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A social learning video method: identifying and sharing successful transformation knowledge for sustainable soil management in Switzerland

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Abstract

To enhance sustainable land use, a *From Farmer to Farmer* project was conducted in Switzerland (2001 – 2010). A Multi-stakeholder Discussion Group co-produced nine videos with experienced farmers and wine producers showing sustainable soil management practices. We analysed the video audio-visual content and drew on reflections of the co-production process, referring to concepts of system, target and transformation knowledge, as well as on social learning. The analysis showed a broad range of means (or actions) for sustainable soil management in arable land management, fodder production and wine growing that are aligned to transformation knowledge. The research showed that farmers refer to three phases of social learning, light-bulb moments, coping with challenges and gaining successful expertise. These are not just linear processes of individuals, four types of social learning were also found in the video analysis: 1) learning from observing actions of others, 2) sharing experiences with storytelling, 3) informal social interactions and 4) being a role model with a large social network. Videos enable transformation knowledge to be shared with peers using storytelling; this powerful narrative communication style provides credibility and respects the 'thought style' of the target audience group. We conclude that for successful implementation of sustainable actions, it is important to address a specific target group and share transformation knowledge built upon system and target knowledge. The social learning video method is a viable way to enable social learning between science, administration and practice and has potential for fostering change in sustainable soil management.

Keywords: social learning, video, multi-stakeholder discussion group, knowledge, soil management

Introduction

In Switzerland up to 40% of the arable land is considered to be affected by erosion, the main causes being intensive cultivation techniques, steep slopes and large fields with little vegetation cover (FOEN, 2018). In 1998, the Swiss Federal Council revised the ordinance relating to impacts on the soil that prevent soil erosion and compaction. Since then the Swiss law regulates anti-erosion cultivation techniques, rotation and land consolidating measures by addressing farmers directly (Swiss-Federal-Council, 1998). Soil protection agencies and advisory organisations developed various instruments to protect soil using techniques such as soil erosion risk maps, technical bulletins and farmer training courses and use of the spade test (Hasinger *et al.* 2001; Soil Conservation Service 2015 (video)). However, considerable difficulties were experienced in moving soil protection measures into regular farming practice.

Two main explanations were proposed for the failure to effect the necessary impact on practices: 1) farmers and scientists have different views, concepts and languages due to distinct working aims, methods and contexts (Fry, 2001; Ingram *et al.*, 2010; also see Schwenke *et al.*, this issue). They belong to different 'thought collectives' with different 'thought styles' (Fry, 2001; Pohl *et al.*, 2010). Thought collective is defined as: "a community of persons mutually exchanging ideas or maintaining intellectual interaction" (Fleck, 1979:39). Thought style is characterised by common features of the problems the thought

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collective is interested in; by the judgements it takes as evident; by the methods used and by the technical and literary style (Fleck, 1979:99). Without translating between their thought collectives farmers and scientists talk at cross purposes and have trouble communicating with each other in an effective way. 2) Explicit information, such as data on soil quality, potentially can be easily transferred by means of documents. However, personal experience, 'know-how' and expertise are needed to interpret these data in a way that is meaningful and useful to farmers. Such implicit or tacit knowledge (Polanyi, 2009) cannot be transferred easily (Davenport & Prusak, 1998). Members of the soil science community have the 'know-how' to generate specific meaning from data but practitioners have difficulties deriving meaning from it. As such, Roux et al. (2006) argue, provision of soil information does not necessarily lead to a change in soil use. This can explain why farmers resist applying knowledge and recommendations from scientists and regulators (Ingram *et al.*, 2010). Such challenges faced in connecting knowledge with action have been increasingly acknowledged (Wyborn, 2015; Barnes *et al.*, 2017).

To reach those farmers, who were less inclined to manage their soil in a sustainable manner, Fry initiated the project *From Farmer to Farmer* in Switzerland between 2001 and 2010 (Allenbach, 2007; Schneider *et al.*, 2009; Schneider *et al.*, 2010; Schneider *et al.*, 2012). The aim of the project was to share farmer experiences of sustainable soil management with other farmers by using videos. The videos were co-produced with stakeholders from science, administration and practice. After conducting several projects this method was documented as the social learning video method (Fry, 2018).

The aims of this paper are to contribute to a better understanding of farmers' knowledge of sustainable soil management, specifically to examine how different forms of knowledge interact with learning, and how this learning is shared with others. These aims are addressed by analysing video content and reflecting on co-production experiences, drawing on concepts of farmer's 'transformation knowledge' and the social learning processes leading to such knowledge.

The paper is structured as follows. First we provide an introduction to conceptual debates on social learning, different forms of knowledge and the social learning video method. In the second section we briefly describe the methods used for the video analysis and in the third section we present and discuss research results addressing how the farmers' experiences relate to the different knowledge forms and to the concept of social learning. Following this, we present our conclusions.

