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## **TRANSDISCIPLINARITY AND ACTION RESEARCH TO ADDRESS THE COMPLEX ISSUES OF URBAN AGRICULTURE**

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### **Summary**

The BMBF project “Urban Agriculture as integrative element of a climate-optimized urban development” was designed as a inter- transdisciplinary research project, generating target and transformation knowledge in the field of multifunctional open space systems in the context of emerging megacities and the challenges going along with this development. One component of it is the is the Pilot Project “Peri-urban tourism and agriculture” exploring on possibilities on how to conserve and further develop the recreational benefit of small scale agriculture while improving the livelihoods of the farming families linking local tourism and peri-urban agriculture, processing and direct marketing.

This article tries to link selected challenges of a transdisciplinary research approach: framing the problem, dealing with a multitude of actors, defining the types of knowledge and following the principle of recursiveness to the almost six year lasting research process. It describes the methods that were used during the main two phases of the action research process and describes the various types of knowledge generated.

The conclusions reflect the application of the transdisciplinary approach itself, insights gained, and some limitations that the project team experienced during the application of the methods and collaboration with the various actors.

### **Keywords**

Transdisciplinarity, action research, pilot project, urban agriculture

### **1 The research project „Urban Agriculture, Casablanca”**

Under the BMBF program umbrella “Future Megacities”, the research project “Urban Agriculture as integrative element of a climate-optimized urban development Casablanca” (UAC) was implemented by a German-Moroccan consortium from April 2008 until March 2014.

The objective was to identify urban and peri-urban open-space systems for the rapidly urbanizing region of Grand Casablanca that include agriculture as key components of urban planning and which contribute to addressing the challenges to which cities are confronted: mega-urbanization, nutrition and food, weather and climate, and endogenous resources and integrated technique and governance.

The polycentric and dynamic growth of the city results in an overlap of urban and rural spheres and calls for a new understanding and design of this interaction while looking at the multifunctionality of agriculture and searching for synergies. Having recognized this fact, a different approach to identify these synergies and develop multifunctional open space systems is required specifically one that helps dealing with the high uncertainty resulting from the lack of data, innovativeness of methods, action research going along with.

An interdisciplinary and transdisciplinary research design was developed within the project and included – among others – four pilot projects to generate target and transformation knowledge for the entire UAC project and beyond.

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The Pilot Project “Urban agriculture and peri-urban tourism” deals with the thematic of the recreation within peri-urban areas which could be an interface between agriculture and urban dwellers. The area of the pilot project is a beautiful valley, situated 20 km east of Casablanca city center. The main activity within the valley is agriculture where small-scale family farms manage small parcels for vegetables production and have small husbandry systems. However, the small plots, inefficient production technology, lack of education and extension services make it difficult for farmers to make a living from agriculture. But with its attractive landscape, fresh air and green and open spaces which attracts thousands of citizens from Casablanca during the week end, tourism offers farmers opportunities to develop their activities and diversify their sources of income. The valley is consequently a perfect place to study the possible relationship and development potential between peri-urban agriculture and local tourism.

The pilot project’s overall objective is to identify synergies between the potentials and needs of the citizens and the inhabitants of the valley while trying to maintain the heritage of the valley.

## **2 The transdisciplinary approach of the UAC project**

### **2.1 Main aspects of transdisciplinarity**

Considering the many facets, dimensions and challenges of research in the context of emerging mega-cities, the research approach needs to comply with the complexity of the research field. Therefore the exact formulation of the research problem is a challenge. Four challenges are representing here the main aspects of the transdisciplinary approach developed for the research process: framing the problem, the multitude of actors, types of knowledge, reflexivity and recursiveness.

#### ***Challenge 1: Framing the problems***

Transdisciplinarity can successfully tackle complex problems and related research questions that are defined by a high interconnectivity of issues. It focuses on life-world issues that require a solution, or perhaps endeavours to transform societal problems. Anyway those problems have to be framed to be able to be addressed through a scientific approach. The phases of transdisciplinary research were centered on framing, processing and solving problems. That means that in addition to clearly defining the research object, clarifying the necessary knowledge and the necessary stakeholders were part of the problem framing.

#### ***Challenge 2: to deal with the multitude of actors***

The working beyond the traditional actors in research and include societal actors helps to identify the common research problem. As Bergmann et al. highlight “transdisciplinary research takes place at the interfaces between society and science, and is directed at the research and transformation or solution of societal problems by making the problems and the societal actors a central point of reference to which scientific resources are related and further developed” (BERGMANN et al., 2010, p.10).

