

Exploring the Potential of Developmental Work Research and Change Laboratory to Support Sustainability Transformations: A Case Study of Organic Agriculture in Zimbabwe

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Exploring the potential of developmental work research and change laboratory to support sustainability transformations: The Zimbabwe organic agriculture case study

1. INTRODUCTION

1.1 The need for sustainability transformation

This study discusses how organic agriculture farmers are working with content specialists from several disciplines and a farmer innovator as a citizen scientist to co-define and reframe the complex and tackle interconnected association-based agricultural production and marketing issues in an intervention research process. The study intends to identify how transitions to sustainability may be facilitated using formative intervention research and establish where it needs enrichment. As a form of sustainable agriculture or agroecology, organic farming was developed in response sustainability challenges of conventional agriculture, which are ecological, economic and socio-political. Bellamy and Ioris (2017, p. 1) identify the challenges as *“Soil degradation, water contamination, groundwater depletion, deforestation and land cover change, health effects of exposure to pesticides, biodiversity loss ... the distribution of power and wealth within the current agri-food system among large retailers and multinational companies enables them to promote a system that works mainly for a few at the top.”* Organic agriculture is an agricultural approach that seeks to sustain and enhance the health of the people and the planet for the benefit of current and future generations; emulate healthy ecological systems and cycles and use energy and other production resources efficiently; and ensure fairness, equity, respect, justice among actors in the agri-food system (IFOAM, 2005).

Sustainability challenges, which are being experienced at different scales across the world, are not limited to agriculture. UNESCO (2016) says the challenges have been caused by current models of economic growth, human actions and habits that have overstretched the earth's finite resources and support systems. Consequently, the 2030 Agenda for Sustainable Development, which developed and unites 17 development and environmental goals in a value-based framework *“emphasizes environmental sustainability issues, the need to transform*

consumption and production to restore balance to life on land and in water, and the need for urgent action on climate change. Furthermore, environmental sustainability is clearly intertwined with social and economic sustainability,” (UNESCO, 2016, p. 18). Globally, Wals (2012) identifies sustainability issues of biodiversity, water, food, energy, poverty and governance and suggests that they should be tackled through multistakeholder platforms and more holistic and integrated approaches. In southern Africa, Mukute, Marange, Masara, Pesanayi and Lotz-Sisitka (2012) identify sustainability challenges as: limited political and fiscal support, poverty and economic decline, environmental degradation and climate change, low inter-sectoral and multistakeholder collaboration, inadequate capacity to integrate and mainstream sustainability education. In Zimbabwe, where the economy and livelihoods are dependent on agriculture and natural resources, climate change has been negatively impacting on agriculture, biodiversity, water, human and human settlements (Ministry of Environment, Water and Climate, 2016). Zimbabwe is already becoming warmer and drier, experiencing unreliable rainfall and shorter lengths of growing periods (LGPs) (Mugandani, Wuta, Makarau & Chipindu, 2012), which undermine rural livelihoods and the national economy. Consequently, Zimbabwe has committed itself to promote climate smart agricultural practices, building resilience and agricultural losses from climate-induced risks such as droughts, improving water and catchment management and cross-sectoral collaboration, capacity development, research, education and training.

1.2 The potential of CHAT-informed methodology and method to help frame and address sustainability challenges

While the sustainability issues and the need for transformations to sustainability are clear, the processes of bringing about the desired change remains elusive as current ones are inadequate (Brown, 2010). This has also been the case with current methods of promoting sustainable agricultural practices such as organic agriculture and agroecology, also understood as the science, practice, and movement of sustainable agriculture (Anderson, Pimbert & Kiss et al. 2015). Agroecology breaks disciplinary boundaries and provides a dynamic opportunity for transdisciplinary innovation that draws on different knowledge systems and also calls for

embracing uncertainty in knowledge claims. It faces questions of how scientific knowledge could be politicised and democratised and be combined with participatory farmer-led knowledge and bottom-up research on one hand, and how to guard against its appropriation into mainstream neoliberal discourse (Bellamy and Ioris, 2017). Developing agroecology requires dialogue and action learning among smallholder farmers, the research community and other actors. The challenge is that current methods have tended to either focus on bottom-up or top-down approaches but what appears necessary is the need to acknowledge and share existing knowledge that has been developed over generations, while at the same co-developing solutions to new and emerging problems. Cultural Historical Activity Theory's (CHAT) dialectical foundation enables the grasping and resolving of contradictions between top-down and bottom-up learning, and the collective generation of new knowledge (Mukute, 2015). This can be achieved through CHAT-informed developmental work research (DWR) methodology and change laboratory (CL) method. DWR is a formative intervention methodology through which expansive learning takes place to produce future-oriented possibility, and actionable knowledge based on the acquisition of culturally accumulated knowledge and experience, and the learning of what is not yet there (Engeström, 2016). CLs are a place and process where joint problem analysis and solution development and refinement is done by practitioners on their own or with support from content specialists, guided by a developmental work researcher (Virkkunen & Newnham, 2013). Save DWR and CL-based studies on sustainable agriculture have shown potential to stimulate transformative learning and agency in sustainable agricultural contexts (Seppänen, 2004; Mukute, 2013; Mukute & Lotz-Sisitka, 2012; (Lotz-Sisitka, Mukute, Chikunda, Baloi & Pesanayi, 2017).

Engeström (2001) identifies the following CHAT principles, which also underpin transformative learning and agency development in DWR and CLs:

- The *prime unit of analysis* is a collective, artefact-mediated and object-oriented activity system seen in its network relation to other activity systems,
- Activity systems are multi-voiced and are a nexus of many points of view, traditions and interests,

- Activity systems take shape and are developed over long periods of time and should be analysed in terms of local history of the activity, its objects and outcomes as well as in terms of the genealogy of conceptual tools that have shaped it over time,
- *Contradictions are potential sources of change and development and consist of historically accumulated structural tensions* between and within systems, and
- Activity systems get qualitatively changed over long cycles of transformations when the object and the motive of an activity are reconceptualised and include a wider horizon of possibilities than of the previous activity.

When dealing with complex issues, the basic CHAT's basic unit of analysis is an object-oriented, collective activity system, that is, a "relatively durable formation that consists of actors working on a shared object, mediated by instruments, division of labour and rules" (Sannino & Engeström, 2017, p. 81). An activity is a practice, such as agriculture or learning, which produces something with societal value. A learning activity can be conducted in different work practices, and is intermediate activity that lies between science and work activities towards generating new solutions and/or models of a practice (Virkkunen, 2005). Engeström (1987, 1999) describes an expansive learning activity as one in which actors jointly establish root causes to problems in their current practice and then transform it qualitatively to overcome the challenge or the threat of a crisis through taking epistemic actions that are described in the expansive learning cycle below (Figure 1).