Knowledge for sustainability challenges: social learning, three knowledge forms and the social learning video method

To understand how practitioners deal with the multiple dimensions of soil protection (Brand, 2016), the concepts of social learning and three different forms of knowledge for sustainability are brought together and their applicability to the social learning video method is assessed.

Phuong *et al.* (2018:880-881) define social learning as "a multi-level learning process bringing together stakeholders with diverging initial perceptions with the intention to learn together and form a common understanding with respect to taking a planned course of

action that they jointly implement by working in iterative cycles of action and reflection.”

Social learning has become an important concept in climate change adaptation (Phuong *et al.*, 2017), natural resource management (Cundill & Rodela, 2012), environmental management (Keen *et al.*, 2005) and sustainability transformation. Macintyre *et al.* (2018) also observed a growing tendency towards dialogue-based social learning between diverse actors including their various ways of knowing and perspectives. Those actors involved have to be willing and able to negotiate as equals in an open communication process, where diversity and conflict are driving forces for development and social learning (Wals, 2007). Social learning can only emerge if trust, cooperation, empathy, intuition and inspiration between different groups with multiple cognition are enabled (Rist, 2007).

To tackle sustainability and global change, scholars argue that three different knowledge forms are needed – system, target, and transformation knowledge (ProClim, 1997). Systems knowledge describes and explains the genesis, the current state and the trend(s) of unsustainable situations in the real world (Wuelser *et al.*, 2012). Examples are: the knowledge scientists have about soil compaction, erosion or heavy metal contaminants; farmer knowledge of cultivation techniques. Target knowledge explains whether certain trends suit respective objectives, and addresses the question of what would be an adequate direction, frame or orientation for change with respect to the core objectives of sustainability. Examples are: studies that determine critical thresholds for soil impacts, knowledge on how to evaluate situations and states with respect to sustainability, including studies that specify and motivate societal objectives like goals of soil protection. Finally transformation knowledge builds upon system and target knowledge and is about transforming current situations and redirecting their energies towards sustainable

development. Transformation knowledge contains the descriptions and explanations of potentials for change, the knowledge about the means for change and how to apply such means as well as the social learning processes needed at several levels (Wuelser *et al.*, 2012). Transformation knowledge is knowledge for action by policy makers and other target groups of society.

The central idea of the social learning video method is to bring together different stakeholders from science, administration and practice to co-produce videos (Fry, 2018). At the core of co-production is the idea that multiple stakeholders and the three forms of knowledge need to be connected. Knowledge co-production is embedded within social contexts and institutions, which in turn shape knowledge production (Jasanoff, 2004; Wyborn, 2015). Co-producing videos involves three elements, which will be briefly explained: 1. setting up a Multi-stakeholder Discussion Group, 2. co-producing the videos and 3. distributing these videos and enhancing social learning.

To foster a strong relationship between science, governance and practice (Wyborn, 2015), the first step, is to set up a Multi-stakeholder Discussion Group (MDG) (Fry, 2017). In this group, representatives of science, civil society, private (e.g. farmers) and public sector continuously consult each other (co-produce) in the development of a social learning video (Schneider *et al.*, 2009; Fry, 2018). In a second step, the project leader facilitates all stakeholders of the MDG in round table discussions and field excursions to select farmer practices of sustainable soil use in arable land management, fodder production or wine growing and identify and select farmers and other possible practitioners to be interviewed and filmed (Schneider *et al.*, 2009; Fry, 2018). The criterion for their selection was they 'have a good story to tell' about their experiences (good and bad) in implementing one or

more of the practices selected by the MDG. During filming in the localities of the practitioners, they shared, in an unscripted format, which captured their most important experiences while showing their cultivation and other techniques in the working environment (see also Curran Bernard 2007). In some cases this took place in interactive settings with other farmers. Finally, based on the existing data from practitioner group discussions and interviews, nine videos were developed showing farmer experiences. At every production step, the MDG as well as the filmed practitioners provided feedback and contributed to the iterative development of the videos (Fry, 2018). In a third step, the videos were made accessible through online portals, where they could be shared easily with the social network of the wider farming community. The videos were also distributed and discussed in practice networks as well as at technical colleges to provide mutual learning opportunities.

The videos have been reviewed in various settings and their reception by other farmers has been discussed elsewhere (Allenbach, 2007; Schneider *et al.*, 2009). These evaluations found that they were very well received due to their proximity to practice, their authenticity, the ease with which the narrative could be followed, and the ways in which they stimulated viewers' reflections. However, farmers did voice their criticisms of the videos when important discussions were missing. Apart from bridging science and practice, the videos distributed results as in any other research process. As such they also generated new questions and challenges for further transdisciplinary research (Schneider *et al.*, 2009; Thieme, 2012).

