

Transdisciplinary research in Sub-Saharan Africa: Experiences and challenges in Kenya

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Abstract: *This paper seeks to analyse and deepen our understanding of the application of transdisciplinarity to agricultural research in sub-Saharan Africa. First, we discuss transdisciplinarity based on a set of thesis, with a focus on the general and specific research issues in developing countries. Then we analyse how these thesis were addressed in our research project "Organic Agriculture with Trees", in the MAU catchment in Kenya from 2005-2009. Finally, we explore if the concept of transdisciplinarity is able to bridge the different perspectives and which consequences this might have for the research process and the results of stakeholder-oriented research projects.*

Keywords: *transdisciplinarity, participatory approaches, developing countries*

"Transdisciplinarity makes conciliation necessary between the internal universe and the external universe, between experience and theory, between the subject and the object"

Basarab Nicolescu

Context

This paper seeks to analyse and deepen our understanding of the application of transdisciplinarity to agricultural research in sub-Saharan Africa. The term transdisciplinary is relatively new in Africa where most research tends to be disciplinary or interdisciplinary in orientation. However, the slow progress towards development in terms of fulfilling the MDG goals, which offer a broad orientation for defining "development"¹ in sub-Saharan Africa, is partly linked to the failures of disciplinary research to transform policy and practice, and it necessitates a shift toward a research paradigm or approaches that account for complex problems in a real world cultural context.

Transdisciplinary research therefore is appropriate for this endeavour. Transdisciplinary research is rooted in the recognition of different levels of reality governed by different types of logic which can be understood either through the synergistic application of diverse disciplines or by integrating non-researchers into the research process.

This paper particularly argues for a kind of transdisciplinary research that involves the integration of societal actors into the research process. However, in the Kenyan context, where more than 40 ethnic groups live together, sometimes in multi-ethnic settings, non-researcher integration often needs to take into account the ethno-cultural and specific gender disparities in order to promote synergetic integration. Besides the integration of different actors, we have to keep in mind that researchers from the North, doing science together with researchers from the South do not have the same background and experiences in the empirical sciences. This is a further condition to account for reflecting on transdisciplinarity in the context of research in developing countries.

¹ In the following we use the term "low income country", to avoid any misunderstanding in use of the term "development".

Objectives and methodology

To deepen our understanding about the potential of transdisciplinary research in research projects within a low income country context, we undertook an ex post facto analysis of the results from our project “Organic Agriculture with Trees”, carried out in the Western Kenya MAU catchment from 2004 to 2009. A brief introduction describes the main subjects of the project. Following this discussion, we present a preliminary catalogue of eight thesis that identify fundamental transdisciplinary research characteristics. Using these, we present the different project phases with attention to why, when and which stakeholders were involved in which phase, what methods were used, and how stakeholders were involved in identifying the themes (see Muhar et al. 2006).

In the final part of our paper, we discuss how successful the approach was, how our methodology stands the test and what is recommended as practical implications for organising transdisciplinarity in a low income country context.

The research project “organic agriculture with trees (OAT)”

The purpose of this project was to investigate the potential of strategic ecological farming practices (Organic farming, Agroforestry and Forestry) for stabilizing the East Mau water catchment and thereby contributing to improved livelihoods, sustainable use of resources, self-sufficiency and a market surplus of catchment products as well as environmental conservation. The study site is a very important catchment area and the origin of key rivers in Kenya. The catchment has experienced intense deforestation and haphazard human settlement in the recent past, which has resulted into inappropriate farming practices. The site covers about 600 km² stretching from the top of the hills, through newly deforested areas to old human settlement zones. Egerton University is situated within East Mau catchment. The project was managed by BOKU, ICRAF and Egerton University, with a focus on three subjects:

- The farming systems subject evaluated the potential of sustainable land use for the whole catchment, including how to re-establish organic farming practises in areas facing environmental problems.
- The marketing subject developed a model for linking organic key catchment products to the market. Part of this theme is an analysis of the national demand for organic products.
- The social systems subject investigated farmers' perception and attitudes, decision making in small holder timber farming and woody plant resources in rural land use, the motivation and acceptance for organic initiatives; it also sought to characterize information systems, linking local knowledge and decision making.