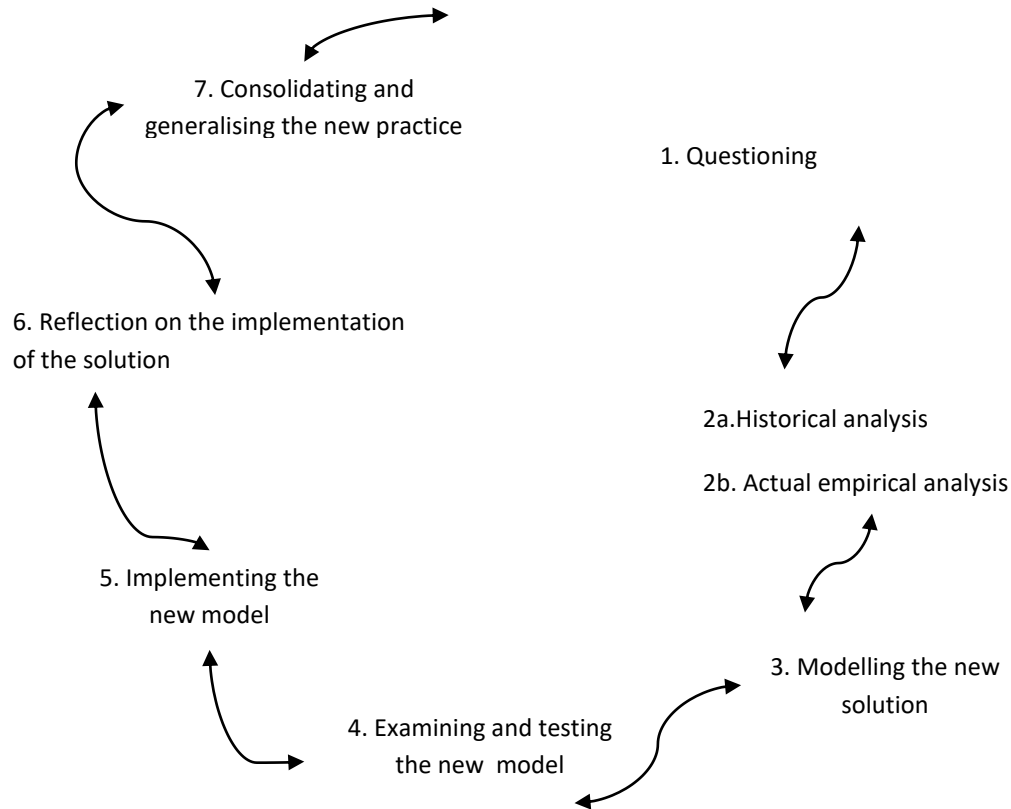


Figure 1: Sequence of actions in the expansive learning cycle

Source: Engeström, 1999, p. 384

1. Questioning, criticising or rejecting some aspects of a practice/activity or cluster of them and their associated wisdom,
2. Historical and empirical analysis of the situation to identify problematic situations, contradictions and their explanatory mechanisms,
3. Modelling solutions to the problematic situations and associated contradictions,
4. Examining and testing the model through thought experiments to better understand its dynamics, potentials and limitations,
5. Practically implementing the model and enriching it based on addressing new challenges, contradictions and insights that emerge,
6. Reflecting on, and evaluating the process of mainstreaming the model in an activity or clusters of activities, and

7. Consolidating the outcomes into a new stable form of activity or set of activities
Engeström (2016, pp. 25-26).

CLs support the expansive learning process through enabling practitioners, scientists and interventionist researchers to tackle difficult challenges through “concept formation and practical redesign in a scale that has to exceed the boundaries of any single discipline, profession or organisation” (Engeström 2016, p. 40) using contradictions to inspire transformation and heterogeneous work coalitions (Sannino, 2017). The CL method is based on the epistemological principles of double stimulation and ascending from the abstract to the concrete and transformative agency (Virkkunen & Newnham, 2013; Engeström, Sannino & Virkkunen, 2014). CLs typically begin with the presentation of research-based problematic situations, which serve as the first stimulus, and are analysed and transformed using conceptual tools, which serve as the second stimulus (Virkkunen & Newnham, 2013). Ascending from the abstract to the concrete entails the development and integration of an “isolated germ cell (a new principle or kind of exemplary action) of a system to a multi-faceted, concrete reality that can be easily understood as the process of coming into being of a new technical system” (ibid., p. 45). In this way, transformative agency is generated through improved capacities to understand, engage and transform structures or power relationships with actors that have causal powers (Engeström, Sannino & Virkkunen, 2014).

1.3 Research problem

The increasingly complex nature of sustainability challenges, worsened by climate change and largely attributed to the capitalism, within which the activity system concept was developed, puts new demands on learning and research. Capitalism and its commodity-based approach treats nature – the earth – as a resource to be exploited (De Sousa, Nunes & Meneses, 2008), and defines use value and exchange value in economic terms only, excluding common good and ecological value. This view of use value and exchange value constraints the potential of current conceptualisations of activity systems’ to represent the increasingly complex socio-ecological issues (Mukute & Lotz-Sisitka, 2012). In this regard, Bellamy and Ioris (2017) underline that

sustainability practices such as “must not be subsumed by the current agri-food hegemony due to the relatively easy appropriation of agroecological techniques (at the expense of the more critical and political dimensions)” (p. 2). In addition, the CL method also needs to be transformed in order to better respond to the new and emerging challenges in the world of work. Engeström (2017, p. 2) says CLs should be reconfigured based on the increasingly: (a) complex and contested nature of problems that need to be tackled, (b) distributed and heterogeneous composition of actors who need to be involved, and (c) longitudinal, long tail and multi-cyclical nature of transformations that demand additional cycles and efforts to foster continuity. In addition, the process of expansive learning should consider paying attention to transgressive dynamics that help disrupt and transform the structures that lie under unsustainable practices (Lotz-Sisitka et al. 2017). Against this background, we conducted a study to address the following question:

- What are the potentials and limitations of DWR and CL in aiding the reframing and transformation of sustainability issues being faced in an organic agriculture and marketing initiative in Zimbabwe?

2. THE NETWORKED CASE STUDY

The study discussed in this paper is based on interventionist research with eight interacting district organic farmer associations that were formed in 2011 and jointly supported by Fambidzanai Permaculture Centre (FPC), Zimbabwe Organic Producers and Promoters Association (ZOPPA) and GardenAfrica, in association with the government’s Agricultural Technical Training and Extension Services (AGRITEX). The project, referred to as *Livelihood Security in a Changing Environment: Organic Conservation Agriculture (OCA)*, ended prematurely in 2014 due to funding constraints, when 44 local organic associations had been established and had just formed eight district organic associations to coordinate organic production and marketing for increased access to markets, better bargaining power, improved agroecological diversity and resource base and livelihoods (McAllister, 2015). Organic conservation agriculture (OCA), as practised in this case study, is part of a *family or ecology of sustainable agriculture practices* that take full account of the environment-society-economy

nexus in the production of food and other goods for the farm families and markets while also contributing to common good such as water, carbon sequestration, landscape quality, wildlife and flood control. The science, practice and movement behind sustainable agriculture is called agroecology (Wakeford, Anderson, Pimbert & Charanya, 2016). This suggests that OCA had an inherent interest in cognitive justice, transdisciplinary and transformative learning involving farmers.