Methods

This paper is based on the content analysis of nine social learning videos, which were developed during the *From Farmer to Farmer* project (Table 1). It also draws on reflections and observations of the first author during development and delivery of the *From Farmer to Farmer* project and in previous evaluations of the effectiveness of the videos in fostering learning and change in practice.

To find out whether the co-produced videos are a productive way to enhance social learning for sustainable soil management, the videos were analysed by asking the following questions: which 'transformation means' were described by the farmers in the videos? What aspects of social learning could be identified in the videos? How was 'transformation knowledge' operationalised in the videos?

The analysis used an audio-visual approach, combining text analysis with analysis of video scenes (Flick 2018). In a first step, nine videos were watched and meaningful scenes were marked, where farmers described their actions for sustainable soil management. These video stills were selected and collected in an Excel document together with the translated English subtitles. In a second step the English subtitles (transcripts) were analysed in an approach inspired by grounded theory (Strauss & Corbin, 1998) using open and axial coding with the focus on general themes relevant to transformation knowledge and processes of social learning. In the first round of open coding, substantial codes were developed describing and naming the study phenomena. Then categories resulting from open coding were refined, differentiated and relations between categories formed (Strauss & Corbin, 1998; Flick, 2018). In a third step the interpretations from the textual material

were related to the visual material. For the following discussion of results, quotations together with the affiliated video stills are presented.

To supplement this analysis, the first author conducted reflection exercises by revisiting and analysing past reports and papers relevant to the co-production process and the themes identified in the above analysis. Reflecting on one's own practice is considered to be an important part of social learning (Brown *et al.*, 2005; Keen *et al.*, 2005). Schön (2017) also pointed out in *The reflective practitioner* that the reflection is important for taking professional responsibility and improving performance.

The analysis brought to light two main themes, which are reflected in the structure of the findings presented here. First, different forms of knowledge and means of acting on this knowledge are related to sustainable soil use in arable land management, fodder production and wine growing. Second, key aspects of social learning are differentiated, such as how farmers experience their own learning and how the learning process was facilitated.

Results and Discussion

Different forms of knowledge for sustainable land use – means for change

The analysis of the nine videos revealed the following means (or actions) for changing to sustainable soil management: Under arable farming practices, minimal tillage, mulch tillage, strip tillage and no tillage were presented. These practices are known to be effective means for preventing soil degradation (Lal *et al.*, 2007; Sturny *et al.*, 2007; Derpsch, 2008).

Furthermore, low pressure tyres, dual wheels and weight reduction of the machines to avoid soil compaction were shown. Farmers in the videos also mentioned soil preserving

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practices e.g. working on dry soil and not ploughing a slope with a high erosion risk. Supplementing no tillage with cover crops to reduce herbicides was presented and discussed as well as promoting soil management with compost and cover crops to regenerate soil structure. For fodder production the following practices were discussed from the lowlands to the mountains: partial grazing, lighter and less demanding animals, limiting grazing time when it is wet, fewer animals per pasture, preventing soil damage in steep meadows through narrowing the paddocks, reducing fertiliser to encourage deeper plant roots and denser sward. For viticulture, green cover to stop erosion and increase workability was discussed as well as its role in stimulating microbial activity, cease using herbicides and terracing steep slopes.

These best practices, specific technologies and actions are the means for change. They are underpinned by the knowledge of how to apply such means, which has at its core transformation knowledge (Wuelser *et al.*, 2012). These means for change are abundantly described in technical bulletins, however, often an implementation problem remains, since those technical bulletins do not include experiences and arguments of practitioners and lack stories of farmers' pathways for change.

In the video "Soil management with compost and cover crops" one of the farmers described why he used feed rye as a cover crop to regenerate soil structure and in doing so reduced the risk of soil erosion and compaction.

(Insert video still 1 near here)

“Feed rye is like a cobweb. These are crumbs with a living structure, very finely interwoven roots everywhere. Of course there are also worms and micro-organisms (...). It is like wool! By the way, these are clayey soils, not light soils. But this is not a problem anymore. Even in a thunderstorm it won’t be washed away. You notice it well when you stand on it. The soil hasn’t settled. Meaning: the soil resists the rain in winter; there is no settlement or compaction. To me this is soil protection and security. Especially a field on a slope like this is in itself a dangerous situation. It could slip down some time. But I am not afraid” (Soil management with compost and cover crops/47).

