INnovative Conservation Agriculture Approaches: Food Security and Climate Action Through Soil and Water Conservation (INCAA)

Final report

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a cooperation of

Summary

Considering the challenges of population growth, changing human consumptions patterns and climate change, it is assumed that farming systems in Africa will have to increase their productivity, sustainability and resilience. Conservation Agriculture (CA) is an approach that has shown promising results in reducing soil degradation, water evaporation, while contributing to biodiversity and reducing climate vulnerability of agriculture. However, CA has not been innovated in Africa on a larger scale.
The ERAfrica-project INnovative Conservation Agriculture Approaches: Food Security and Climate Action Through Soil and Water Conservation (INCAA) aimed at contributing to an innovation of CA by (1) assessing the benefits and adaptations of CA; (2)fostering joint learning and co-innovation around CA adaptation; (3) integrating institutional and individual dimensions into tools that assess the applicability of CA; (4) designing a learning process involving all stakeholders towards innovation of CA.
The CDR-BOKU team contributed to INCAA objectives 2, 3 and 4 by (1) extracting a solid concept of communicative action and transformative learning in natural resource management from the literature; (2) translating these insights into a learning process that was tested in Burkina Faso; (3) integrating the theoretical and empirical work on communicative action and transformative learning to submit a scientific publication; and 4), making the developed learning process available to a wider audience in the form of 3 instructional videos.

Currently, multi-stakeholder processes (MSPs) have become mainstream in development research and practice. While proponents argue that MSPs lead to more sustainable, legitimate and transparent decisions, MSPs are confronted with at least three challenges - the question of power, the paradox of initiating an MSP as an unbiased broker and the fact that MSPs may create artificial incentives for interaction. Few studies have attempted to critically analyse MSPs and build on theoretical considerations to design a learning process as part of MSPs. In contributing to INCAA, we referred to the Theory of Communicative Action and the Transformative Learning Theory to design such a process.

The learning process has six steps and starts with the exploration of the social, economic and ecological health of the farming system to assess whether CA could make a meaningful contribution to improve the livelihoods in the community.
In case of a positive outcome, we use stakeholder mapping to make roles and interests f different stakeholders explicit. Thirdly, the stakeholders jointly develop a timeline of agricultural change in the region and create non-scripted, non-edited videos of challenges in the farming system. The videos are then screened in a multi-stakeholder meeting to stimulate discourse, and a more rigorous assessment of the potential of CA is carried out using the Qualitative Expert Assessment Tool for Conservation Agriculture Adoption (QATOCA).The results of all exercises feed into a proposal for necessary change promotion if CA is to be pursued as a strategy for the farming system. Examples are expert promotion, process promotion, power promotion or relationship promotion.
The health assessment showed that the agroecosystem in Koumbia is under demographic, economic, and climatic stress. The stakeholder mapping established that important stakeholders had not been well integrated into project efforts in the past. The innovation timeline created a debate on drivers and constraints of Conservation Agriculture innovation. The participatory video production and screening were particularly effective in building process ownership and giving a

voice to all participants. The QAToCA framework integrated the lessons learned into an actionable format.
We conclude that the suggested learning process around CA is suitable to create multiple learning opportunities, contextualized meaning, and to stimulate dialogue in many contexts. It is not limited to CA or the agricultural sector.

Kurzfassung

Angesichts der Herausforderungen des Bevölkerungswachstums, veränderter Konsummuster und des Klimawandels wird davon ausgegangen, dass die landwirtschaftlichen Systeme in Afrika ihre Produktivität, Nachhaltigkeit und Resilienz erhöhen müssen. Conservation Agriculture (CA) ist ein Ansatz, der vielversprechende Ergebnisse bei der Verringerung der Bodendegradation und der Evaporation gezeigt hat und gleichzeitig zu Biodiversität beiträgt und die Klimavulnerabilität verringern soll. Allerdings erreichte CA in Afrika nicht das Stadium einer breit umgesetzten Innovation.
Das ERAfrica-Projekt INnovative Conservation Agriculture Approaches: Food Security and Climate Action Through Soil and Water Conservation (INCAA) hatte zum Ziel zu einer Innovation von CA beizutragen, indem es (1) den Nutzen und die Anpassungsfähigkeit von CA bewertet; (2) gemeinsames Lernen und Ko-Innovation fördert; (3) institutionelle und individuelle Dimensionen in Methoden zur Potentialbewertung integriert; (4) einen Lernprozess gestaltet, der alle Interessengruppen einer Innovation von CA einbezieht.
Das CDR-BOKU-Team trug zu den INCAA-Zielen 2, 3 und 4 bei, indem (1) aus der Literatur ein wissenschaftlich fundiertes Konzept erarbeitet wurde, um kommunikatives Handeln und transformatives Lernen zu ermöglichen; (2) diese Erkenntnisse in einen Lernprozess übersetzt wurden, der in Burkina Faso getestet wurde; (3) diese theoretischen und empirischen Erkenntnisse in einer wissenschaftlichen Publikation aufgearbeitet wurden; und 4) der entwickelte Lernprozess in 3 Lehrvideos einem größeren Publikum zugänglich gemacht wurde.

Multi-Stakeholder-Prozesse (MSP) haben sich in der Entwicklungsforschung und -praxis als Mainstream etabliert. Während Befürworter argumentieren, dass MSPs zu nachhaltigeren, legitimeren und transparenteren Entscheidungen führen, sind MSPs mit mindestens drei Herausforderungen konfrontiert - der Frage der Macht, dem Paradox der Initiierung eines MSP als unparteiischer Makler und der Tatsache, dass MSPs künstliche Anreize für Interaktion schaffen können. Nur wenige Studien haben versucht, MSPs kritisch zu analysieren und auf theoretischen Überlegungen aufzubauen, um einen Lernprozess als Teil von MSPs zu entwerfen. Für unseren Beitrag zu INCAA bezogen wir uns auf die Theorien des Kommunikativen Handelns und des Transformativen Lernens, um einen solchen Prozess zu entwerfen.