We used second generation CHAT as our most basic unit of analysis because of its systems perspective (Figure 2), focusing on the networked district organic farmers' activity system. We were cognisant of the merits of working with third generation CHAT (Figure 3) in which actors such as organic farmers have a partially shared object with at least one actor such as neighbouring conventional farmers, organic farming promoters and government agricultural extension workers in the OCA project. We chose to work with the district organic farmer association a central activity system interacting with other activity systems in second generation CHAT (Figure 4) because it is the foundation of third and emerging fourth generation activity system; and enables a potentially deeper understanding of the strengths and limitations of the activity system's structure, elements and relationships. Second generation activity system also makes it easy to show the four kinds of contradictions, which are the drivers of learning and agency development. Figure 4 shows the location of contradictions as follows:

- Primary contradiction (1), which exists within an element of an activity system, and in organic agriculture, could refer to the conceptual and material tools used in the practice,
- Secondary contradiction (2) between elements of the activity system that emerge as a result of changes in the elements such as agricultural conditions and available agricultural tools in relation to the object,
- Tertiary contradiction (3) between the object of the centrally activity system and a historically more advanced form of that activity such as commodified industrial produce on one hand and sustainable food systems on the other,

- Quaternary contradiction (4), between the central activity system and different activity systems that it interacts with, such as between organic agriculture and universities as tool-producing activity systems.

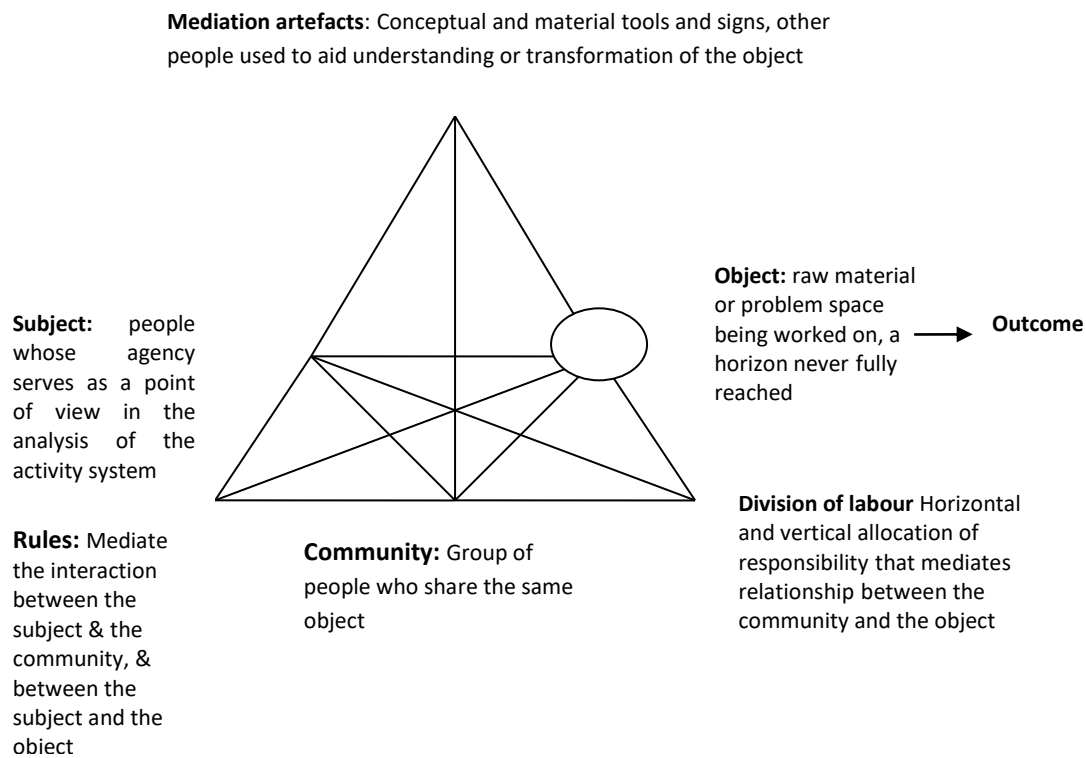


Figure 2: Structure of second generation activity theory mode (Adapted from Engeström, 1987)

Basic third generation CHAT diagram

Minimum unit of analysis 3rd generation CHAT

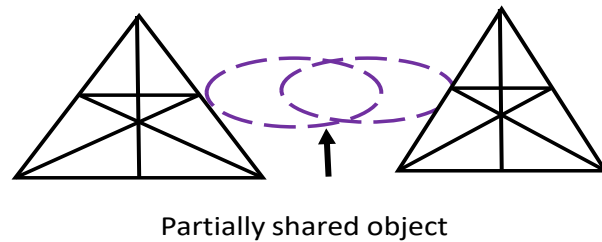
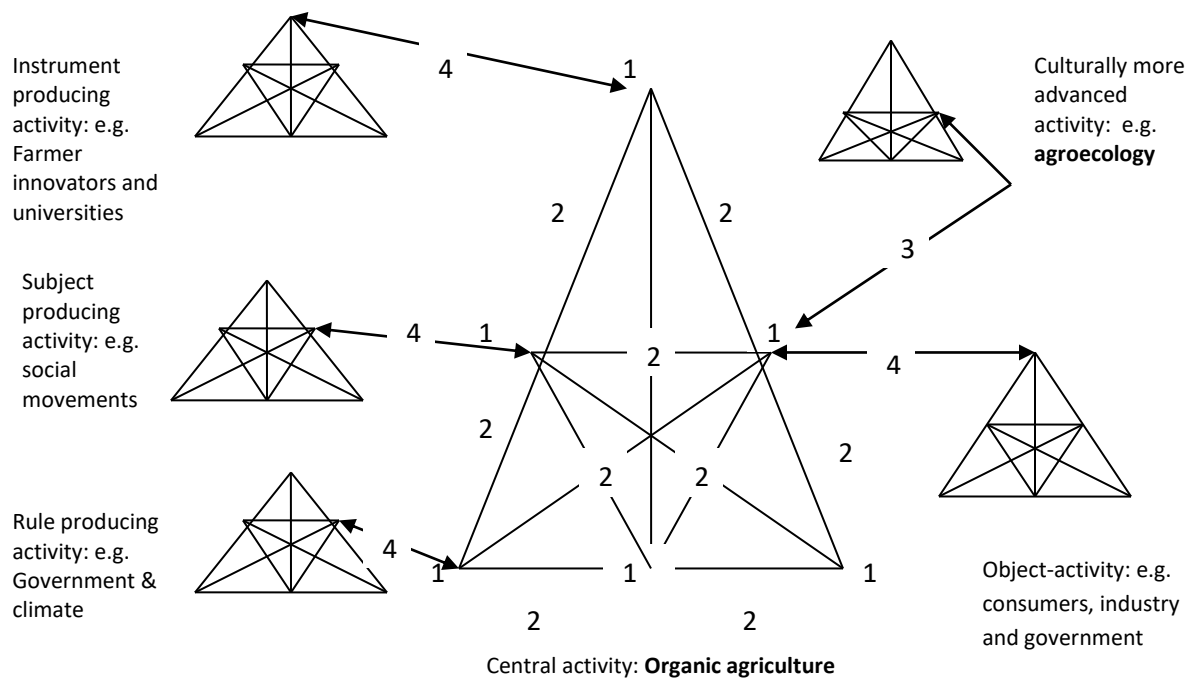


Figure 3: Source: Adapted from Engeström (2001, p. 136)



Source: Adapted from Engeström, 1987

Figure 4: Second generation activity theory and the four levels of contradiction

3. STUDY PROCESS

The study covered the first four stages of the expansive learning process: questioning, analysis, modeling solutions and examining solutions (Table 1).