To cover these broad themes, a transdisciplinary research approach, based on several disciplinary perspectives and input from local stakeholders, seemed obvious. This allowed us to go beyond a top down approach to research. The research team included an animal scientist, a soil scientist, agronomists, agricultural economists and sociologists. The researchers offered a rich combination of academic and professional expertise on soil, agriculture, economic analyses, social and environmental sciences, modeling, environment, forestry and agroforestry. Students participating in the project also came from diverse disciplinary backgrounds.

The project also integrated ethnically diverse groups to ensure representation of a broad spectrum of life worlds. Acknowledgement of unique ethnic based contributions opened the study to access to knowledge systems generated in specific and different ethnic contexts. These forms of knowledge should not be confused with traditional knowledge. Though it may be premised on certain traditions, many years of local dynamics have resulted in emergence of knowledge that is neither local nor “modern.

Our approach employed transdisciplinarity to transcend the limitations of conventional “participatory” approaches by mainstreaming participation of diverse people throughout the research process. All workshops were participatory in nature. It was organised in such a way as to have facilitators drawn from the scientific team as well as the farmers and NGOs representatives.

However, participation has many forms and in that sense it is not more than a headline. Participation in defined in our sense, was, that many stakeholders very part of the research process and influenced the research focus as well as the interpretation of our results.

Finally, we have to keep in mind that this research project was undertaken in the context of specific political conditions. Different ethnic communities settled in the MAU catchment over the last 20 years and since then, there has been a political debate, accompanied by armed conflicts, about the management of the forests and the acceptance of different ethnic communities to live in the region or to leave. In this context the research was caught in a political tension field that influenced our ability to contact and communicate with farmers and others in some regions and of course was limiting participatory processes.

What is the promise of transdisciplinary?

Acknowledgement of the existence of multiple realities implies the need to apply multiple research methodologies. A deeper understanding is only possible by using approaches that transcend the confines of disciplines. Transdisciplinary case studies demonstrate the method's transformative nature (Stauffacher et al. 2008; Bell et al. 2009).

Basarab Nicolescu (2000) speaks of transdisciplinarity in the context of the analysis of different levels of reality that are united in transdisciplinary research. The need for transdisciplinary research arises because of the complexity of problems that transcend many interconnected realms of existence (Klein, 2004; Lawrence & Després, 2004). Lawrence and Després (2004: 399) stress that transdisciplinarity “deals with research problems and organizations that are defined from complex and heterogeneous domains”.

Nicolescu (1997, 2000) identifies three central aspects of transdisciplinary: the concept of levels of reality, the logic of the included middle and complexity. Transdisciplinarity “concerns the dynamics engendered by the action of several levels of reality at once. The discovery of these dynamics necessarily passes through disciplinary knowledge”. Though not a new discipline or a new superdiscipline, transdisciplinarity is nourished by disciplinary research; in turn, disciplinary research is clarified by transdisciplinary knowledge in a new, fertile way (Fuchs, 2008). In this sense, “disciplinary and transdisciplinary research are not antagonistic but complementary” (Nicolescu, 1997). In this context, the OAT project was designed to maximize on disciplinary diversity combined with some elements of transdisciplinarity.

Most transdisciplinary research activities are based in a northern scientific and cultural context, and the discussion of this approach in developing countries is limited (see Hurni et al., 2004, Goebel et al., 2009). However, there is evidence that elements of transdisciplinarity are in use in ethno-ecological and participatory research² in low income countries for several years, even though this research has not been explicitly identified as transdisciplinarity (see e.g. Boillat, 2007).