The research team consisted of researchers and practitioners from 32 different institutions in

Morocco and Germany: civil society, research, administration and politics<sup>2</sup>.

The challenge of the multitude of actors is present for the pilot project as well as it has to deal with farmers, urban dwellers, administrations, researchers, private tourist investors and with associations.

Various disciplines to address the various topics on the one hand would not be sufficient; there is need for an approach that also allows to work under uncertainty. During the research process, the need for different forms of knowledge can vary. Defining and specifying the need for knowledge is one important tool to reduce complexity and to identify the actors and disciplines that have to be involved.

### ***Challenge 3: to define the knowledge needed***

In their approach to the design of transdisciplinary global-change and sustainability research, MOLL and ZANDER (2006) highlight the importance of interface management and also refer to the need for different forms of knowledge, differentiated by factual knowledge – data, and the generation of empirical and historical factual, practical and orientation knowledge. In the areas of practical research and orientation knowledge in particular, this should be based on surveys and queries into experience and facts. In their process-oriented approach, Pohl and HIRSCH HADORN (2006, p17) subdivide into three forms of required knowledge: systems knowledge (empirical data), target knowledge (explaining better practices) and transformation knowledge (goals and feasibility of proposed solutions). But transdisciplinary research takes into account that knowledge about problem fields is uncertain and social groups' stakes are high. Therefore, the production of the three forms of knowledge could face particular difficulties which are presented as follow by POHL and HIRSCH HADORN (2006):

- **Systems knowledge** confronts the difficulty of how to deal with uncertain problem fields and concrete cases with specific conditions, for which knowledge may be lacking. The uncertainties regarding the comprehension of the problem could lead to different evaluations of the need for action, for target knowledge and transformation knowledge.
- **Target knowledge** confronts the difficulty of the multiplicity of social goals and how research can deal with it regarding society's practice-related problems and collaboration between researchers and societal actor.
- **Transformation knowledge** deals with options for change which should take into account the established technologies, regulations, practices and power related to the concrete case. Options which will have to rely on existing infrastructure, on current laws, and to a certain degree on current power relations and cultural preferences, in order to have any chance to be successful.

For our pilot project, the need for the different forms of knowledge was expressed as questions at the beginning of the process to well define which knowledge is lacking (Overview 1).

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<sup>2</sup> Moroccan NGOs, local associations, local and regional administration (agriculture, urban planning, regional development), Moroccan research institutions (Université Hassan II, INAU – Institut National de l'Aménagement et Urbanisme, School of Architecture, Rabat) and German research institutions (TU Berlin: landscape architecture, climatology, chemical and process engineering, Cooperation and Consulting for Environmental Questions (kubus), Universität Hohenheim: Institute of Social Sciences in Agriculture, Chair of Agricultural Communication and Extension, Bergische Universität Wuppertal: School of Architecture, Chair of Economy of Planning and Building, fbr: Association for Rainwater Harvesting and Water Utilisation (fbr e.V.), Darmstadt).

## Overview 1: Forms of knowledge that the project should acquire

<b>Systems knowledge</b>	<p>What are relevant functional relationships between the city and agriculture within the valley?</p> <p>What are potential interactions and potential synergies between the two spheres?</p> <p>What are factors influencing the relationship and what are the main mechanisms of interaction?</p> <p>What are existing conflicts?</p> <p>How to develop and improve those interactions and synergies?</p>
<b>Target knowledge</b>	<p>Are people of the valley aware of the potential of the region?</p> <p>How do they consider the valley in relation with the regional context?</p> <p>How do they want to adapt to the new peri-urban conditions?</p> <p>How do they consider the future of the region?</p> <p>Do they already interact with tourists and do they want to develop the interactions?</p> <p>What are the plans of administrations regarding the valley?</p> <p>What could be the place of agriculture in the future in the valley?</p> <p>How are the relations between actors in the valley?</p> <p>Are people ready to implement new ideas and concepts?</p>
<b>Transformation knowledge</b>	<p>What are simple solutions to improve interaction between agriculture and tourism?</p> <p>What are simple technologies to improve agricultural production in the valley?</p> <p>How legal is the existing rural tourism in the valley?</p> <p>Are changes socially accepted in the valley? – and how can changes be promoted?</p> <p>How to reach the motivated people in the valley ready to try new concepts?</p> <p>How should the communication be developed with locals to manage to develop solutions?</p> <p>How to work with administrations to have real cooperation for development of solutions?</p>

“The resulting interdependencies between the three forms of knowledge are the main viewpoint from which the need for knowledge must be identified and structured. Research questions relating to systems, target and transformation knowledge are not isolated in transdisciplinary research; instead, they can only be answered by referring to the other two forms of knowledge” (POHL and HIRSCH HADORN, 2006).