Table 1: Summary of the study process

	Workshops to generate mirror data	Change laboratory to analyse mirror data, model and examine solutions
Number and composition of participants	<ul style="list-style-type: none"> Analysed OCA project documents for historical information 99 farmers in 8 districts and from 8 organic associations and 10 agricultural extension workers (AEWs) Facilitated by 2 interventionist researchers 	<ul style="list-style-type: none"> 39 farmers , 7 content specialists and 1 interventionist researcher, and 1 scribe and 2 audio-visual recording personnel (documenters) Content specialists covered agriculture, marketing and group development 4 were from NGOs who initiated the OCA project, 1 was a farmer innovator, 1 an academic and 1 farmer activist Divided farmer representatives from the 8 district associations farmers into two groups – 5 farmers per district – to ensure adequate representation and co-learning and improve reporting back potential Documenters, content and process specialists worked with both farmer groups
Time taken	<ul style="list-style-type: none"> Conducted over 8 days in August 2016 in the respective districts Spent about 3 hours with each association 	<ul style="list-style-type: none"> Conducted over 4 days at a central venue in October 2016 First 2 days involved 19 farmers from 4 northern districts, and last 2days involved 20 organic farmers from 4 southern districts Spent about 12 hours with each group
Video-recorded and transcribed materials	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Transcribed problem analysis and solution development sessions on production, marketing and leadership issues into 408 speech turns for southern and 339 speech for northern districts

In this paper, we coded the conversations according to districts and theme as follows: SD for southern districts and ND for northern districts; L for leadership, M for marketing and P for production deliberations.

3.1 Questioning the practice

Two interventionist researchers facilitated the questioning of the collective organic conservation agriculture and marketing practice in the context of local nexus issues outlined

above to identify problematic issues or matters of concern of the eight district organic farmer associations. This was done through document analysis and literature review of the organic agriculture project and holding focus group discussions organic farmers AEWs they worked with. Interventionist researchers documented the difficult matters of concern for subsequent collective review and analysis in CL sessions.

3.2 Historical and empirical analysis of matters of concern

Research participants comprising organic farmers as practitioners and content specialists conducted an historical and empirical analysis of the matters of concern to surface contradictions and possible explanations behind them in a CL. During this session the interventionist researcher presented the expansive learning cycle and mirror data. Research participants validated, analysed and reframed the mirror data, which constituted the first stimulus. The analysis was conducted in three issue-based groups and mediated by a problem tree analysis and discipline-specific second stimuli. The interventionist researcher introduced the problem tree analysis as a useful tool for reframing the matters of concern, and research participants identified issue-specific second stimuli as some of them had experience of working with double stimulation (Mukute, 2013). The discussions were video-recorded for subsequent analysis.

3.3 Developing model solutions

This third session focused on facilitated joint development of practical solutions to identified, prioritised and reframed matters of concern and contradictions, drawing on the distributed cognition of farmers as practitioners and content specialists in a CL. After analysing the matters of concern and identifying causal explanations, research participants proceeded to develop model solutions in their respective three issue-based groups. Research participants used their issue-specific second stimuli and the expansive learning concept introduced by the interventionist researcher to model solutions to their reconceptualised matters of concern. The discussions were also video-recorded for subsequent analysis.

3.4 Examining model solutions

The fourth and last session of the CL focused on examining, improving and refining the model solutions in a CL. Each of the three groups made a presentation of its analysis and reframing of the matters of concern that they were dealing with, and of the model solution that they had developed. This was then critiqued by research participants from the other two groups, resulting in further improvements being made to the analyses and model solutions. These were subsequently compiled in Shona language for ease of communication with other members of their district associations who were not present.

3.5 Data analysis

We used CHAT's second generation activity system as the basic unit of analysis to view organic farming as an activity (Figures 4) and interacting with neighbouring activity systems, without factoring in the partially shared object. We also conducted an inductive analysis of the data that was generated by research participants based on the prioritised and reframed matters of concern around:

- Water and agricultural input constraints in organic production,
- Poorly coordinated organic production and marketing and group development, and
- Ineffective organic district association development.

We subsequently conducted theory-based abductive analysis to identify contradictions as well as trace the emergence of expansive learning and transformative agency in CL sessions (Virkkunen & Newnham, 2013; Sannino, 2008). These layers of analysis provided the basis for our identification of methodological insights on T-learning.

4 RESULTS AND DISCUSSION

In this section we present and discuss the organic farmers' matters of concern as identified from the questioning process, their reframing and prioritisation by research participants and our (authors) surfacing of contradictions from them. We later analyse CL conversations that

reveal instances of potentially expansive learning, and which demonstrate the interconnectedness of the matters of concern and associated contradictions and the model solutions outlined in this section.

4.1 Matters of concern and their linkages

Matters of concern tend to “involve us, touch and brush up against us, envelop us or otherwise call us to respond to them” (Ivakhiv, 2014, p. 3). Tackling such matters of concern requires paying attention to diverse practices and knowledges, human agency as well as non-human agency in the context of political ecology and the survival of the planet (Latour, 2004; Hill, 2015). Through focus group discussions and interviews involving members of all the 8 district organic associations, and document analysis, interventionist researchers generated mirror data, which also reflected the matters of concern, as follows:

- a. *Organic production*: Water shortages and limited access to water-conserving irrigation technologies and limited availability and to locally adapted seed, organic fertilisers and environmentally friendly pest and disease tools. The matters of concern were non-human in themselves and concerned with protection and care for the biophysical environment and agrobiodiversity, which in turn impact human life.
- b. *Organic marketing*: Lack of coordinated production and marketing, high costs of organic certification and under-developed organic markets. The matters of concern touched on the human agency of organic producers, current and potential consumers, and other actors involved in the production, processing and availing of organic produce.
- c. *Group development*: Lack of farmer association cohesion and linkages at district level, poor relations between organic farmers and neighbouring conventional farmers, low farmer association capacities to engage and influence service providers, buyers and policy makers. The matters of concern principally related to the agency of the organic farmers as a collective.