Inspired by our research process, our own experiences with transdisciplinarity (e.g. Freyer and Muhar, 2006; Nicolini et al., 2004; Freyer et al., 2010) and theoretical knowledge on transdisciplinarity, we identified eight themes for transdisciplinary research in context of research in low income countries. We use partly well known arguments in defining transdisciplinarity in the North and integrate new perspectives from the South.

1. In contrast to conventional research, transdisciplinary research improves the relevance of agricultural research results as a base for transforming farming and marketing systems. Knowledge gained is used explicitly for direct practical application. The usefulness and first

² The term participation is often misused as the practise of it is more public communication in form of presentation of results and a top down organised discussion in a workshop setting or a public consultation in form of an interview (see Rowe and Frewer, 2000; 2005).

recommendations how to use this knowledge is the responsibility of researchers; this is not the case in the classical neo-positivist research approach.³

2. From a neo-positivist perspective knowledge claims in science can only be made in terms of, and based upon a specific educational background (Detel, 2007: 90). The active integration of so called non-researchers into the problem identification process in transdisciplinary research is scientifically accepted. While neo-positivists claim that only scientists can interpret the world (ebda), in transdisciplinary research, this responsibility is shared between scientists and stakeholders.
3. In transdisciplinary sciences non-researcher knowledge is accepted as legitimate in its own right and recognized as being generated from outside the biotope in which scientists can enter. This knowledge includes daily practices, experiences, traditions and cultural background. Where different ethnic groups come together we have to keep in mind that enumerators (those who support identification of the farmers and organize contact, know the local specific language and have the trust of local people and help in guiding interviews) are aware of this principle, and therefore help to integrate a third quality of knowledge basis and transfer from one culture and often language to another one (see Murenga 2010).
4. New knowledge is created and/or emerges out of the clash / converge of knowledge in transdisciplinary sciences from different disciplines and different ethno-cultural backgrounds. However there is need to communicate it and to create awareness about it.
5. To understand each other in a transdisciplinary setting, researchers and others have to share their ontological and epistemological foundations (Berkes, 1999; Freyer et al., 2010). This enables everyone in their own "language" to create a meta language comprehensible for all partners.
6. The research-policy-practice link remains weak in conventional research (Eksvärd, 2010). Transdisciplinary research improves the likelihood of research translating into positive change in policy and practices. This is organized by integrating policy stakeholders into the definition of research questions, integrating them into ongoing workshops as well as translating research findings into policy recommendations.
7. Transdisciplinary projects have the potential to constitute "powerful interventions into local systems" (Thompson Klein, 2001: 114) by the "taking of ownership" (Häberli et al., 2001: 9). Through the integration of as many relevant actors as possible the chances of achieving "socially robust knowledge" (Nowotny, 2003) are enhanced (see also (Novy and Beinstein, 2009:5-6).
8. To understand the world of interviewed persons, there is need to know about their ethical context (see Boillat, 2007).

As a result of these theses, it should be clear that all participants have to move away from their traditional positions, as already mentioned by Messerli et al. (2007) for researchers. In the following we try to give some answers how we operationalised the theses. However we do not discuss the theses step by step, because in several cases the way we dealt with, was interrelated.

Participants involved and their role in the research process

In this research project, different heterogeneous groups interacted. Table 1 provides an overview of the project phases in which researchers, farmers and stakeholders were involved.

The project was undertaken by a multidisciplinary research team consisting of senior researchers and students from sociology, agricultural economics and agronomy who had different backgrounds in inter- and transdisciplinary research as well as cultural backgrounds (different nationalities and ethnics). By sharing in all phases of project development, the definition of the research objectives

³ The philosophers and social scientists Theodor W. Adorno and Karl Popper, prepared basics for these perspectives, surprisingly with two competing concepts, but they did not draw the consequences in organizing their research concepts in a transdisciplinary sense. While Popper argued that science's responsibility is to find solutions for societal problems, Adorno's stand point was that science has to identify the roots of societal problems (Raithel et al., 2009: 188).

and the methods, the researchers learned from one another and together, as well as from and with the other actors involved in the project. In addition, enumerators were responsible for data collection together with the students. The enumerators were conversant with local languages. They were Agikuyu, Kalenjin and Ogiek enumerators who assisted in translation of the questions.