### ***Challenge 4: a necessary recursive process***

The phases of transdisciplinary research were centered on framing, processing and solving problems. During the process, these phases continually undergo various feedback loops. The recursiveness is another important principle in the research design of the inter- and transdisciplinary research process (JAHN, 2005; POHL and HIRSCH HADORN, 2006; BERGMANN et al., 2010).

The project pursues an open, process-oriented research approach subjected to follow-up adjustments. This means that new insights and the ones generated from the research process can be applied to monitor and more precisely define the research questions, and that feedbacks occur. Throughout the whole research process, the repeated feedback loops guarantee a relation to the research problem, intensify the production of knowledge, and achieve a re-adjustment of the integrated results during every phase of the project. (POHL and HIRSCH HADORN, 2006, p.19).

The transdisciplinary design of the research process and the recursive work approach are important methodological approaches for the overall project. The last important one is the action-research approach via the pilot projects.

## 2.2 Action-research as part of the transdisciplinary approach

A pilot experiment, also called a pilot study, is a small scale preliminary study conducted in order to evaluate feasibility, time, cost, adverse events, and effect size (statistical variability) in an attempt to predict an appropriate sample size and improve upon the study design prior to performance of a full-scale research project. The design and implementation of the pilot projects enabled elements of classic participative action research to be anchored in the project structure and linked to the transdisciplinary research approach. Action research is here considered as a method of solving problems, a model or paradigm, a problem-solving process, and a series of activities and events.

The aim of the action-research related component was to connect the defined problem area with concrete questions from the field and to enable direct social action. On the one hand, the pilot projects created a mutually supportive interface between the academic and the everyday worlds – for example through a targeted link between civil society initiatives/actions, academic impulses, technological solutions and planning approaches. In addition, they were and are a social communication platform for networking the different actors, their roles and ideas.

The pilot projects formed as well a (system, target and transformation) knowledge generator for the requirements of the types of integrated urban agriculture and in relation to the existing restrictions and restraints. They supported particularly the generation of transformation knowledge in order to derive the consequences and effectiveness for the later practicability of this kind of urban agriculture.

## 3 Research methods for doing interdisciplinary and transdisciplinary research

The principle of reflexivity and recursiveness influenced the design of the project. The process of framing the problem through an extensive diagnosis phase took place in a cyclic procedure starting with a situation analysis, action planning, their implementation and the reflection before proceeding to a next cycle. As several sub-processes took place in parallel, the pilot project team had to simultaneously manage multiple cycles.