An initial analysis of the matters of concern that was conducted by interventionist researchers showed that the matters were not only interconnected but also stratified. For example, climate change causes water shortages through droughts and longer mid-season dry spells, and water

shortages undermine food production, which results in food insecurity and poverty. Research participants' analyses of the matters of concern using problem tree analysis suggested that the nexus issues such as food insecurity, water and climate change were stratified at one level. At another, they form a vicious circle at another as exemplified by poverty and food insecurity exposing farmers to the climate change impacts and weakening their abilities to overcome water challenges. This is typical of nexus issues, wicked problems and/or runaway objects.

4.2 Analysis, prioritisation and reconceptualisation of matters of concern

The priority matters of concern were selected under the organic production and organic marketing categories but the associated development category was re-conceptualised to ineffective district association leadership/district committees.

4.2.1 Organic production: water and agricultural input shortages

The root causes of water shortages were identified as low and declining rainfall (due to climate change and, during 2015-16, El Nino), deforestation and wild fires, water pollution and gold panning, soil erosion, siltation of rivers, declining water table, poor wetland use and restrictive by-laws. The identified effects include a reduction of the agro-ecological potential; low yields, loss of livestock and declining livestock prices; increase in local food prices; a gradual and on-going loss of local and indigenous seed varieties; hunger and poverty; and an increase in conflict and crimes in the community.

Research participants identified the causes of inadequate soil nutrients as low soil fertility, lack of organic top dressing manure, the labour intensiveness of compost making and lack of commitment to organic production by some members. The main causes and effects of inappropriate seed were identified as climate change and lack of community seed banks at association level and seed insecurity, reduced yields and dependence on imported seed. Lack of organic pest and disease control solutions was attributed to the privileging of high external input agriculture and marginalisation of traditional and modern knowledge on environmentally sensitive pest and disease control methods. This has resulted in low adoption of organic and related sustainable agriculture practices.

4.2.2 Organic produce marketing: uncoordinated production and marketing

The research participants identified the following internal causes of uncoordinated production: lack of a shared vision, lack of capital to invest in production, expectations to get quick profits, low levels of commitment and mutual trust and respect among some organic farmers. Also identified was a lack of internal support for and from association leaders, low levels of collaboration between the local and district association leadership, weak coordination structures, and lack of enforcement of penalties stipulated in the constitutions. The external factors were identified as loss of government agricultural extension workers trained in organic farming under the OCA project, low public understanding of organic farming, long distances between local organic associations, which makes joint planning and bulking difficult (increasing the costs of transaction beyond the district), and unscrupulous buyers. The research participants identified the following as effects of uncoordinated production: decrease of the quantity and quality of organic yields and sales, failure to meet market demand, increased costs of marketing, reduced income, and a subsequent reduction in the number and sizes of organic associations.

The identified causes of uncoordinated marketing were both internal and external to the district organic farmer associations. These include: poor production due to poor soils and rainfall, insufficient access to and availability of organic fertilisers, inadequate marketing and branding knowledge, lack of a binding district production plan, non-registration of farmer associations which limited their access to certain markets and government financial support, non-renewal of organic compliance certificates, organic farmers failure to meet agreed production targets, inconsistent and different quality of produce from members, poor packaging, inadequate monitoring of the production processes, weak or non-existent district marketing structures and lack of knowledge about what to do when contractors breach agreements. The external factors included the increasing costs of local organic certification and organic labels, unreliable and expensive transport, limited organic markets and relatively less-discerning consumers, cash shortages and a shift to plastic money that is still new to organic farmers, most of whom have no bank accounts. Farmers also identified late payment for

supplied produce to formal markets that affect planned reinvestment for ongoing market supply (such as materials and transportation) and timely succession planting.

4.2.3 Association development: ineffective district association leadership

Several causes of ineffective leadership were identified, including, lack of: passion and commitment in leadership; leadership skills, transparency, consultation and collective planning and action; adherence to associations' constitutions including unconstitutional leadership selection. The main contextual constraints were identified as cultural values and norms that hold back competent women from taking leadership roles; and long distances between associations, which was worsened by low production and income for transport to attend association events (Figure 5). The main effects included poor production, low membership, lack of group cohesion, ineffective decision-making and stakeholder engagement, undermining the reputation of organic associations that limits the growth of membership and thus of the organic movement.

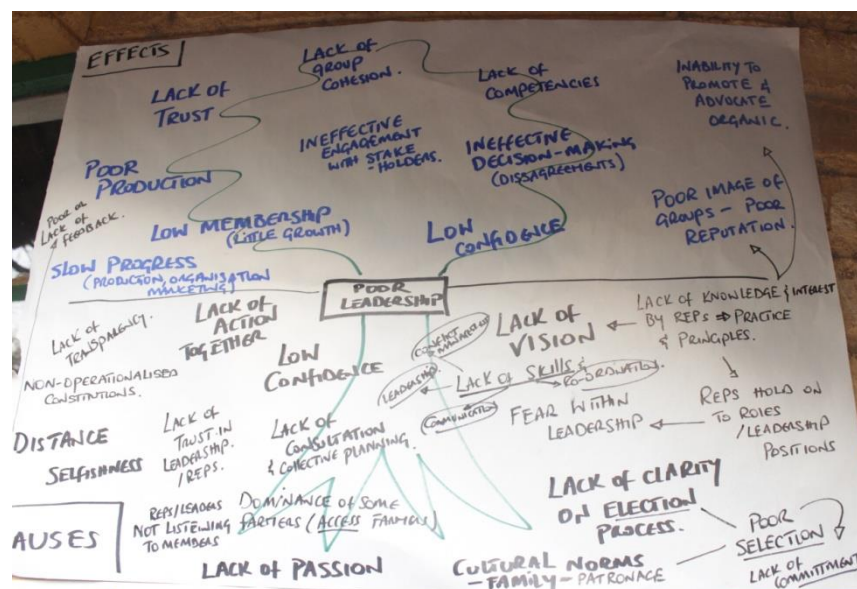


Figure 5: Problem tree analysis of ineffective district association leadership matter of concern

4.2.4 Identification of contradictions

As part of the process of problem analysis, which precedes solution development, interventionist researchers and authors identified the following contradictions from the matters of concern (Figure 6):

- Primary – between maximising the economic benefits of individual farmers and generating benefits for association members and the community at large. Some members wanted to monopolise access to production resources such as water, guano found in the wild as social good and access to local markets against the spirit of the association to benefit members and the community at large.
- Secondary – between the available organic agriculture knowledge, fertilisers, pest, disease control tools organic production and its interest to produce enough food and fibre sustainably. Organic agriculture production and marketing knowledge in the associations is still developing, local seed and seed knowledge on locally adapted varieties was lost through stigmatisation, organic seed and agrochemicals are scarce and yet all these are needed to work towards the object and outcomes of organic agriculture.
- Tertiary – between seeing agricultural processes and results as agricultural commodities that externalize environmental and social costs and as food systems that also produce common good and ecological services that benefit the earth and future generations. Current and dominate agricultural production systems harm the environment while the desired system heals and nourishes it.
- Quaternary – Between the organic farmers' activity system and those of conventional farmers (and those of pro-conventional agriculture policy making, knowledge and technology developing activity systems). Organic farmers' activity system is driven by ecological sustainability, socio-political justice and long-term economic interests while that of conventional farmers has a primarily driven by maximising production and profits.