The non-researcher actors involved in the project in the initial phases came from different sectors directly or indirectly concerned with organic agriculture and forestry and included NGOs, government administration, advisory services and certification bodies and farmers (including those from the Ogiek ethnic group, the Kalenjin, the Kikuyu and the Masaai). These actors were selected based on their expertise/involvement in organic agriculture and every effort was made to ensure balanced representation from sectors of organic agriculture and forestry. Through workshops, small group discussion and informal meetings, these actors shared insights on organic agriculture and agroforestry that helped to formulate a realistic view of the research tasks and approach. More specifically these discussions helped to refine the questionnaire and sampling procedure, added new research ideas, and helped to develop the justification of the research questions and findings. These actors also provided logistic support and facilitated making contacts with other key players. Both enumerators and non-researchers were contributing to trust building between interviewed persons and researchers.

Researcher and stakeholder integration and interaction

There are numerous approaches to integrating researchers from different disciplines and stakeholders into a transdisciplinary research process. The OAT-project followed a stepwise process. Including the research activities we identified in total 12 project phases describing integration and interaction with stakeholders and researchers (Table 1).

Table 1. Partners relation in the research phases.

Phases	1	2	3	4	5	6	7	8	9	10	11	12
Participants / type of relation	W	W	W	W	W	QN	QL	T	W	W		
Senior researchers												
Students												
Other researchers												
Farmers from the MAU area												
Enumerators												
Translators												
Stakeholders												

Type: QL=Qualitative research; QN=Quantitative research; T=Training; W=workshop

The following explains all phases with focus on participation, indicating the character of interdisciplinarity, the method, the target group, the issue, and any transdisciplinary character of the approach.

1. Senior researcher from different disciplines: workshop: project definition as a first framework for the research process.
2. Senior researchers, students stakeholders: workshop: identifying problems/challenges facing the farming community in the catchment and by suggesting priority interventions. Results of that workshop had consequences for some slight but not fundamental modifications of the research framework.
3. Senior researchers, students and selected stakeholders: workshop: redefining of objectives with employed students, with some consequences for the research framework and methodology.

4. Senior researchers, students, farmers and stakeholders: workshop: identification of agricultural challenges (Table 2). Results were influencing the performance of the quantitative questionnaire.
5. Senior researchers, students, farmers and selected stakeholders: workshop: exchange of experiences with trees. Collection of local knowledge on tree selection and management-practises resulted in a manual for farmers.
6. Senior researchers, students, farmers, enumerators: field studies: Quantitative survey (farmers): items from the research proposal (researcher's views) and the input from stakeholder's workshop.
7. Senior researchers, students, consumers: qualitative survey (consumers): developed based on researchers view.
8. Senior researchers, students, farmers: qualitative interview (farmers): social and cultural issues that influence farmers adoption processes.
9. Students, farmers: qualitative interviews / focus groups (farmers): During the survey, key aspects were identified for further in depth qualitative research through narrative interviews and focused group discussion.
10. Researchers from Egerton University, stakeholders, 10 farmer groups: training in nursery and tree management (farmers): distribution of seedlings and management of seedlings and trees. A second training was established on trees and organic farming techniques.
11. Senior researchers, students, 15 farmer group heads, stakeholders: workshop: Marketing of Organic Foods; supply and demand.
12. Senior researchers, students, stakeholders, farmers, other researchers: two workshops: dissemination and discussion of research results.

The following discussion is guided by our thesis as well as the research process. We identified some cross cutting issues, which are of relevance in our specific case of research in a developing country context.