Der Lernprozess umfasst sechs Schritte und beginnt mit der Erforschung der sozialen, ökonomischen und ökologischen Gesundheit des Agrarökosystems. So kann beurteilt werden, ob CA einen sinnvollen Beitrag zur Verbesserung der Lebensgrundlagen in der Community leisten könnte. Im Falle eines positiven Ergebnisses nützen wir Stakeholder-Mapping, um Rollen und Interessen verschiedener Stakeholder explizit zu machen. Als dritten Schritt entwickeln die Stakeholder gemeinsam eine Timeline wichtiger Entwicklungen der vergangenen Jahre im Landwirtschaftssystem. Anschließend erstellen sie ungeskriptete, ungeschnittene Videos über gegenwärtige Herausforderungen, die in einem Multi-Stakeholder-Workshop gezeigt werden, um den offenen Austausch

anzuregen. Abschliessend wird das Potenzial von CA durch das Qualitative Expert Assessment Tool for Conservation Agriculture Adoption (QATOCA) strukturiert beurteilt. Die Ergebnisse aller Schritte fließen in einen Vorschlag für notwendige 'change promotion' ein, falls der Wunsch nach einer Veränderung des landwirtschaftlichen Systems besteht. Beispiele hierfür sind 'expert promotion', 'expert promotion', 'process promotion', 'power promotion' und 'relationship promotion'.

Das Erproben des Lernprozesses in Burkina Faso ergab, dass das Agrarökosystem unter demografischem, ökonomischem und klimatischem Stress steht. Das Stakeholdermapping zeigte, dass wichtige Stakeholder in der Vergangenheit nicht ausreichend in Projektbemühungen integriert waren. Die Timeline erzeugte eine Debatte über Faktoren, welche Veränderungen in der Landwirtschaft fördern oder ermöglichen. Participatory video war besonders effektiv, um Ownership aufzubauen und allen TeilnehmerInnen eine Stimme zu geben. Das QAToCA-Framework integrierte die gewonnenen Erkenntnisse in ein strukturiertes Format. Wir kommen zu dem Schluss, dass der vorgeschlagene Lernprozess rund um CA geeignet ist, vielfältige Lernmöglichkeiten, kontextualisiertes Wissen und Dialog zu schaffen. Das Potenzial des Lernprozesses ist nicht auf CA oder den Agrarsektor beschränkt.

1 Project achievements

Learning for innovation

The objective of the BOKU contribution to the INCAA project was to conceptualize, test and analyse a learning process that supports the innovation of CA in Sub-Sahara Africa.

The parental INCAA project had as its specific objectives to:

Four objectives

1. Assess the benefits and adaptations of CA in innovation systems around partner projects involving small-holder farmers.
2. Foster joint learning and co-innovation of approach tools/models that harness needs, capabilities and opportunities of stakeholders towards CA adaptation under diverse conditions.
3. Integrate institutional and individual dimensions into tools that assess the applicability of CA.
4. Building on tools in obj. 3, design a learning process involving all stakeholders towards innovation of CA as a strong basis for future transnational partnership.

The CDR-BOKU committed to three outputs:

Outputs

D5.1 Report on communicative action for innovation in natural resource management, proposing an institutional learning process.
D5.2 Production of min. three instructional videos on initiating, guiding and closing institutional learning processes.
D5.3 Publication on the designed institutional learning process for innovation.

All outputs were completed (see Table). The report on communicative action for innovation has been integrated into this report, but is available as a stand-alone document.

Achievements

Output	Level of achievement	Remarks
D5.1 Report on communicative action for innovation in natural resource management, proposing an institutional learning process.	Fully	Completed and shared April 2017.
D5.2 Production of min. three instructional videos on initiating, guiding and closing institutional learning processes.	Fully	Videos are available on Youtube and Facebook.
D5.3 Publication on the designed institutional learning process for innovation.	Fully	Manuscript submitted in December 2017 to the The Journal of Agricultural Education and Extension.

2 Approach and case

Conservation Agriculture in Sub-Sahara Africa

Conservation Agriculture (CA) has been promoted in Sub-Saharan Africa referring to different narratives of positive change - 1) soil and water conservation, 2) reducing input dependency, 3) increased food production, 4) climate change mitigation and 5) empowerment (Whitfield et al., 2015).

The basic principles of CA are no or minimum mechanical soil disturbance, maintenance of permanent soil cover, and diversification of crop rotations and associations (FAO, 2008).

The invention not innovated

However, and despite the substantial support of donors and development agencies, CA has not moved from the invention to the innovation stage in Sub-Sahara Africa. The common strategy to transfer the technology through training-of-trainer schemes from science to farm has been disappointing. Friedrich et al. (2012) estimated that the total area under CA in Africa is about 1% of the cultivated land. In Sub-Sahara Africa, CA has been taken up significantly only in South Africa, Zambia, Zimbabwe and Mozambique (Corbeels et al., 2015).

Constraints to adoption

Different constraints to a wider adoption of CA in Sub-Sahara Africa have been identified in the literature (Ndah et al., 2014, 2012). For example, in regions where livestock is an important means of saving, draft power or a source of income and food, there is usually a trade-off between the use of crop residues for CA or animal feed. Also, farmers may not be able to invest the additional labour (weeding), and inputs (herbicides) required to successfully implement CA (Giller et al., 2009). Moreover, Rusinamhodzi et al. (2011) showed that costs of converting to CA are immediate, whereas benefits and production may increase only gradually over several seasons. Particularly smallholder farmers are not ready to make such longer-term investments and are risk-adverse (Grabowski and Kerr, 2014). Also, improved production technologies may not be sufficient to have a substantial impact on livelihoods of resource poor households (Harris and Orr, 2014). Finally, the wider institutional and innovation system context may resist change or prevent the emerging practice of CA to reach a significant scale. For example, markets may not demand produce from CA farming, or dominant actors in the agricultural system (e.g. cotton processing and trading companies) may not support CA practices through their own extension strategies.

The challenge of measuring adoption

To complicate things further, it has proven difficult to specify what CA and its adoption mean in a given context - if a farmer is using two principles of CA, but only on parts of the land, and with project support, can we call this adoption (Andersson and D'Souza, 2014)?
The standard approach to elicit adoption figures is the household survey, which returns some characteristics of so-called adopters for econometric modelling. Such approaches cannot capture, however, the structural realities of agriculture as well as the more complex decision-making processes of farmers. Andersson and D'Souza (2014) therefore call for more systemic strategies that include the institutional, market and policy environment to improve our understanding of agricultural change in Sub-Sahara Africa. Investigations and interventions at different levels of the agro-food system will require context-specific research and learning methods.