### 3.1 Overview of sub-processes over time

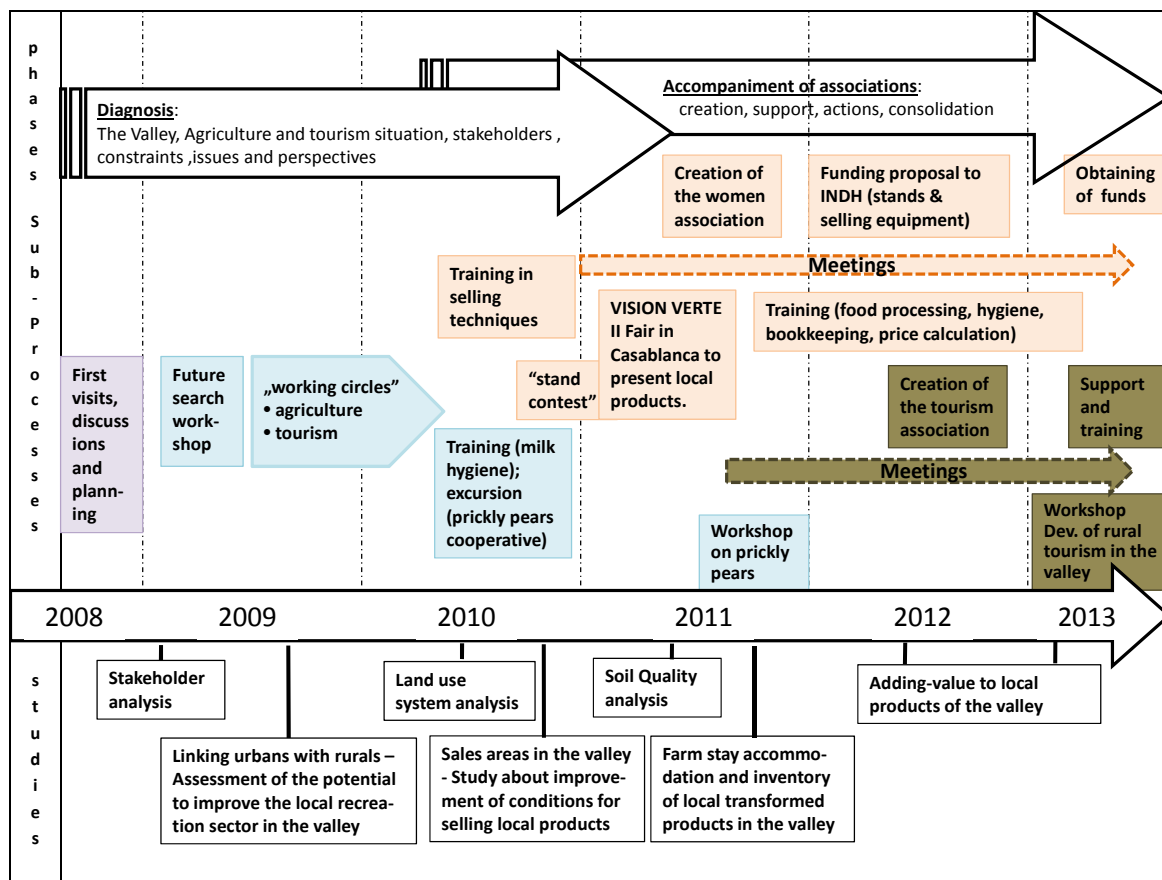
The two main working phases (diagnosis and accompaniment) and the activities of the different sub-processes as well as underlying studies are summed up in the graphic below (see Fig. 1). The first two years were almost entirely dedicated to the **diagnosis**, as it was necessary to get to know the stakeholders, the environment and getting clarity on target knowledge. From year two onwards, a large proportion of time was spent on the accompaniment of the associations<sup>3</sup> and the support of its members in the **diversification of their income** through **capacity development, value adding, and institutional support**. Over the entire life cycle of the project, **studies** were conducted by research team members and / or masters students.

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<sup>3</sup> Two associations were created during the project duration: the Association of the Women of the Valley of the Oued el Maleh” in July 2012 and the “Association for the Promotion of Tourism in the Valley Oued el Maleh” in October 2013.



**Figure 1: Phases and sub-processes of the Pilot Project ‘Peri-urban tourism and agriculture**



### 3.2 Methods used during the diagnosis phase

As indicated earlier, the Pilot Project team started with broad ideas and a lot of possible questions that could be relevant in the context of local recreation and agriculture within the city region of Casablanca. Therefore, it was of utmost importance to get into contact with possible stakeholders, and to start the diagnosis to come up with relevant problems, suitable possible collaboration constellations and ideas for joint actions.

The methods used in the diagnosis phase to generate the necessary knowledge for further action research were quite diverse. After first field visits and discussions with representatives, an extensive stakeholder analysis was conducted, followed by a future search workshop in the valley. In parallel a number of studies were conducted to better understand some special aspects of the valley: improvement of agricultural production, value adding and direct marketing of local agricultural products, tourism facilities (BAUMERT et al. 2009, MASSÉ, 2009, BERGAUER, 2010, CROZET, 2010, HART, 2010, HART et al., 2011, KRAUS, 2012, BERDOUZ, 2012). The following methods were crucial for the entire process:

The **stakeholder analysis** provided first insight to the different kinds of actors in the project region, their interests and link to agriculture and the city. It gave first information about the relationship among the various categories of people and brought into light the respective actors' views on potentials and problems they are facing. Following a 'snowball system' possible stakeholders were identified, and interviewed using a interview guideline. The results were feed into the future search workshop.