Integration of stakeholders' expertise

The theme finding process, organised in a step by step integration of different disciplinary oriented researchers, stakeholders and farmers in workshop structures allowed to link the overall research question with local demands (see Table 2), strengthening the ownership of the results. Farmers were interested in concrete information on management techniques in organic farming and trees. The project group was able to offer some trainings and tree seedlings for free, but not to cover all mentioned demands. This underlines that farmer interests are different to researchers and therefore transdisciplinarity is running in a framework given by researchers, financed and committed with a specific contract of any donor. But this also demonstrates, that it is not only a research result, which could be transferred directly into practise, but also results from any workshop on a certain issue could lead to direct interventions in a local system. A good example of this a stakeholders' workshop which identified preferred agroforestry trees in Mau. Farmers' preferences provide a basis for designing interventions which focus on preferred tree species.

Table 2: Farmers' perceptions of the challenges of organic agriculture in MAU East catchment.

Category	Variables	(%)
Crop and soil management	Organic soil and crop management is labour intensive	82
	Manure is not enough for large scale organic production	79
	There is lack of technical knowledge on organic crop and soil management	70
Organic livestock	There is lack of knowledge on organic livestock production	70
	No dosage formulations are available for ethno-veterinary medicine.	60
Marketing issues	There is lack of markets for organic products	90
	There are no price differentiation between organic and conventional food products	88
	Market linkages do not exist for organic foods	82
	Consumers lack knowledge about organic products	94
	Farmers are exploited by middlemen during trade	82
	There are no organic standards	88
Social issue	Organic certification process is long and expensive	82
	Women participate more in organic production	76
	There is limited knowledge about the value of organic products	88

The relevance of ethnic characteristics and attitudes

The interaction with farmers from four different ethnic groups, was a further challenge, when claiming a transdisciplinary approach. Our workshops, trainings with farmers as well as qualitative interviews supported by enumerators from the ethnic groups, with focus on culture, traditions and habits, gave us sensitive insights for describing and understanding how different ethnic groups deal with adopting their agriculture. However, there was no reflection with enumerators, who were also responsible for the selection of farmers, about their own ontology, their experiences with the interviews, and how they dealt with information from farmers.

Farmers' with diverse ethnic background's participation in transdisciplinary research through interviews and workshops provided an arena for raising their concerns to the academic and government community. It provides another avenue for contributing to knowledge production. However the interview approach, quantitative and qualitative is mainly top down oriented, In contrary the relation differs if (a) the results of the interviews affect the research project general objectives; (b) in narrative interviews the farmer is nearly free in his argumentations; or (c) if the results of the interviews are transferred into recommendations for politicians. Wed could argue with (a) and (c) following a participatory approach, while case (b) character is not bottom up, but is more open for the farmers perceptions.

Integration of ethnic and gender dimensions in the research process was crucial in the promotion of experience-based knowledge. Unique ethnic and gender experiences were factored in through ethnic and gender sensitive workshops which ensured substantial participation of male and female stakeholders of different socio-economic status and farmers living in different areas of Mau and coming from different ethnic background. Gender and ethnic background provide not only the context for knowledge generation but also shape the research process at several stages.

How to bridge researchers' hobbyhorses and methodologies?

In the course of project implementation it also became apparent that the researchers also needed to learn to "talk to each other" based on some shared understanding of the research process. The project did not create the conditions for an open discourse about our differences in research paradigms or understanding what constitutes scientific research. This became clear for example in our debates around the following questions:

- Which research issues should be investigated with quantitative methods and ones which with qualitative methods?
- Does it make any sense to triangulate qualitative and quantitative methods and if yes, why and how should this process be organised?

- Should we follow more an inductive or a deductive approach or both in combination or something else?
- If we decide to follow a qualitative approach, do we use a narrative or a more question guided interview, a hermeneutic or a content analysis guided interpretation?

To conclude, coming together with different disciplinary backgrounds, sharing the contents of different disciplines, developing within the whole research team the questionnaires, is only one part of interdisciplinarity. Besides that, we have also to bridge the diverging knowledge between less and more experienced scientists. As a consequence, to understand each other and to extract all advantages of an interdisciplinary setting, a guided reflection on our ontological and epistemological is to integrate into the work plan. Following our thesis on quality in transdisciplinarity, we also missed the criterion of integrating any ethical debate within the research team and with farmers and stakeholders.