This quote exemplifies how farmers integrate soil protection into farming practice and reveals three different forms of knowledge and how they relate to each other. This farmer’s description of how he uses feed rye as a cover crop to regenerate soil structure is characteristic of transformation knowledge. He refers to system knowledge by mentioning that clayey soil and a steep slope may lead to soil erosion. By mentioning that the regenerated soil resists the rain in winter and that this means soil protection and security to him, the farmer is referring to target knowledge. He connects these three knowledge forms in the video in a meaningful way for other farmers. He translates between soil protection and agriculture – target knowledge – by embedding soil erosion and compaction – system knowledge – in farmers’ working situations and actions – transformation knowledge – and articulates using metaphors and emotions.

Furthermore, farmers do not only relate to soil in a narrow and disciplinary sense but use a broad argument with economic, ecological, agronomic, social and aesthetic dimensions, as noted by Schneider *et al.* (2010). So soil protection becomes one among many other issues, and economic arguments can also lead to sustainable soil management:

(Insert video still 2 near here) *“I work with this machine for three reasons: soil protection; there is no compaction or plough pan; I need less time and I have lower costs. We now use 2000 litres of diesel. That is very little”* (Mulch tillage/117).

Three different phases of learning

The video analysis and first author’s reflections show how farmers go through a learning and innovation process when developing successful practices. The author observed how the co-production of the videos which involved interviews and discussions with the MSG made the farmers reflect on their own learning process and revealed different phases: ‘light-bulb moments, coping with challenges, and gaining successful expertise. These are illustrated in the individual video stories. Light-bulb moments refer to the observations, during work for instance, which can trigger first ideas and so become starting points for change: *“We have very heavy soils here in the Limpach valley. Beautiful soil was pressed deep into the ground, the wet soil was turned up, and one day we tried to do it the other way round and it worked surprisingly well. This is how it all started”* (From ploughing to no tillage/25). Based on these experiences he started his own business as a contractor with conservation agriculture expertise, a system which involves reduced tillage, residue management and maintenance of cover and reduces soil erosion and soil compaction. Another farmer recalled a crucial

experience which led to fundamental changes on his farm. This was sparked off by economic arguments, which is system knowledge coming from agronomy. He then switched from partial grazing to full grazing, choosing lighter animals which do not compact the soil so much.

((Insert video still 3 here)) *“About 13, 14 years ago I did a full-cost accounting of our milk production. That was a crucial experience. Subsequently, I tried to modify the production. When I saw the first result of this full-cost accounting, I discovered that I was virtually paying an entrance fee for milking. And at that time we still had a milk price of about 1 Swiss Franc (per litre)!”* (Fodder production from the lowlands to the mountains/16).

Another major theme to emerge in the video analysis was the ability to cope with challenges entailed in the transition to new practices. Changing methods on a farm is often demanding. One has to be able to learn from mistakes and not to give up immediately: *“In the beginning we made some mistakes. We had reduced corn yields, especially poor plant stands. The seed grooves broke open again, dried out and slugs went at it”* (From ploughing to no tillage/63). The crops may grow irregularly and show extensive gaps with direct seeding for instance. It is important to realise that this may level out in time. Obstacles and difficulties with new methods can also be larger due to the climatic region and take some time to adjust to. At higher altitudes crops fail more often, mainly due to unfavourable weather and soil conditions, heavy rains, cool temperatures and a shorter vegetation period. When changing actions, farmers encounter obstacles and difficulties on the social side as well. Green cover, for example, can be aesthetically a provocation and a challenge for the family and the community leading to negative peer pressure, and potentially social exclusion or marginalisation.

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((Insert video still 4 here)) *“For my father’s generation, herbicides were a big step forward. They were upset at the sight of our vineyard and all the grass. They said it doesn’t look nice at all; one should be ashamed of it. It was really a huge conflict. But gradually they saw that we were rather successful with it”* (Green cover in viticulture/19).

While going through ‘light-bulb’ moments and coping with different challenges, practitioners experience a growing confidence in using their new expertise. They increasingly trust the new system and start reflecting and arguing in favour of the new system: *“If you first need to plough, then pass a rotary harrow once or twice, then add an operation with the drill, and then maybe another one with a roller. In the end, the whole thing has to be sprayed: then it’s obvious that this is going to be more expensive than doing it all in just a single pass”* (Mulch tillage/46). Generally it is not just one factor making the difference. Important considerations are costs, crop yield, practicability, improved workability of the soil and how and in what quality the crops grow. Even aesthetics play a role. After several years of gaining experience pioneer farmers can serve as role models for others with techniques like green cover. For instance:

((Insert video still 5 near here)) *“30 years ago, grass was our biggest enemy. Over the years through discussions and practical experiences we learned that we could actually make the grass our ally. Only yesterday, I noticed again how many kinds of plants we have. We have up to 60 or 70 different kinds of plants. I think that is fantastic.”* (Green cover in viticulture/81).