Learning for innovation

There is growing evidence and consensus that change in agricultural practice is as much a social as a technological process. When change reaches a social scale, we can refer to an innovation - following Spielman and Senge, we define innovation as a social process of adapting and incorporating knowledge, driven or constrained by the needs, capabilities and opportunities of actors within a social system (based on: Senge, 1994; Spielman et al., 2011, 2009).
Multi-stakeholder processes are now standard interventions that build on this rationale - in its systemic approach, multi-stakeholder processes deviate from the conventional model of "technology supply push" (Faysse, 2006; Röling, 2009). In the current paradigm of innovation systems (World Bank 2006), it is assumed that the pure supply of technology to different contexts has hindered "the recognition of the role of enabling institutions and the positive contribution of indigenous knowledge" (Hounkounnou et al. 2012). Also in the field of CA, there have been calls for aligning interventions with local innovation networks that foster dynamic interactions and synergies (Corbeels et al., 2014).
Our objective was to conceptualize, test and analyse a learning process that supports the innovation of CA in Sub-Sahara Africa. We outline theoretical considerations behind multi-stakeholder processes and translate these considerations into a learning process that reflects current insights in learning theory and practice. We then report insights from testing the approach in Burkina Faso.

3 Theoretical foundations

Innovation systems and multi-stakeholder processes

Recent concepts of change and innovation assume a non-linear learning process characterized by the constant exchange of knowledge from multiple sources (Friederichsen et al., 2013; Hermans et al., 2013; Klerkx et al., 2012; Spielman et al., 2011). The system that hosts and undergoes this change process is the "innovation system" (Hall et al., 2010). It consists of actors (e.g. researchers, farmers, policy makers), their interaction in learning processes and of institutions (e.g. rules, norms, land tenure arrangements). We followed the approach of innovation systems to frame the INCAA project.

Bringing together innovation system actors in multi-stakeholder processes (MSPs) to facilitate change and learning have become mainstream in development practice, also in natural resource management (Adekunle et al., 2010; Faysse, 2006; Kefasi et al., 2011; Pali and Swaans, 2013). The approach is neither limited to so-called development countries nor specific fields – documentation of geographically and thematically global use is growing. (Amdam, 2010; Häring et al., 2009; Søreide and Truex, 2013; Sparrevik et al., 2011). Thus, multi-stakeholder processes can be seen as a widely-legitimized approach to further the innovation of CA in Sub-Sahara Africa as proposed by INCAA.

While practical guidelines on how to set up and run multi-stakeholder processes for development are available (for example Pali and Swaans, 2013; Tenywa et al., 2011) theoretically guided reflection is still limited, in particular regarding the learning processes that MSPs hope to host.

Three challenges in Multi-Stakeholder Processes

Moreover, in practice MSPs encounter at least three key challenges - the question of power, the paradox of starting an MSP as an unbiased broker and the fact that MSPs create artificial incentives for interaction.

Power

Faysse (2006) had already predicted "troubles on the way" if power relations in MSPs are ignored in discourse and application. Martin and Rutagarama (2012) extend this concern when they point to the undue trust put into the process of reasoning in separation from power. The tendency to cover conflict with technical terminology can, for example, be observed in Hermans et al. (2013): their study looks at "the distribution of roles and functions" in innovation systems – but does not question how these are linked to inequalities and interests among stakeholders. While they study a Dutch innovation system, we may even be more troubled about how power and the capacity to participate meaningfully affect MSPs in typical development projects.

The paradox of initiating

Secondly, practical guides do not reflect that initiating a communication process in development cannot come without self-interest; though the initiator should be an honest, independent facilitator of innovation processes. The act of "opening […] communicative space is necessarily paradoxical" (Wicks and Reason, 2009), as the implicit superiority of the initiator is theoretically unavoidable (Habermas, 1973).

Artifical incentives

Thirdly, MSPs are often "aid-driven" (Søreide and Truex, 2013) and thus create a "temporary bubble" (Martin and Rutagarama, 2012) that may vanish when the initiating actor pulls out. Jacobson and Storey (2004) contend that participating in a multi-stakeholder process may well be based on strategic interests, without the genuine will to adapt positions through deliberation.

Theory of Communicative Action

MSPs, according to their proponents, lead to more sustainable, legitimate and transparent decisions (Amdam, 2010; Hemmati, 2002). Only few studies have attempted to understand the process and outcome of multi-stakeholder interventions beyond impact figures and evaluation. When doing so, Habermas' Theory of Communicative Action has proven to be a useful theoretical approach (Amdam, 2010; Chang and Jacobson, 2010; Fast, 2013; Mahon et al., 2010;

The counter-factual extremes of strategic and communicative action are key concepts of Habermas' Theory of Communicative Action. Strategic action is ends-oriented and can take open (orders, imperatives) or concealed forms (manipulation). In contrast, communicative action requires a discourse that (1) includes all stakeholders without exception; (2) "guarantees all participants equal opportunity to contribute to argumentation"; and (3), establishes rules

that ensure the right to (1) and (2) (Habermas, 1990). While the foundations of the theory have attracted substantial criticism, and fully communicative action will not be encountered in the social wild, the theory does guide the design of an institutional learning process for the innovation of CA. Such a process should thus operationalize the principles of communicative action, keep in mind the mentioned challenges of MSPs, and use recent insights in learning theory and practice.

4 Multi-stakeholder learning process

The suggested learning process has six steps and is based on principles of transformative learning, communicative action and the established Qualitative Expert Assessment Tool for Conservation Agriculture Adoption (QATOCA).

The six steps of the learning process

The starting point is an exploration of the agro-ecosystem health of the farming system. By exploring the social, economic and ecological characteristics of the system, we can make a general conclusion whether CA practices could work in the farming system, given the ecological, social and economic realitites.
Second, we use participatory stakeholder mapping to make the roles, values, interests, and capabilities of the different stakeholders explicit.
Third, and if CA has already been introduced to the farming community, the stakeholders jointly work on a timeline to identify key events, drivers and constraints of the innovation process. Then, to support individual but shared experience, dialogue and different ways of learning, the stakeholders together create non-scripted, non-edited videos of their perspectives on challenges in the farming system.
The videos are then screened in a multi-stakeholder meeting to stimulate the discussion on the innovation potential of CA. This discussion is structured by the established Qualitative Expert Assessment Tool for Conservation Agriculture Adoption (QATOCA). QATOCA is a comprehensive exercise to determine the likelihood that some form of CA is implemented in a given context. The results of all exercises feed into a proposal for necessary change promotion if CA is to be pursued as a strategy for the farming system. Examples are expert promotion, process promotion, power promotion or relationship promotion. The elements of the learning process are summarized in Figure 1.

