming became one of the most attractive [or least miserable] professions after independence, many other professionals and well-connected people ended up in the farming business, often with a high level of formal education, good networks, and a certain grip over land and resources, but little expertise in farming, and high dependence on peasants [former kolkhozniki] for the daily activities (Djanibekov et al. 2013; Shtaltovna et al. 2012, Wall 2008).

For university extension to have an impact, one needs, trivially, universities, and also a government enlisting their services or allowing others to work with them. In Tajikistan and Uzbekistan, universities still exist, but their knowledge base has been so dramatically eroded, their links with applied research [cf the Soviet institutes] have been so much severed, their means so much cut [hence corruption], that they can do little (UNESCO 2010a). Moreover, government has not used or required their services systematically, and in the Uzbek case, their autonomy is much limited because of potential interference with ever shifting rural policies stemming from the ever unstable balance of power within government. In Georgia, more of the knowledge base has been preserved, and the autonomy of the universities is not as limited, while both local and foreign money, and an intense contact with western academia have secured the sustainability of academia as such. Yet, the lack of interest in agriculture by donors and government in society in general, in combination with the virtual dismantling of the system of agro-research institutes, have brought few students to agricultural sciences, and the perceived gridlock because of fragmented land ownership does not help this situation. If no larger farms can be formed, no group of more prosperous farmers can arise, few young people will be attracted to the profession of being a farmer or to the profession of an extension specialist. The main reasons for that are that knowledge at the Tajik Agricultural University is outdated and that it is hard to find a well-paid job afterwards. Students after graduation do not return to the countryside to run agriculture (Boboyorov 2012). Moreover, young men go to the Agricultural University not to obtain agricultural education, but to avoid army service (Interview with the agricultural expert at Welt Hunger Hilfe, Ayni, Tajikistan, May 2012).

What we can observe in our case countries are therefore three different hybrids, with remaining fragments of a communist state extension system, real or pretended aspirations towards a capitalist extension system, virtually no university extension, virtually no cooperative or professional association extension, and, especially in Georgia and Tajikistan, fragments of an individualist extension system, limited by factors described above. One could, for all three, add a form of barely acknowledged cooperative extension, in the form of old or reinvented family, clan and village networks. In some cases, what we called extension barely takes place, and is even considered suspicious [Tajikistan], while in others, there is a strong profit motivation to enhance production and look for expertise, but this does not easily translate into extension demand because of the hidden nature of profit seeking [Uzbekistan]. Of our three countries, Georgia seems most open to change, because of its general openness, in political, economic and scientific/ educational terms, for the west, but here, the land fragmentation and

long neglect of agriculture in general have created a strong negative path dependency: even with much expertise and good will, and some resources, recreating an agricultural economy out of almost nothing is extremely hard.

8 Epistemic cultures and knowledge cultures

Linking back these observations to the discussion on epistemic cultures and knowledge cultures, we can say that the engineering mentality of the Soviet agro-system, embedded in a broader communist knowledge culture perfused with engineering metaphors, can still be found. One can observe a stronger influence of these metaphors and these cultures in Uzbekistan, in the frame of a more centralized regime with stronger engineering ambitions, a prevailing state plan on cotton and wheat agriculture and more remaining [even if unpaid] experts. When there is less interest in agriculture [Georgia] or simply less government and government control [Tajikistan], the associated epistemic cultures shrink to small islands, in a knowledge culture dominated by different metaphors and different modes of thinking and discovery. In Tajikistan, a 'return' to reinvented traditional structures and principles can entail a real communal spirit averse to change and innovation, or it can entail a pretended communal spirit benefiting entrenched elites, sometimes open to innovation, sometimes not. The openness to extension efforts, of whatever model, are thus strongly defined by the localized power games.