With their insights and experiences they can offer clear advice: *“To me, mulch tillage is the future. Forget the plough, direct seed when conditions are ideal and mulch-till in between”* (Mulch tillage/41).

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The three different phases of learning are not just linear and strongly interrelated, these different moments were also confirmed in an earlier study by Allenbach (2007) on sustainable farming who described them as: the prephase, where first thoughts and questions arise; the experimenting phase where new methods are chosen, tested, developed further and the whole farming system and lifeworld may be changed; and the consolidating phase where they know what works best and why.

What facilitates social learning?

The social learning video method builds on the idea of learning as a social process, embedded in social relations and networks (Bos *et al.*, 2013; Barnes *et al.*, 2017). The strong social embeddedness of learning and innovation was revealed by the video analysis with four types of social learning apparent: learning from seeing what others do, sharing experiences with storytelling, informal social interactions and learning from key persons with large personal networks. A contractor in one video for example described a “snowball effect” through neighbours which encouraged them to experiment with a new technique on their own land. Such learning in soil management through observing and copying neighbours is well documented (Ingram, 2014). The video method allows farmers to share their experiences, their learning processes and assessments with storytelling, an important medium for farmers’ communication, as described by Curran Bernard (2007). One of the contractors organised a farmer field day which was captured in the video. There he first showed different fields he had sown by means of no tillage. Then he compared two very different soil samples (see video still 6). The contractor used metaphors, everyday language and storytelling in an informal setting to share knowledge.

((Insert video still 6 here))

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This way of communicating about soil conservation techniques during informal social interactions was central to the overall success of the project (Ravn, 2004). Farmers are often keen to meet and interact socially, they use social networks to compare and to formulate their own opinion, by accepting or rejecting others' knowledge (Morgan *et al.*, 2002). Respected experts within these social networks have an important function as role models. These can be contractors in a large network with a lot of experience, pioneers or intermediaries acting between soil protection policy makers and practitioners. Learning through role models has been reported to be effective in other contexts and opinion leaders are regarded as drivers for social innovation (Bandura 2004; Rogers, 2008).

The video format supports opportunities for recounting and sharing transformational knowledge. As a collaborative process, film both in its production and viewing generally requires people to cross boundaries of their thought collectives and create spaces for dialogue (Parr, 2007; Thieme, 2012; Thieme, 2017). The videos enabled farmers, who viewed their stories, to relate their own personal experience, their own farm situation and the situation of agriculture in general, they show credible examples of practices, landscapes, machines, soil management, that their peers can relate to. Video is also described as an ideal medium to show emotions and reinforce credibility (White, 2003; Chowdhury & Hauser, 2010; Milne *et al.*, 2012). This particular type of video addresses the shared norms and values as well as cognitive, social and emotional competencies, which are known to be key dimensions for social learning processes (Rist *et al.*, 2006; Rist, 2007; Rist *et al.*, 2007). The video is powerful since there is no voice-over giving a systematic summary on sustainable soil management practices based on system knowledge on soil erosion for instance. Instead, practitioners tell their own stories in their own thought style on how and

why they started using their land sustainably in an authentic way. The videos are meaningful to the target group because the means for change are embedded in their shared life worlds (Schneider *et al.*, 2010).

Conclusion and outlook

We conclude that the social learning video method is a promising way to foster learning processes between science, administration and practice by building and facilitating a Multi-stakeholder Discussion Group and co-producing solution oriented videos showing the means for transformation, and social learning processes. The experience in the project overall confirmed that it is important to identify and share sustainable transformation knowledge and not to try to transfer information about isolated soil properties and soil system knowledge when addressing practitioners. This message is important for soil protection agencies and advisory organisations who are trying to deliver the Swiss laws on soil protection. Generally, the videos promoting sustainable soil management disseminated to farmers, focus on system and target knowledge but do not capture farmer transformation knowledge. The speciality of the social learning video method is that it enables transformation knowledge, which is built upon system and target knowledge to be shared.

The social learning video method has a great potential for altering how change can be brought about in farmers practice, when success stories and reported failures are well balanced and the networks and institutions continuously use the videos to enhance knowledge exchange in informal situations; and when there is subsequent follow-up material provided by counsellors and interactive websites.

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The next generation of land managers and soil scientists can be engaged by using this method to enhance social learning in their groups, networks and communities of practice to foster sustainable soil use and management. It is concluded that this method can potentially serve as a model also for other target groups and other issues, where system and target knowledge has to be transformed – for instance in climate adaptation and mitigation, in health issues as well as in biodiversity protection.