Step 1
Agroecosystem health exploration

To get a quick, comprehensive overview of the agroecosytem we use dimensions of the framework of agroecosystem health (AESH). AESH overlaps with concepts of sustainability, as it looks at ecological, economic and social dimensions of the farming system. However, 'health' as a description of a systemic state has the advantage that it is not biased towards ecological thinking. Farming communities in healthy agroecosystems are able to address emerging challenges such as climate change or other higher level trends (Altieri and Koohafkan, 2008; Vignola et al., 2015; Wezel et al., 2014; Zhu et al., 2012).
In developing a guide for exploring the ecological, economic and social dimensions of the farming system we relied on earlier work on assessing the

status of farm systems (Bockstaller et al., 2009; Cabell and Oelofse, 2012; Friis-Hansen, 2008; López-Ridaura et al., 2000; Sadok et al., 2009; Van Der Werf and Petit, 2002).
A possible method to gather the necessary information is through key-informant interviews and meetings with local stakeholders.

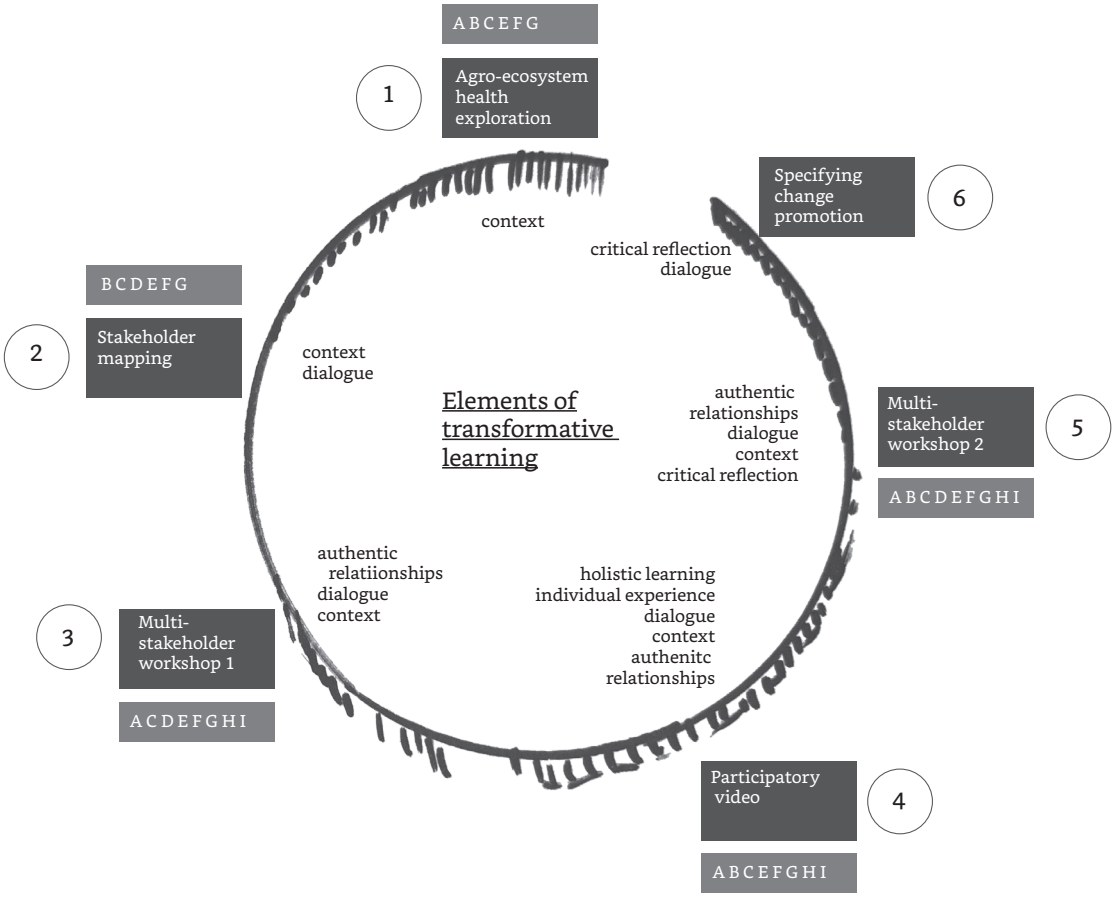

Figure 1 Steps of the suggested learning process. Elements of transformative learning in the center, letters indicate elements of QAToCA addressed in each step

QAToCA: **A** - CA vs. conventional form of agricultural practice; **B** - Farm and household characteristics; **C** - Capacity of implementing/ promoting institution(s); **D** - Attributes of dissemination (diffusion) strategy; **E** - Political/Institutional framework/VillLev; **F** - Political/Institutional framework/RegLev; **G** - CA products and inputs market conditions (Adoption Context); **H** - Perception of community towards CA (Subject of adoption); **I** - Knowledge of CA's role on climate change and other ecological benefits

(Source: Probst et al. 2018, forthcoming)

Step 2
Stakeholder mapping

We conducted a simplified, participatory innovation system mapping exercise to identify those who have a stake in agricultural practices and decision making in the agroecosystem (Schiffer and Hauck, 2010). A first round of this mapping can be conducted in combination with the AESH assessment - this will allow to integrate the relevant actors to the subsequent steps of the learning process (multi-stakeholder workshops, participatory video). A second round of mapping should be conducted as part of the first multi-stakehoder workshop, to validate the results and to initiate a discussion about the interests, values and capabilities of different actors. Making the roles of different actors explicit, and appreciating their needs and roles will help to set in motion social learning.

Step 3
Multi-stakeholder workshop 1

The next element of the learning process is a first meeting of the stakeholders identified through the innovation system mapping. The workshop is intended to create trust and rules for a truthful deliberation, to clarify the objectives of the process, and to make the role and interests of the initiators transparent.
In terms of content, the workshop explores the institutional framework of the agricultural system in the region. If CA has been introduced earlier to the community, a timeline exercise is helpful to structure the discussion and to identify events, drivers and constraints of an innovation of CA. Here, the possibly diverging perspective of the different stakeholders is of particular interest.