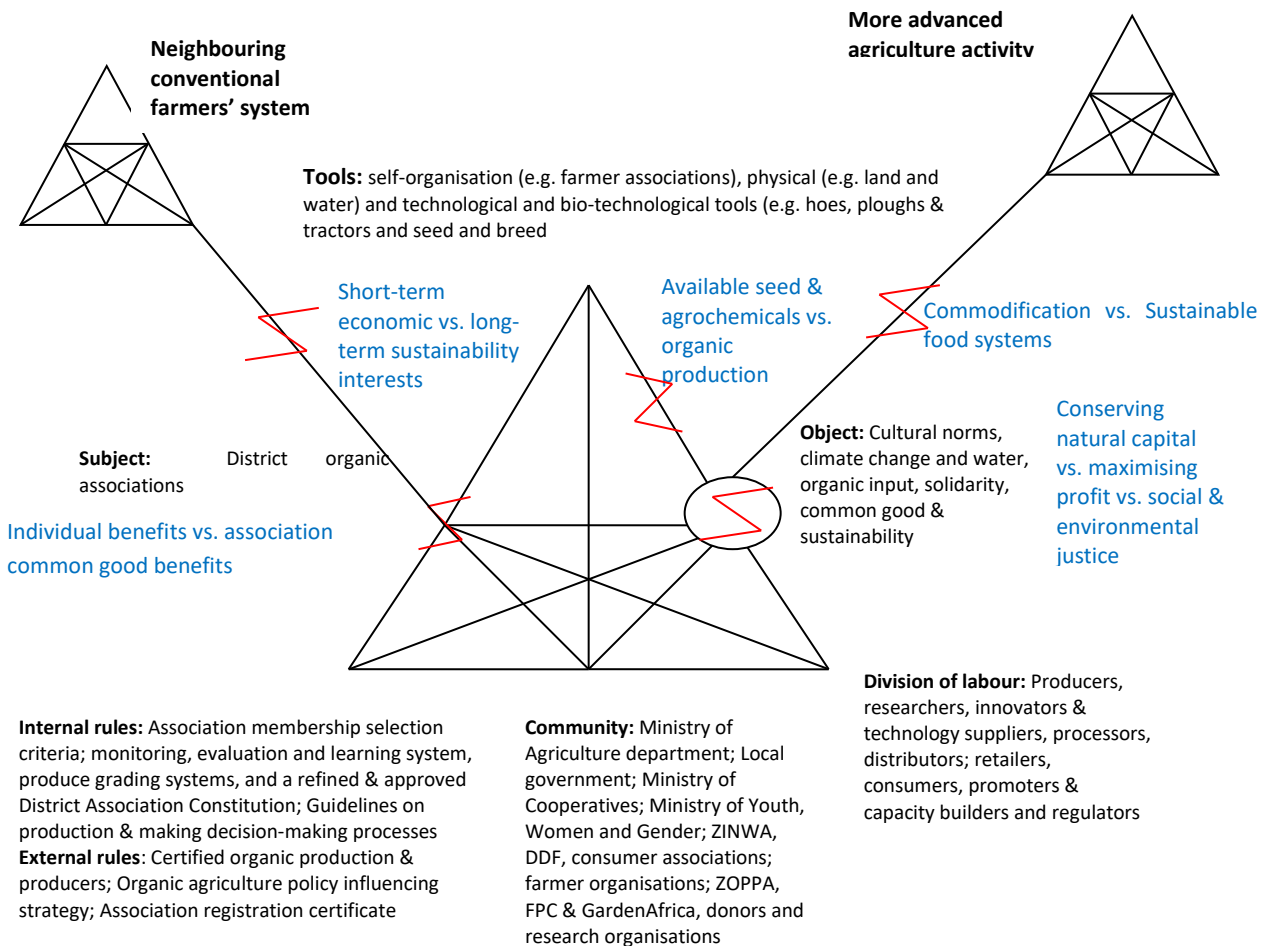


Figure 6: Mashonaland East organic district associations' activity system and identified contradictions

4.2.5 Illustrating the process of questioning and reformulation of matters of concern in CL

CL deliberations included the reconceptualisation of the object, and the expansion of tools and rules as well as the redefinition of relationships. The research participants, including the content specialists, reconceptualised the object and also produced model solutions to their problems in the form of words (Tables 3 and 4) and diagrams (Figures 7 & 8). Tables 3 and 4 below show indications of T-learning in CL sessions during southern districts' deliberations on organic marketing (SDM) and northern districts' discussions on leadership (NDL):

Table 3: Traces of transgressive and transformative learning on organic marketing

Result of analysis	Speech turns that form the defined causal problems and emerging solutions
Solution: <i>Associations should assume full responsibility for marketing their produce</i>	<p>SDM149: I think when we talk about coordinated marketing we do not mean that ZOPPA should be at the centre of our marketing.</p> <p>SDM150: So in other words we have to find markets of our own.</p> <p>SDM151: Yes and ZOPPA can assist us since it is into organic marketing. Let me give you our example in Hwedza where we have worked with ZOPPA to link with supermarkets such as Pick n Pay that you are talking about. We are the ones who breached the contract last year because as soon as we had delivered produce, we were called and told that the shelves are already empty. ZOPPA had done their bit, including labeling. We ended up switching off our phones ... This is the problem of inconsistent supply that we have already alluded to.</p>
Solution: <i>Mobilise internal resources to enable leaders to meet and to support resource-poor farmers</i>	<p>SDM211: Long distances between associations make it difficult for leaders to follow up...</p> <p>SDM215: This one has spoken like a leader: You leave home early without having had something to eat, and you use your own money for transport and sometimes you walk 2 km to reach the members and they do not even give you water to drink.</p> <p>SDM216: So there is lack of support from other association members.</p> <p>SDM217: It once happened in our association. We invited association leaders and they came; and when we asked fellow farmers to make contributions towards transport costs for the return trip the other farmers did not cooperate. I ended up being the only one making the contribution. And that was the end of it.</p> <p>SDM218: Why is there lack of such support?</p> <p>SDM219: ... Sometimes it is because members are ignorant about the value they get from working with the leadership.</p> <p>SDM220: The other reason could be that the members do not learn anything new.</p> <p>SDM221: And sometimes it is just because the members do not have the money.</p> <p>SDM222: If it was a question of money then members would donate in kind: prepare a meal for the leaders so that they gain energy to walk back to their respective homes.</p> <p>SDM223: So the members should be taught to support and sponsor the leadership to carry out its work...</p> <p>SDM257: On the issue of farmers failing to raise money for contributions, are there no members with genuine financial challenges?</p> <p>SDM258: They are there – those who would like to pay but have no money.</p> <p>SDM260: We, as an association, when we establish that the member is facing financial and production challenges, we contribute on his/her behalf.</p>