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References

- Allenbach, S. 2007. ... besser als ein Biologe vom Telehochhaus.... In: *Centre for Development and Environment CDE, University of Berne*.
- Bandura, A. 2004. Health promotion by social cognitive means. *Health education & behavior*, **31**, 143-164.
- Barnes, M., Bodin, Ö., Guerrero, A., McAllister, R., Alexander, S. & Robins, G. 2017. The social structural foundations of adaptation and transformation in social–ecological systems. *Ecology and society*, **22**.
- Bos, J., Brown, R. R. & Farrelly, M. A. 2013. A design framework for creating social learning situations. *Global Environmental Change*, **23**, 398-412.
- Brand, U. 2016. “Transformation” as a new critical orthodoxy: the strategic use of the term “transformation” does not prevent multiple crises. *GAIA-Ecological Perspectives for Science and Society*, **25**, 23-27.
- Brown, V. A., Dyball, R., Keen, M., Lambert, J. & Mazur, N. 2005. The reflective practitioner: practising what we preach. *Social learning in environmental management: towards a sustainable future*. Earthscan, London, 224-243.
- Chowdhury, A. H. & Hauser, M. 2010. The potential of moving pictures. Does participatory video enable learning for local innovation? In: *ISDA 2010*. Cirad-Inra-SupAgro, 23 p.
- Cundill, G. & Rodela, R. 2012. A review of assertions about the processes and outcomes of social learning in natural resource management. *Journal of environmental management*, **113**, 7-14.
- Curran Bernard, S. 2007. Documentary storytelling. London: Focal Press.
- Davenport, T. H. & Prusak, L. 1998. *Working knowledge: How organizations manage what they know*, Harvard Business Press.
- Derpsch, R. 2008. No-tillage and conservation agriculture: a progress report. *No-till farming systems. Special publication*, 7-39.

- Fleck, L. 1979. *Genesis and development of a scientific fact*, University of Chicago Press.
- Flick, U. 2010. *Qualitative Sozialforschung*.
- Flick, U. 2018. *An introduction to qualitative research*, Sage Publications Limited.
- FOEN 2018. State of Swiss soil. <https://www.bafu.admin.ch/bafu/en/home/topics/soil/info-specialists/state-of-swiss-soil.html> (retrieved 31.1.2019)
- Fry, P. 2001. *Bodenfruchtbarkeit: Bauernsicht und Forscherblick*, Margraf.
- Fry, P. 2017. Multistakeholder Discussion Group. td net methods: https://naturwissenschaften.ch/topics/co-producing_knowledge/methods/td-net_toolbox/multi_stakeholder_discussion_group (retrieved 31.1.2019)
- Fry, P. 2018. Social learning videos: a method for successful collaboration between science and practice. In: *Transdisciplinary Research and Sustainability: Collaboration, Innovation and Transformation*. (ed M. Padmanabhan), Routledge.
- Hasinger, G., Marendaz, E., Keller, L., Neyroud, J.-A., Vökt, U. & Weisskopf, P. 2001. Bodenbeurteilung im Feld, Forschungsinstitut für biologischen Landbau FiBL.
- Ingram, J. 2014. Agricultural adaptation to climate change: New approaches to knowledge and learning. *Climate change impact and adaptation in agricultural systems*, 253-270.
- Ingram, J., Fry, P. & Mathieu, A. 2010. Revealing different understandings of soil held by scientists and farmers in the context of soil protection and management. *Land Use Policy*, **27**, 51-60.
- Jasanoff, S. 2004. *States of knowledge: the co-production of science and the social order*, Routledge.
- Keen, M., Brown, V. A. & Dyball, R. 2005. *Social learning in environmental management: towards a sustainable future*, Routledge.
- Lal, R., Reicosky, D. & Hanson, J. 2007. Evolution of the plow over 10,000 years and the rationale for no-till farming. *Soil & Tillage Research*, **Editorial / 93**, 12.