Step 4
Participatory video

As a next step of the learning process, mixed stakeholder groups jointly explore the social, ecological and economic challenges in the comunity using participatory video. A particular focus of the videos are reasons for change in agricultural practice and on the relation of challenges and Conservation Agriculture. The participants are briefed on the video exercise and provided with cameras - the videos are non-scripted and non-edited.
We used the videos in the final stage of the learning process to create a rich picture of the innovation system around CA. The main function of the videos is their transformative potential - using the videos gives the opportunity to gain individual experience, initiate dialogue between actors and critically reflect the assumptions different actors have about each other. The joint production of the video further grounds the learning process in the local context and includes different elements to facilitate holistic learning.

Step 5
Multi-stakeholder workshop 1

The second multi-stakeholder workshop brings together all actors and integrates the earlier steps of the process.
First, the videos produced earlier are screened – the screening triggers a discussion on the social, ecological and economic realities of the farming system and if CA has been implemented, on CA practices. The discussion illustrates vividly the potential of CA to address challenges in the farming system, and possible weaknesses of the approach. These insights, in combination with the earlier gathered information, feeds directly into the second activity of the workshop – the QAToCA exercise (Ndah et al., 2014). The updated QAToCA 2.0 is a structured assessment of factors that influence the potential of CA in a given region. The results help to see the potential of CA in a clear and graphic output, covering nine distinct aspects of enquiry (Table) – each aspect scale comprises a set of items. The results, beyond their value for decision making, are then critically reflected on in the multi-stakeholder group.

QAToCA

Table	Aspects of the QAToCA assessment
A	CA as an Object of Adoption
B	Characteristic attributes of CA as an object of adoption
C	Capacity of implementing institution (CapacityofImplInstVillRegLev)
D	Attributes of dissemination strategy (AttrOfDissemStraVillRegLev)
E	Political/Institutional framework on Regional Level (PolInstFramRegLev)
F	Political/Institutional framework on Village Level (PolInstFramVillLev)
G	CA products & inputs Market conditions (ProInpMarkCondVillRegLev)
H	Perception of community towards CA (PercepCommVillRegLev)
I	Knowledge of CA's role on climate change and other ecological benefits

The workshop closes with a summary of the lessons learned, a feedback on the learning process and a reflection on whether CA is an option that should be further pursued in the given context. This reflection informs the formulation of change promotion options.

Step 6
Specifying change promotion

If CA is considered a strategy that should either be introduced or further innovated in the context analysed, we propose to specify which change promotion would be necessary to do so. This will help to facilitate a possible follow-up of the learning process. In the transition literature, individuals, organisations or groups who pioneer new ways of practice are referred to as agents of change (Kristof, 2010). Expert promotion further develops the systematic knowledge about an issue – scientific research on CA would be an example. Process promoters link systematic knowledge to a systemic agro-ecological process – for example, NGOs that promote CA practices. Power promoters have leverage in policy dimensions and can take a change to scale – for instance by legitimizing CA practices through integration in agricultural policies. Relationship promoters are key to create networks and support the other actors in interaction processes – for example by linking actors with whom they have trustful relationships.

5 Testing the learning process in Koumbia

Koumbia, Burkina Faso

In May 2016, we tested the approach in the community of Koumbia in Western Burkina Faso. Koumbia is located in Tuy province and an area of cultural diversity. The main ethnic groups are Bwaba, Mossi and Fula. The different groups have historically different livelihood strategies (eg. farming, pastoralism) - through adaptation and integration, these lines have become blurred over the past several years. CA was introduced around 2013 by the project 'Agro-ecology Based Aggradation - Conservation Agriculture' (ABACO). Cotton remains the main cash crop, and maize is the main staple crop. The soils are characterized by low organic matter and the rainfall patterns have become increasingly erratic. CA was consiered a possible approach to improve agricultural livelihoods in Koumbia.

Study site

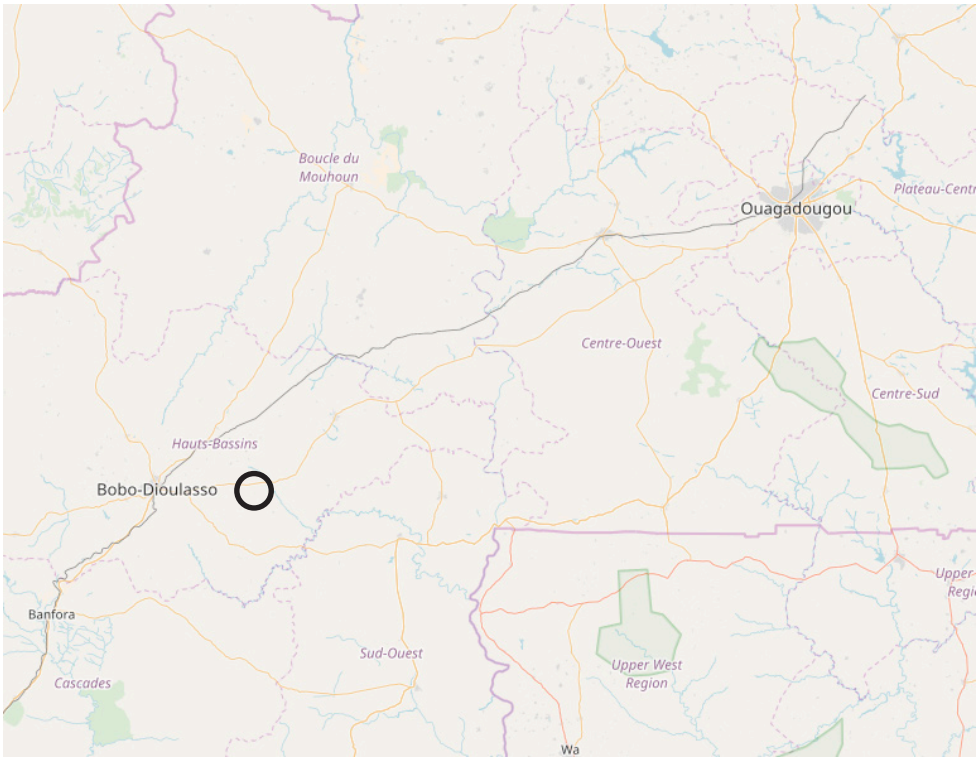

Figure. Study site in Koumbia, Burkina Faso. Openstreetmap data.