Table 4: Traces of transgressive and transformative learning on association leadership

<p>Solution: <i>Members should select good leaders and the leaders should be trained on their duties soon after being selected</i></p>	<p>NDL102: [We have] inappropriate representatives in the district committees.</p> <p>NDL103: There is need for training [of committee members].</p> <p>NDL104: Were you trained on leadership skills as Goromonzi?</p> <p>NDL105: It was different and some were not trained.</p> <p>NDL106: Were you elected as district association leaders? ...</p> <p>NDL111: So we are saying associations need to be trained on leadership before the wrong people are put into leadership positions.</p> <p>NDL113: a District committee's leadership comprises the chair, secretary and treasurer and each of them should know how to perform their duties. So that training needs to be done. The training of chairpersons was done in reaction to one chairperson who was destroying his association through dictating... So we should get the training first...</p> <p>NDL115: Resource mobilization is so important ...</p> <p>NDL116: We can mobilise money for training from those who attend.</p> <p>NDL117: But at this stage, if we ask for a dollar from each, members will not attend because they have not realised the benefits of organic farming.</p> <p>NDL118: And yet that [training] is very important because farmers need to be trained first.</p>
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The speech turns in Tables 3 and 4 show how the change laboratory-based deliberations helped farmers to critically reflect on their practice and develop solutions to them. Given that individuals and communities in the region, country and research site tend to attribute their problems and challenges to others without taking responsibility for them, transgressive learning was manifested through voluntary introspection as the following speech turn reflects. There appears to be two explanations to the transgressive learning: the participation of content specialists who, in one way, served as 'strangers who could ask any question'; and the preparedness of farmers as practitioners to look into themselves critically. The potential value of strangers in asking difficult questions and causing transgressive learning was highlighted in one of the group discussions in the following discussion:

SDM234: I am not sure where this problem belongs: people are so used to being donor-dependent. They wait for the donor to come and if it does not, they return to their old ways.

SDM237: That is correct. The donor syndrome is inside our communities...

SDM248: The solution [concerning donor syndrome] is to do exchange visits where we learn from each others' experiences...

SDM249: A troublesome snake in a village can only be killed by a passer-by...

SDM250: Exchange visits are very helpful in dealing with difficult issues ... For example; we had visitors from Zambia who attended our meeting with all key stakeholders in the district, including chiefs, the District Administrator (DA) and the Ministry of Agriculture – and us the organic farmers. So the difficult questions that we could not ask the DA were posed by the Minister of Agriculture from Zambia – deep questions.

The reference to ZOPPA in table 4 illustrates how the associations re-conceptualised their relationship with ZOPPA as a different and critical activity system from an organic marketing perspective. The CL also reconstructed the relationship between the eight district associations re-conceptualising how they might otherwise be networked through a provincial committee beyond the chairperson and chairpersons to include the production, marketing and training managers from the district association level (Figure 7). This expansion suggests a growing interest in making production and marketing coordination part of the brief of the provincial committee through what appears to be technical sub-committees. . The diagram also shows how this structure could be connected to the local associations that form a district association. The Zimbabwe T-learning case study is part of a nine-member T-learning partnership, which in turn works with three other international transformative learning partnerships to form the global Transformative Knowledge Network (TKN). The Zimbabwe case study forms one of the niche level actors in the global knowledge network as conceptualised in Durban during the meeting of eight shortlisted project proposals in September 2015 (Figure 8).

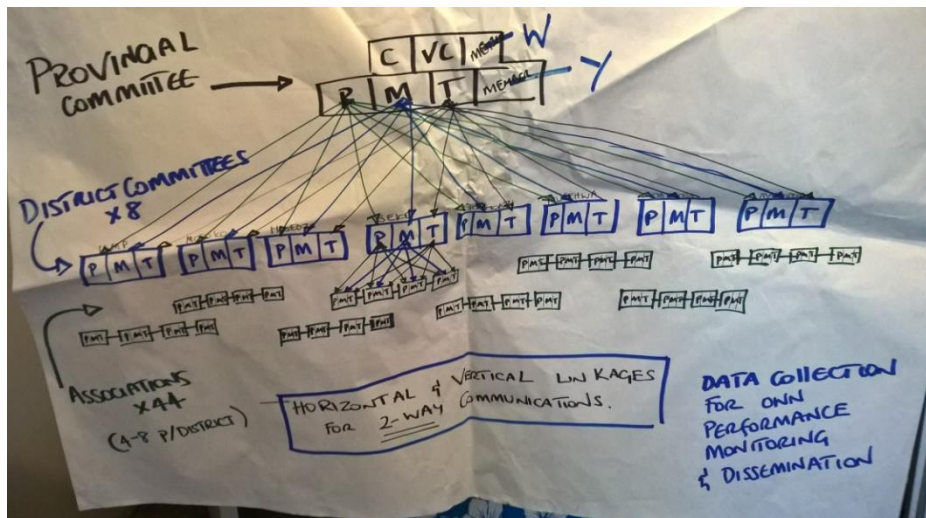


Figure 6: CL-developed diagram on how district organic associations could form a provincial association

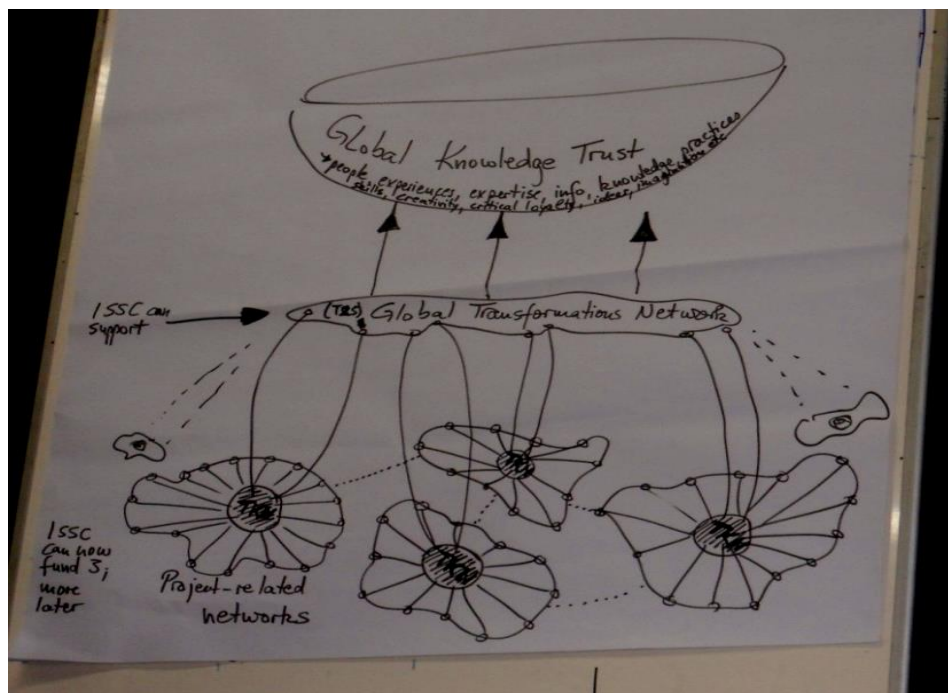


Figure 8: ISSC supported Transformative Knowledge Trust that the T-learning research project is part of

4.3 Solution development and the potential of CL in tackling sustainability challenges in agriculture

CL sessions in this study served as important spaces and processes through which potentially actionable solutions were jointly developed as discussed below. Working with research participants in CL workshop sessions, we generated potential solutions to each of the identified contradictions are summarised in Table 5 below.