We can say now that not only an a priori model of capitalist state extension, with its assumptions of autonomous farmers and autonomous extension specialists, is very tricky, but also the idea of extension itself, as providing new knowledge inputs to improve and modernize agriculture. Indeed, people need to eat, everywhere, and this provides incentives to cultivate the land, but beyond that, almost everything else can vary according to the reigning power/ knowledge configurations and their evolutionary paths. In Knorr-Cetina's terms, we could say that knowledge cultures might be universal, but not necessarily epistemic cultures, and this has implications for agricultural extension. Furthermore, it seems clear that the development of extension in western countries is tightly coupled with the development of nation-states, their bureaucracies, education systems, and notions of development [even 'civilization' of their own subjects] and openness to the West (i.e. donors). Where the nation state is fragmented or is the facade of regional clan rule, state extension or its substitutes under the state umbrella [university, professional, cooperative] cannot flourish. Governance in other words is crucial, and the knowledge culture that made the epistemic cultures of extension possible in many western countries, have to be seen in that light. In an era of globalization, one can present multi-level governance as something new and highlight the importance of local governance [all correctly] but forgetting the possibilities of the state [if present], its organizations and institutions, its knowledge and epistemic cultures and rules of law enabling discovery and implementation of agricultural expertise, is just as ignorant as forgetting the importance of local adaptation in centrally steered systems.

9 Conclusion

The above presents a discussion on the epistemic cultures of three societies, that in Knorr-Cetina's understanding would not be categorized as 'knowledge societies', i.e. "not simply a society of more experts, more technological gadgets, more specialist interpretations. [But instead] a society permeated with knowledge cultures, the whole set of structures and mechanisms that serve knowledge and unfold with its articulation" (Knorr-Cetina 1999: 7-8). Rather we have focused on societies and a sector in these societies – agriculture – that are characterized by numerous processes of transition, with the field of agricultural knowledge production, dissemination and further development only being one of numerous. With the transition of the industrial societies of the Northern hemisphere into 'knowledge societies', Knorr-Cetina sees a widening divide "between global knowledge and its expert cultures and social groups, and those areas of practice and mentality which remain local" (2007: 372). The above – in an overview manner – delves into the epistemic and knowledge cultures of societies that are less regarded in the literature on the construction of knowledge societies (for an overview see Hornidge 2011), but instead as potential recipients of 'knowledge for development', propagated by international organizations in the field of development cooperation including the World Bank, IMF, but also UNESCO, UNICEF and others (World Bank 1999; Hornidge 2012). The presented outline offers insights into the knowledge cultures in agriculture in all three countries, as well as punctual insights into the epistemic cultures of agricultural organisations, such as different types of farm enterprises and agricultural service organisations, as well as with regard to different crops, such as wine, tea, cotton and wheat. We see three specific amalgams of Soviet-legacies, post-independence revitalizations of 'private' agriculture and donor-driven foci on agricultural advisory services. Knowledge and epistemic cultures in agriculture differ, largely depending on the continued presence of state-quota systems, as well as the degree of privatization in farming. In Uzbekistan we observe continued reliance on the state in experimenting with old farming practices and developing them further. In Tajikistan, this reliance on the state, to be observed in Uzbekistan, can be found with regard to relying on international assistance and donor inputs. Yet, the abolishment of state quota on agricultural production also comes with a higher individual ownership in the farming processes and thus a stronger eagerness in experimenting, trying out alternatives and thinking ahead. Similarly in Georgia, an openness to helping oneself can be observed. Yet existing state extension programs emphasize high-tech knowledge diffusion, rather than bottom-up, localized knowledge developments along local abilities, needs and contexts.

In all three countries, the epistemic and knowledge cultures found in agriculture are characterized by a high degree of fragmentation, a continued belief in absolute truths and man's ability to engineer environment and society, as well as low degrees of individual experimentation and upscaling of local-level idea development. While the high degree of fragmentation confirms what Knorr-Cetina with regard to epistemic cultures in industrial societies assesses as 'the disunity of science', the low degree of individual experimentation and local-level idea development (further hindered by the strong belief in high-level expert knowledge produced by experts in research institutes rather than by a farmer on his own field) fails to reunite (and fill open gaps in) the diverse epistemic landscape of agriculture. It is therefore also impossible to advise for one rather than another model of extension, but instead, just as most societal sectors in these countries, also agriculture and attached to it agricultural extension will have to be developed as part of ongoing transition processes, according to local possibilities and needs. The seven models depicted above are nevertheless thought to serve as inspiration.

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