Agriculture in Koumbia

Figure. A typical field in Koumbia. Photo: Schuler.

The learning process was efficient and effective in creating multiple learning opportunities, contextualized meaning, and dialogue. Particularly the elements of the process that required the participants to collaborate across typical hierarchies led to moments of discourse that we believe qualified as communicative action. Using the results of the different steps of the process, we facilitated the QAToCA exercise in the final joint workshop.

Stakeholder mapping

Figure. Participatory stakeholder mapping during Workshop 1 in Koumbia. Photo: Probst

Participatory video

Figure. Video stills of movies produced by workshop participants - ecological, economic and social group.

QAToCA results

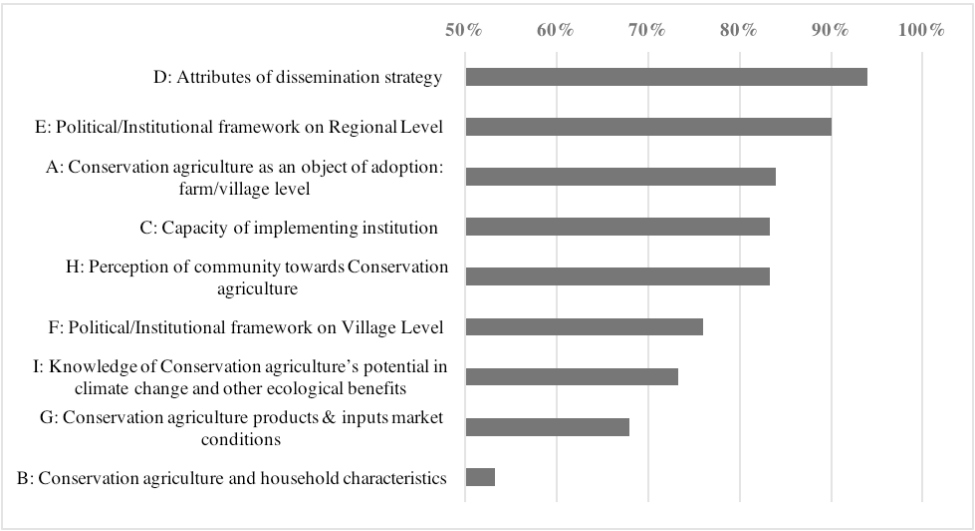

Figure. Results of the QAToCA exercise in Koumbia, Burkina Faso.

Based on all learning insights, we concluded the process with drafting the necessary change promotion if Conservation Agriculture is to reach innovation stage in Koumbia. Specifically, we see a need for:

Expert promotion (systematic knowledge)
- Integration of cotton in CA
- Development of multiple combinations and options of CA cropping strategies that work
- Solve adverse effects of CA (attraction of pests and snakes)

Process promotion (linking systematic knowledge and social processes)
- Long-term, tailored learning interventions integrating different stakeholders
- Facilitate adaptation of CA to needs and opportunities of communities (e.g. Fula)

Power promotion (Creating leverage in policy dimensions)
- Strengthening by-laws on grazing and land titles
- Lobbying with dominant socio-economic actors (cotton…)

Relationship promotion: creating networks and supporting the other actors in interaction
- Better link actors who have a stake in agriculture in the region (e.g. policy, farmers, cotton industry)
- Promote approaches of joint learning

6 Outputs and relevance

The BOKU team achieved the following outputs fulfilling and going beyond the set objectives:

Title	Type	Availability	BOKU role
INCAA - INnovative Conservation Agriculture Approaches: Food Security and Climate Action through Soil and Water Conservation	Conference contribution Tropentag 2015	This report	Contributor
Institutional learning is critical for Conservation Agriculture innovation: Evidence from Iran, Uganda and Burkina Faso	Conference contribution Tropentag 2016	This report	Lead
Communicative action for an innovation of Conservation Agriculture. Proposal for a transformative learning process	Project deliverable	Upon request	Lead
From Adoption Potential to Transformative Learning Around Conservation Agriculture in Burkina Faso	Conference contribution Tropentag 2017	This report	Lead

Feeding the soil AND feeding the cow – Conservation Agriculture in Kenya	Conference contribution Tropentag 2017	This report	Contributor
How to start a multi-stakeholder learning process?	Video	https://youtu.be/urCUD-spH61c facebook.com/CentreforDevelopmentResearch	Author & producer
Elements of a multi-stakeholder learning process	Video	https://youtu.be/1VqfASh-KVd8 facebook.com/CentreforDevelopmentResearch	Author & producer
What do we need to promote change in agricultural practice?	Video	https://youtu.be/s9HpdKx-tYmM facebook.com/CentreforDevelopmentResearch	Author & producer
From Adoption Potential to Transformative Learning around Conservation Agriculture	Scientific article	Submitted to the International Journal of Agricultural Education and Extension in December 2017	Lead

Relevance for KEF priorities

The INCAA project, including the BOKU contributions, resonate with SDGs particularly regarding the sustainable development of food systems.
The outputs contribute to a critical but constructive discourse on the way knowledge in agricultural development is produced and used. The work undertaken relates to SDG 1 (No Poverty), 2 (Zero Hunger), 3 (Good Health and Well-being), 12 (Responsible Consumption and Production), 13 (Climate Action), 15 (Life on Land), and 17 (Partnerships for the Goals).

TROPENTAG 2015
Management of land use systems for enhanced food security – conflicts, controversies and resolutions
September 16 - 18, 2015, Humboldt-Universität zu Berlin, Germany

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INCAA - INnovative Conservation Agriculture Approaches:

Food Security and Climate Action through Soil and Water Conservation

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Background

Conservation Agriculture (CA) is promoted in Africa

- to increase food production on the basis of more sustainable farming practices,
- to address the problems of soil degradation resulting from agricultural practices (e.g. organic matter, nutrient content),
- To increase crop yields and lower production costs.

Yet, success with adopting CA on farms in Africa has been limited.

CA field preparation with ripper; Kalalu, Kenya

Objectives

- to mentor and analyse a trans-disciplinary learning process that supports innovation of CA in **Kenya** and **Burkina Faso,**
- to assess the benefits and adaptations of CA in innovation systems around partner projects involving smallholder farmers,
- to integrate institutional and individual dimensions into tools that assess the applicability of CA,
- to design a learning process involving all stakeholders towards innovation of CA as a strong basis for future transnational partnership.