Table 5: Potential solutions that were developed to address contradictions

Contradiction	Potential solution(s) developed in change laboratory sessions
Between current commodities-oriented agriculture and transitioning to agriculture that produces common good and ecological services	<ul style="list-style-type: none"> • Increase collective organic agriculture production and marketing, meet organic standards, and raise consumer awareness on the health, nutrition and socio-ecological sustainability of agroecology • Recognise and promote the generation of ecological services and common good associated with water conservation, soil protection and improvement, and landscape management
Between the available organic agriculture knowledge, fertilisers, pest, disease control tools organic production and its interest to produce enough food and fibre sustainably	<ul style="list-style-type: none"> • Construction of water harvesting contour ridges and small dams with government support and promotion of the use of water conserving technologies in irrigation • Promote and scale out the growing, exchange and sharing of and locally drought tolerant seed varieties and small livestock production alongside the expansion of diversified, nutrient-rich and climate-smart cropping and livestock designs and systems • Establish and utilise organic fertiliser experimentation plots, and OPV seed production plots • Conduct experiential learning tours to places and communities whose emergent practices generate sustainability transformations in the ecological, social and economic spheres; and enter into knowledge and innovation partnerships sensitized by cognitive justice • Scale out and up the production, distribution and use of organic fertilisers and pesticides, and of locally adapted farmer seed
Between maximising the economic benefits of individual farmers and generating benefits for association members and the community at large	<ul style="list-style-type: none"> • Refine district organic association constitutions so that they provide for: experience-based membership selection criteria; a learning-oriented monitoring and evaluation system; association capacity assessment and development system; district leadership structures that include production, marketing and training positions; and a district association fund • Develop, implement and regularly review district organic production and marketing strategy and production plans
Between the organic farmers' activity system and those of conventional farmers	<ul style="list-style-type: none"> • Spearhead the establishment of community-wide and driven watershed management structures involving traditional leaders, district council and government departments

4.4 The potential of CHAT informed interventionist research in support the framing and tackling of sustainability challenges

Through the study being reported here, we identified the following as important strengths of CHAT-informed interventionist research in tackling complex issues:

- CHAT-informed research has shown that the main value of bringing together multiple actors comprising practitioners, content and process scientists lies in the broadening and deepening of the knowledge base on which to undertake the analysis and solution development alongside the development of individual, relational and collectively agency development. External practitioners and specialists, as ‘strangers’, are better positioned to challenge norms, paradigms and taboos and thus laying the foundation for T-learning.
- Double stimulation used in CL sessions allows for the transformation of the object and the tools, rules and division of labour that may be used to transform it. For example, research participants expanded the conceptualisation of a farm from the horticultural plots and rain-fed agricultural fields to embrace the landscapes around them where micro-catchment area management was needed. The changes have transformative potential and can transgress mental and practice boundaries imposed in the past. Relationships with neighbouring activity systems (e.g. conventional agriculture farmers in the same catchment area, ZOPPA, research organisations and traditional leaders) were re-conceptualised even though these stakeholders were not present in the CL. This suggests that the absencing of absent stakeholders paves the way for working in solidarity with them in spite of, or even because of differences.
- A multi-actor expansive learning process potentially enables the development of relational and collective agency. For example, organic farmer meetings within and between their district associations and with AEWs, and content specialists helped develop relational agency or relational solidarity between them and also underlined the value of farmers to relate with and engage their stakeholders. This enables creative solidarity, which reveals new horizons and produces new ways of being together by working on the tensions between old longings and fears on one hand, and embracing new possibilities and strengths on the other (Gaztambide-Fernández, 2012, p. 58).

- There are at least three sites of transformation in agricultural activities that may be transitioning to sustainability. These comprise: (i) farming landscapes, especially through the construction and utilisation of water harvesting contours and diverse and nutrient-dense cropping systems; (ii) relationships between organic farmers and researchers, and organic farmers and their neighbours through research and innovation partnerships and community catchment management structures respectively as well as between district organic farmer associations (Figure 6); and (iii) mindsets and attitudes towards farmers' capacities to improve their farming and production systems, towards female farmer leadership, and towards the agroecological potential of the historically marginalised traditional crops in times of changing climate.
- Identifying the emergence of methodological insights requires rigorous documentation and careful inductive and abductive analysis. Audio-video recording is a central part of change laboratories, and it provides material that can be used to trace evidence of learning and agency development as well as new and emerging challenges.

4.5 Study implications on the potential of CHAT-informed DWR and CLs to support expansive learning towards sustainability transformations

We conclude by reflecting on the implications of the study on CHAT, the activity system structure and change laboratories in relation to contemporary debates in the context of sustainability challenges and transformation to sustainability. We found Engeström's (2016) call for a fourth generation CHAT to deal with runaway objects in today's runaway world consistent with Latour's (2004) call for tackling matters of concern. They both point to the limitations of current problem-solving approaches that have been developed in, and tend to serve a capitalist-based approach, which commodifies knowledge, natural resources and life forms. There is therefore need for embracing and tackling life issues that matter on the planet and contribute to sustainability transformations (Lotz-Sisitka et al., 2017) in a manner that goes beyond current CHAT affordances to take into account the production and distribution of risks, ecological services and common good. This is likely to contribute towards a fourth generation CHAT whose unit of analysis is not only a runaway object but also "a social-ecological and

cultural-historical activity system” (Mukute & Lotz-Sisitka, 2012, p. 354). These considerations are likely to require a reframing of the capitalism-driven definition of use value and exchange value in activity systems – starting with the second generation. The complexity of issues in the study, and their contested nature demanded ethical deliberations as proposed by Brown (2010), which in turn creates multiple types and layers of contradictions. These appear to demand an added layer of reflexivity on the CL method, and its enrichment as suggested by Engeström (2017) to better contribute to transformations to sustainability.

5. CONCLUSION

The study has shown that, sustainability transformations that include those seeking to transgress normalised unjust and unsustainable norms, are interested in caring for and protecting the earth and the life in it, and is therefore empathetic and gentle on the earth as the source of life. This is a fundamental matter of concern underpinned by the existential contradiction between human life and nature. The study also highlighted and confirmed CHAT, activity system and CL’s new and emerging challenges, suggesting their zone of proximal development.

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