Observers from the observers – monitoring and evaluation of the research process

Based on understanding transdisciplinarity as an integrated researcher-non-researcher process, we failed to establish a steering group which would have had the responsibility for an internal ongoing monitoring and evaluation of our research methodologies and findings. There are some reasons for this oversight. We recognise that participation in such groups must be financed totally, that there is rivalry between different stakeholders as well as ethnics, that meetings of such groups need a neutral territory especially in that case and finally there is need that participation is motivated by any added value which must be highly transparent for all participants. Neither were we able to finance such a committee, nor were we able to play any referee function between the different groups.

In contrast, our stakeholder workshops were successful in the sense that we always realised a critical mass of stakeholders and farmers. However, we missed a committed and consistent participation of local politicians and other decision makers or stakeholders with high political influence.

Also, the attendance and motivation of farmers to participate in quantitative and qualitative interviews was high. However, this was in some cases associated with high expectation of some gain. Although this expectation, was to some extent fulfilled by the projects provision of tree seedlings to some farmers in the final phase of the project it was apparent that farmers longed for long term engagement.

The stakeholder participation at critical phases of the project helped to shaping the course of research process. For instance, the initial stakeholder workshop provided researchers with opportunity to learn from and with farmers, and identify key concerns to be taken into account in problem formulation and development of data collection instruments. The interaction with experts from government, non governmental organisation and farmers help sharpen our understanding of issues, refinement of methodological strategies, field logistic preparations. It was from the workshop that we learned the need ethnic representation in the field personnel especially enumerators.

Beside interaction with non researchers, the project provided framework for consolidation of shared researcher experiences cutting across disciplines. This meant building of networks and shared understanding of issues.

Conclusions

The integration of experience-based knowledge from diverse stakeholders with scientific knowledge in the research process improves the depth of understanding and ultimately resulting in integrated knowledge needed to tackle research problems.

The involvement of different disciplines helped to bridge knowledge gap and enhanced understanding. However, to develop a common theoretical framework and methodological understanding is a challenge for researchers with different experiences and competences. We identified that a basic

knowledge in qualitative social science is able to support the development of a common understanding. Therefore, Rosenfields (1992) that “in transdisciplinarity, researchers from different disciplines work jointly to create a shared conceptual framework that integrates and moves beyond discipline-specific theories, concepts, and approaches, to address a common problem”, is an idealistic model.

In the context of Kenya and in particular MAU area, transdisciplinarity was able to provide deeper understanding through multiple perspectives emanating from integration of views of different stakeholders in the project. However, we identified several limitations related to the ethnic characteristics, individual attitudes as well as political reality. From our experiences, it is clear that integrating stakeholders at different stages of research process yield valuable insights, improves logistics, enhances stakeholder relationships and finally enhances research output. But, mainstreaming integration of stakeholders in research process is crucial in ensuring that research is relevant to the people (farmers) or subjects as well as policy makers.

Furthermore, the participation of policy makers and administrators in workshops is influenced by societal interactions. The critical point was that the case of MAU catchment was already a political conflict, not free from violence and therefore the potential that research would become a mandate for re-establishing an environmental sound agriculture was limited. Policy makers were difficult to integrate and finally there was no concrete result because of strong political intervention in MAU catchment. A successful integration of politicians is often related that they identify an obvious added value. However, research process should not be controlled by that what politically is accepted.

In the Kenyan context, imported “western” ideas “mix” with local ideas to produce forms of knowledge that is neither traditional nor modern. Thus, integration of ethnic knowledge brings in hybrid knowledge previously often overlooked due to excessive compartmentalization of knowledge into traditional and modern. The traditional-modern distinction fails to take into account emerging in between forms of knowledge pervade contemporary African societies. However, cross fertilization of knowledge through workshops creates environments which promote synergy and synthesis in the research. There is need to be sensitized for this interface between different cultures, experiences and attitudes.

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