- Macintyre, T., Lotz-Sisitka, H., Wals, A., Vogel, C. & Tassone, V. 2018. Towards transformative social learning on the path to 1.5 degrees. *Current Opinion in Environmental Sustainability*, **31**, 80-87.
- Milne, E. J., Mitchell, C. & Lange, N. d. 2012. *Handbook of participatory video*, AltaMira Press.
- Morgan, M. G., Fischhoff, B., Bostrom, A. & Atman, C. J. 2002. *Risk communication: A mental models approach*, Cambridge University Press.
- Parr, H. 2007. Collaborative film-making as process, method and text in mental health research. *cultural geographies*, **14**, 114-138.
- Phuong, L. T. H., Biesbroek, R. & Wals, A. E. 2017. The interplay between social learning and adaptive capacity in climate change adaptation. *NJAS Wageningen Journal of Life Sciences*, **82**, 1-9.
- Phuong, L. T. H., Wals, A., Sen, L. T. H., Hoa, N. Q., Van Lu, P. & Biesbroek, R. 2018. Using a social learning configuration to increase Vietnamese smallholder farmers adaptive capacity to respond to climate change. *Local Environment*, 1-19.
- Pohl, C., Rist, S., Zimmermann, A., Fry, P., Gurung, G. S., Schneider, F., Speranza, C. I., Kiteme, B., Boillat, S. & Serrano, E. 2010. Researchers roles in knowledge co-production: experience from sustainability research in Kenya, Switzerland, Bolivia and Nepal. *Science and public policy*, **37**, 267-281.
- Polanyi, M. 2009. *The tacit dimension*, University of Chicago press.
- ProClim, 1997. Research on Sustainability and Global Change – Visions in Science Policy by Swiss Researchers https://naturalsciences.ch/uuid/3df3d017-7928-56dd-864f-63904096048d?r=20190123173530_1543438467_97d18713-8a31-5e4b-bea2-f1f63980ae97. (retrieved 31.1.2019)
- Ravn, J. E. 2004. Cross-system knowledge chains: The team dynamics of knowledge development. *Systemic Practice and Action Research*, **17**, 161-175.

Rist, S., Chidambaranathan, M., Escobar, C., Wiesmann, U. & Zimmermann, A. 2007. Moving from sustainable management to sustainable governance of natural resources: The role of social learning processes in rural India, Bolivia and Mali. *Journal of rural studies*, **23**, 23-37.

Rist, S., Chiddambaranathan, M., Escobar, C. & Wiesmann, U. 2006. "It was hard to come to mutual understanding..."—The multidimensionality of social learning processes concerned with sustainable natural resource use in India, Africa and Latin America. *Systemic Practice and Action Research*, **19**, 219-237.

Rist, S., Freddy Delgado and Urs Wiesmann 2007. Social learning processes and sustainable development: the emergence and transformation of an indigenous land use system in the Andes of Bolivia. In: *Social learning towards a sustainable world: Principles, perspectives, and praxis*. (ed A. E. Wals), Wageningen Academic Pub.

Rogers, E. M. 2008. (2003). Diffusion of Innovations. *New York*.

Roux, D. J., Rogers, K. H., Biggs, H. C., Ashton, P. J. & Sergeant, A. 2006. Bridging the science–management divide: moving from unidirectional knowledge transfer to knowledge interfacing and sharing. *Ecology and society*, **11**.

Schneider, F., Fry, P., Ledermann, T. & Rist, S. 2009. Social learning processes in Swiss soil protection—the from farmer-to farmerproject. *Human ecology*, **37**, 475-489.

Schneider, F., Ledermann, T., Fry, P. & Rist, S. 2010. Soil conservation in Swiss agriculture—Approaching abstract and symbolic meanings in farmers life-worlds. *Land Use Policy*, **27**, 332-339.

Schneider, F., Steiger, D., Ledermann, T., Fry, P. & Rist, S. 2012. No-tillage farming: co-creation of innovation through network building. *Land degradation & development*, **23**, 242-255.

Schön, D. A. 2017. *The reflective practitioner: How professionals think in action*, Routledge.

Soil Conservation Service of the Canton of Berne 2015. The Spadetest. Video by Halbbild Halbton GmbH https://www.youtube.com/watch?time_continue=2&v=XPztjZdzCHY

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- Strauss, A. & Corbin, J. 1998. Basics of qualitative research: Procedures and techniques for developing grounded theory. Thousand Oaks, CA: Sage.
- Sturny, W. G., Chervet, A., Maurer-Troxler, C., Ramseier, L., Müller, M., Schafflützel, R., Richner, W., Streit, B., Weisskopf, P. & Zihlmann, U. 2007. Direktsaat und Pflug im Systemvergleich—eine Synthese. *Agrarforschung*, **14**, 350-357.
- Swiss-Federal-Council 1998. Ordinance of 1 July 1998 relating to impacts on the soil (OIS).
- Thieme, S. 2012. " Action": Publishing Research Results in Film. In: *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*.
- Thieme, S. 2017. 11 Non-social Science Perspectives in Research on social Sustainability. In: *Symposium: Soziale Nachhaltigkeit: Beiträge für das "Symposium: Soziale Nachhaltigkeit" am 2.11. 2017, Potsdam (IASS)*. BoD—Books on Demand, pp. 155.
- Wals, A. E. 2007. *Social learning towards a sustainable world: Principles, perspectives, and praxis*, Wageningen Academic Pub.
- White, S. A. 2003. *Participatory video: Images that transform and empower*, Sage.
- Wuelser, G., Pohl, C. & Hadorn, G. H. 2012. Structuring complexity for tailoring research contributions to sustainable development: a framework. *Sustainability Science*, **7**, 81-93.
- Wyborn, C. A. 2015. Connecting knowledge with action through coproductive capacities: adaptive governance and connectivity conservation. *Ecology and society*, **20**.