Left: CA farmer with hand rippers; Right: animal drawn direct seeder

Reported constraints for adoption

- Lack of information, education and training
- Economic factors rank far ahead of other considerations
- Hindrances by government legislation, incentives and subsidies
- Using crop residues for soil cover or as feed for cattle in arid regions
- Poor physical access and affordability of CA services (e.g. for direct seeding; cover crop seeds; herbicides applications)
- Farmers are not adequately involved in the development of new technologies
- **Gender related obstacles for women**

Discussions with CA farmers in Laikipia district, Kenya

Preliminary results from Kenya

Qualitative interviews in Laikipia county among farmers:

- Farmer field schools often mainly attended by women.
- Women practising CA are considered “lazy farmers”.
- Only ploughing means “real farming”.
- Rather strict gender division between social or professional activities - “We only go to church together”.
- Decision-making regarding the adoption of CA is ultimately validated by men.
- Men are largely in control of cash.
- Livestock raising and milk selling represent important sources of income.
- Farm residues are perceived as important to sustain this income.

Outlook

- Based on field studies in Kenya and Burkina Faso new insights on adoption obstacles will be generated.
- Analyze institutional influence on CA adoption.
- Compare Kenyan experience to Burkina Faso.

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Institutional learning is critical for Conservation Agriculture innovation: Evidence from Iran, Uganda and Burkina Faso

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Introduction

Conservation agriculture (CA) has been proposed as a strategy of sustainable intensification that can mitigate the effects of climate change and reverse land degradation (CTFCSA, 2010).

It has been introduced in a variety of countries spanning different agro-ecological zones such as Iran, Uganda, and Burkina Faso.

In Iran, Government interventions have promoted conservation agriculture for sustainable management of soil and water. The intervention is aimed at reducing the cost of production and increasing productivity in dry and irrigated land. In Uganda and Burkina Faso, although in line with governmental policies, conservation agriculture has been promoted mainly by NGOs, development partners and research for development organizations.

Despite differences in agro-ecological, social and economic environment, the adoption record of conservation agriculture remains weak (Andersson and D'Souza, 2014). Much of earlier research and projects on conservation agriculture have targeted adoption barriers at a farm level (Corbeels et al., 2014). Schut et al. (2016), however, found that barriers for innovating agricultural systems are mainly economic and institutional.

We thus hypothesize that underlying institutional patterns, interests of different stakeholders and systemic constraints are critical for the innovation of conservation agriculture. We contrast preliminary findings from case studies in Iran, Uganda, and Burkina Faso to explore this hypothesis. Our methods included literature review, key informant interviews, and stakeholder mapping.

Iran

The Iranian government has devoted substantial efforts to promote CA - however, the uptake of CA in Iran has not been rapid and extensive. According to the Ministry of Agricultural Jihad (2016), CA is currently practiced on 1.5 M ha, representing 5% of arable land in Iran.

Figure 1 No-till farming in Kermanshah Province, Iran. (Photo: Latifi)

The results from the key informant interviews show that CA innovation in Iran is not sufficiently embedded in the complex social, economic and political system around agriculture. The process is dominated by government institutions.

A first step to creating an enabling environment would be to make existing linkages and interactions among stakeholders explicit to identify the relevant actors. Then, more effort should be put into designing the institutional learning processes necessary for a sustainable intensification of agriculture in Iran.

The subject of ongoing research is how best to initiate and facilitate the interaction of innovative farmers, advisors, researchers, machinery manufacturers, input suppliers, NGOs, the private sector, and government officials.

Burkina Faso

We explored CA practices in Koumbia, Western Burkina Faso. Our results show that the CA interventions had not paid sufficient attention to socio-economic dynamics.

For example, the most powerful actor in local agriculture, the state-owned cotton company, was not integrated into projects. The agronomic practices promoted by this company are compulsory for contracted farmers and are readily applied also to food crop plots. Secondly, pastoralists from Northern regions are migrating to the region, exacerbating the existing competition of livestock for crop residues. Finally, ploughing and tractor ownership are core aspects of the farmers' identity and status. To promote zero-tillage, an intervention would have to address explicitly the need for changing self-conception.

We concluded that future interventions will need to identify all relevant stakeholders and create space for an open deliberation of challenges and solutions. Since CA may not be ideal for the local context, this process would need to allow for a long-term exploration of several alternative practices.

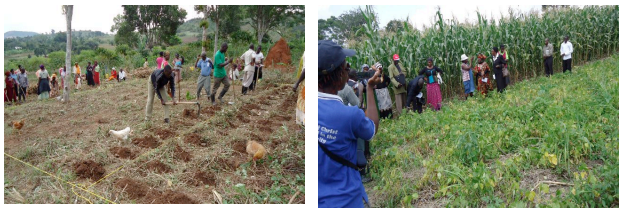
Figure 2 A plot for visitors and a plot for production in Koumbia. (Photos: Probst)

Uganda

The country has the targets of achieving 250,000 hectares of land under CA by 2016 and 1,000,000 farmers practicing CA by 2025. CA is being promoted through projects of stakeholders such as the UNDP, World Bank, faith groups and NGOs. Some of these projects have been going on since the year 2000.

However, the underlying institutional problem of poor coordination between several autonomous agencies jeopardizes the farmers' trust in CA interventions. Smallholders rather stick to known methods than invest into a technology that demands unaffordable inputs and entails unknown risks. Besides, there are many challenges related to CA that have not been answered: hard pans, weeds, credit access, social and cultural contexts in scaling out CA. This raises the questions whether the current rate of adoption is not mainly an effect of project incentives, and how a lasting transition could be achieved.

Future work should concentrate on ways to promote agricultural education and effective agricultural support in the policy discourse. Agencies need to be coordinated to increase efficiency in operations, provide linkages and accountability among powerhouses. Lastly, reforming land tenure would encourage farmers to invest in their land.



Figures 3 & 4 Training famers on CA in maize and field visits in Uganda (Photos: Kaweesa)

Outlook

Considering our results, we propose the following questions for future research:

- How can we initiate and facilitate a multi-stakeholder process in agricultural development with open outcomes?
- What are useful learning tools to make challenges and realities of stakeholders explicit?
- What alternative approaches can replace the short-term project interventions?