Table 1 Project “From Farmer to Farmer – success stories for sustainable land

management”: Project phases, video titles, duration and languages, filmed practitioners,

production year and film team. Videos with subtitles: www.fromfarmertofarmer.ch

Project phases	Video title	Video duration, languages	Filmed practitioners	Production year and film team
Pilot phase	No tillage field day	15 min, Swiss German	Contractor visiting four clients, Field day	2003. Director: Patricia Fry, camera: Monika Schenk, post production: Jolanda Piniel.
Main phase	From ploughing to no tillage	9 min, Swiss German	Contractor gives overview	2005. Director: Patricia Fry, camera and post production: Renata Grünenfelder, music and sound: Hipp Mathis.
	Mulch tillage	18 min, Swiss German	Interviewing two clients of a contractor, visiting two additional farmers	2005. Director: Patricia Fry, camera and post production: Renata Grünenfelder, music and sound: Hipp Mathis.
	Strip tillage	12 min, Swiss German	One farmer explains method and shows development of a field over a season	2005. Director: Patricia Fry, camera and post production: Renata Grünenfelder, music and sound: Hipp Mathis.
	No tillage over a season	14 min, Swiss German	One farmer explains method and shows development of a field over a season	2005. Director: Patricia Fry, camera and post production: Renata Grünenfelder, music and sound: Hipp Mathis.
	Soil management with compost and cover crops	20 min, Swiss German	Visiting four organic farms in several cantons	Visiting four organic farms in several cantons
Extension phase	No tillage from Jura to Lake Geneva	16 min, French	Five farmers in several cantons	2010. Director: Patricia Fry, camera and post production: Renata Grünenfelder, interview: Jeanne-Charlotte Bonnard, music and sound: Hipp Mathis.

	Fodder production from the lowlands to the mountains	35 min, Swiss German		2010. Director Patricia Fry, camera and cut: Renata Grünenfelder, music and sound: Hipp Mathis.
	Green cover in viticulture	24 min, French	2 organic farms and 3 integrated production	2010. Director Patricia Fry, camera and cut: Renata Grünenfelder, interview: Jeanne-Charlotte Bonnard, music and sound: Hipp Mathis.

FIGURE CAPTIONS



Video still 1 Soil management with compost and cover crops.



Video still 2 Mulch tillage.



Video still 3 Fodder production from the lowlands to the mountains.



Video still 4 Green cover in viticulture.



Video still 5 Green cover in viticulture.



Video still 6 Farmer field day: Using everyday language and storytelling in an informal setting to share knowledge.

Figure 1. Video still and quotation “Soil management with compost and cover crops”.

“Feed rye is like a cobweb. These are crumbs with a living structure, very finely interwoven roots everywhere. Of course there are also worms and microorganisms (...). It is like wool! By the way, these are clayey soils, not light soils. But this is not a problem anymore. Even in a thunderstorm it won’t be washed away. You notice it well when you stand on it. The soil hasn’t settled. Meaning: the soil resists the rain in winter; there is no settlement or compaction. To me this is soil protection and security. Especially a field on a slope like this is in itself a dangerous situation. It could slip down some time. But I am not afraid” (47).

Figure 2. Video still and quotation “Mulch tillage”.

“I work with this machine for three reasons: soil protection; there is no compaction or plough pan; I need less time and I have lower costs. We now use 2000 litres of diesel. That is very little” (117)

Figure 3. Video still and quotation “Fodder production from the lowlands to the mountains”.

“About 13, 14 years ago I did a full-cost accounting of our milk production. That was a crucial experience. Subsequently, I tried to modify the production. When I saw the first result of this full-cost accounting, I discovered that I was virtually paying an entrance fee for milking. And at that time we still had a milk price of about 1 Swiss Franc (per litre)!” (16).

Figure 4. Video still and quotation “Green cover in viticulture”.

“For my father’s generation, herbicides were a big step forward. They were upset at the sight of our vineyard and all the grass. They said it doesn’t look nice at all; one should be ashamed

of it. It was really a huge conflict. But gradually they saw that we were rather successful with it” (19).

Figure 5. Video still and quotation “Green cover in viticulture”.

“30 years ago, grass was our biggest enemy. Over the years through discussions and practical experiences we learned that we could actually make the grass our ally. Only yesterday, I noticed again how many kinds of plants we have. We have up to 60 or 70 different kinds of plants. I think that is fantastic.” (81).

Figure 6. Video still “Farmer field day”.