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"Future Agriculture:
Socio-ecological transitions and bio-cultural shifts"

From Adoption Potential to Transformative Learning Around Conservation Agriculture in Burkina Faso

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Abstract

Despite the substantial support of donors and development agencies, Conservation Agriculture (CA) has not moved from an invention to an innovation stage in Sub-Saharan Africa. The results of the common strategy to transfer the technology from science through donors to farms in a top down manner have been disappointing (with Burkina Faso being a typical case). To make things worse, assessing the actual levels of adoption has been problematic due to the biases and weaknesses of the applied methods - including the Qualitative expert Assessment Tool for CA adoption in Africa (QAToCA). However, to promote sustainable farming pathways such as CA, we still see a need for methods that help to understand and foster transitions in agricultural practices. The purpose of this work is thus to design an approach that combines current insights in learning theory and practice. The starting point of the process is an assessment of the agro-ecosystem health of the farming system of interest, by exploring the social, economic and ecological characteristics of the system. Second, to create space for social learning, we apply participatory stakeholder mapping to make the roles, values, interests, and capabilities of the different stakeholders explicit. Third, the stakeholders jointly work on a historical timeline of CA promotion to identify key events, drivers and constraints of the innovation process. Then, to support individual experience, dialogue and different ways of learning, the stakeholders together create non-scripted, non-edited videos of their perspectives on challenges in the farming system. These videos are then screened in a multi-stakeholder meeting to stimulate the discussion on the innovation potential of CA. Discussions are structured by the framework of QAToCA. The results of all exercises feed into a proposal for an improved promotion of CA. We tested the approach in a farming community in Koumbia, Burkina Faso. The described learning elements helped to moderate the expert bias and rigidity of QAToCA. As a learning outcome, the results underlined that CA uptake will depend on the adaptation to the local conditions (e.g. competition over crop residue exacerbated by free-grazing) in order become a viable agricultural system.

Keywords: Adoption, conservation agriculture, participatory video, transformative learning

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Feeding the soil AND feeding the cow – Conservation Agriculture in Kenya

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Problem

The implementation of Conservation Agriculture (CA) in Sub-Saharan Africa is still lagging:

- Main obstacle: the priority given to using crop residues as livestock feed rather than mulching material.
- In this way the CA approach will not reach its full potential - particularly in countries with a limited biomass production due to climatic conditions.

Livestock competition for biomass (photo: H.T. Ndah)

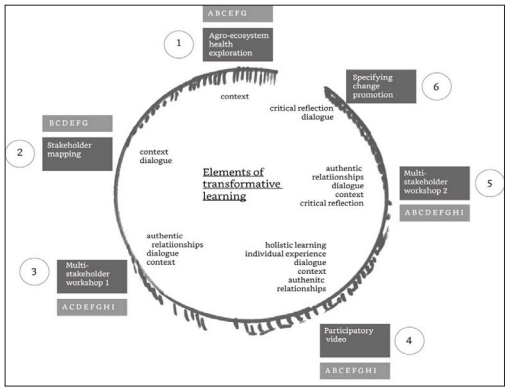
CA field with pigeon peas and Maize mulch (photo: H.T. Ndah)

Specific objectives

- To identify pathways for enabling an implementation of CA that is not in conflict with other goals of farmers' livelihoods, esp. livestock farming
- To analyze socio-economic factors that determine the adoption of combined CA-livestock systems

Methods

- A transformative learning approach with farmers and other stakeholders in Laikipia County (Kenya):



Conclusions

- Importance of an enabling environment provided by government programs which support long-term extension efforts combined with farmers' willingness to jointly learn towards a more sustainable agriculture.
- On farms where both systems (CA and conventional) are practiced, women play an important role by experimenting with CA practices, thereby realizing promising results in terms of yield and drought resilience.
- Furthermore, our findings underline the need for a long-term monitoring of innovation processes which is often not possible within short-term research projects and promotion programs.

Results

- **Challenges** to CA adoption:
  - competition for fodder,
  - a lack of financial resources to get started with CA,
- There are **knowledge gaps** on:
  - proper application of CA equipment,
  - the fodder production and conservation options and,
  - sustainable crop-livestock production systems.
- Farmers feel partly disconnected from existing governmental support.
- **Solutions** which enable feeding the soil "and" feeding the cow:
  - Some farmers have started to grow forages in order to reduce dependence on crop residues as a feeding source which had not been promoted during past extension projects.

Farmer workshop (photo: H.T. Ndah)

Outlook

- Further research on trade-offs between CA and livestock is needed.
- To develop forage and livestock systems that fit into CA systems.
- To improve knowledge sharing at all levels from training of extension officers to training of farmers.

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From Adoption Potential to Transformative Learning around Conservation Agriculture

Abstract

Purpose: To develop a conceptually and methodologically sound transformative learning process around the innovation potential of technologies such as Conservation Agriculture.

Design/methodology/approach: We translated theoretical considerations behind multi-stakeholder approaches and transformative learning into a process structured by the Qualitative Expert Assessment Tool for Conservation Agriculture Adoption in Africa (QAToCA). Elements of the learning process are: agroecosystem health exploration, stakeholder mapping, innovation timeline, participatory video, the QAToCA exercise, and specifying future change promotion. We tested this approach in Koumbia, Burkina Faso.

Findings: The agroecosystem in Koumbia is under demographic, economic, and climatic pressure. Conservation Agriculture, despite its agronomic potential, has not been able to integrate with socio-economic realities and has not reached an innovation stage.

The designed learning process benefitted from the application of communicative action and transformative learning. The exploration of agroecosystem health and relevant stakeholders provided comprehensive insights. The innovation timeline triggered a debate on drivers and constraints of Conservation Agriculture innovation. The participatory video production and screening created process ownership and gave a strong voice to participants. The QAToCA framework integrated the lessons learned into an actionable format.

Practical implications: The designed process can be applied to create multiple learning opportunities, contextualized meaning, and to stimulate dialogue.

Theoretical implications: The relevance of learning and communicative action theories for agricultural innovation is underlined. In turn, cases from agricultural innovation can inform the refinement of such theories.

Originality: Few studies have attempted to design and test learning processes on agricultural innovation based on theories of learning and communicative action.

Keywords: Conservation Agriculture; innovation; Transformative learning; participatory video; change promotion.

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