The **Future Search Workshop** was the official launch of the collaborative research work in the valley. It was designed after the ideas of Robert Jungk along three phases: critique, visioning, and realization (see JUNGK and MÜLLERT, 1981 p.73-124) and took place during 2 days

with around 200 inhabitants of the project region, representatives from the respective community and regional administration, as well as members of different research institutions. The use of this participatory process experiment (involving citizens in regional development decision-making processes) was unusual, as this was the first time farmers, 'ordinary people', were invited and given the opportunity to voice their concerns. Thus, the future search workshop was not only a method but a tool to inform the inhabitants of the valley of the project (transparency) and create awareness about the complex issue of urbanization, recreation, and agriculture.

One outcome of the Future Search Workshop was the creation of two **working circles**. Interested inhabitants of the project region decided to meet on a regular basis to deepen the analysis of the Future Search Workshop in the area of agriculture and tourism, and to develop solutions in collaboration with the project team. The working circles were meetings facilitated by the project team; the results were visualized and documented as photo minutes.

An overview of the methods used and the results obtained during this first phase is presented in the figure below (fig. 2).

**Overview 2: Methods applied and specific knowledge gained during the first research phase**

	<b>Methods used</b>	<b>Results</b>
<b>Systems knowledge</b>	Studies using participative observation, focus group interviews, individual interviews with questionnaires and guidelines. Stakeholder analysis Regular research team meeting	Better comprehension of functional relationships between the city and agriculture within the valley. Better knowledge about conflicts, mechanisms of interactions and obstacles to improve synergies between agriculture and tourism. Better aware of difficulties of participative methods as people are not used to them. Formulation of further research topics
<b>Target knowledge</b>	Stakeholder analysis; Future Search Workshop Topic-specific workshops working circles Studies using participative observation, focus group interviews, individual interviews with questionnaires and guidelines.	Better knowledge of people's life and feelings in relation with their environment Increased understanding of the inhabitants' vision about their future in relation to the valley. Better knowledge of relations between stakeholders and their potential link with the project work. Better comprehension of obstacles avoiding the development changes or the implementation of new ideas. Definition of more precise necessary target knowledge more focused on special solutions.
<b>Transformation knowledge</b>	Workshops Meetings Trainings (in improving dairy production, processing of local products, hygiene, selling techniques, etc.)	Through meetings and discussions: acquisition by stakeholders of new work methods Processes built trust and establish a collaboration process Better determination of what is possible and what is not and why.

The various methods are interrelated and generate wider, adapted and more precise research questions; the steps do not run consecutively to one-another but rather parallel and in feedback. Adjustments were necessary along this phase depending on the results of each action but also regarding (changed) local conditions.

### 3.3 Methods used during the ‘accompaniment’ phase

In the second phase of the project, decision was made to work in priority with women selling products to tourists during week-ends. Their activity is very important to link agriculture and tourism as through the sale of local products (vegetables, fruits, milk products etc.), tourism is directly linked to agriculture. Moreover, with the former work realized in the valley, it was clear that women were more ready to improve their activity and as many of them are conducting the same activity, their objectives were similar. The second priority was to work on the development of farm stay catering and accommodation services as some people were really interested in it. The questions developed for this phase were more focused on the development of those activities (see overview 3).

#### Overview 3: Forms of knowledge that the project should acquire for the transformation processes

<b>Systems knowledge</b>	How to improve the direct sale in the valley? How to develop farm stay services in the valley?
<b>Target knowledge</b>	What are the interests and the motivation of the women? Are they really interested in changing their practices? Can they work together? What are the conflicts between women? How to improve the trust between consumers and women?
<b>Transformation knowledge</b>	What are the possibilities to improve the sale conditions of the women? Which kind of material do they need? How women can deal with the informal situation of their activities? How should farm-stay accommodation and catering look like? How to get support of the administrations? Which institutionalization form is the best adapted to the situation?

Actions were undertaken to support women in their **direct marketing** activities: participative design of a common logo; design of improved stands for selling women’s products in collaboration with the local school; design of product labels; the promotion of products through leaflets; better packaging and labeling; support in participation in local and regional fairs. Support was also given to elaborate a financial proposal to finance improved sales stands and other equipment.

For the **valorization and preservation of local food knowledge**, a study was undertaken applying focus group and in-depth interviews to collect women’s knowledge on the use and preparation of local vegetables, herbs and spices, fruits, as well as dairy products, meat and eggs. The results were put together in the cookbook “Beldi for Casablanca. Products and Recipes Presented by Women of the Valley Oued El Maleh” which includes also aspects of the women’s lives. All receipts have been tested during the focus group interviews as well (GERSTER-BENTAYA et al., 2014).

The tourism association received similar support in the phase of creation of the association and the development of the financial demand for the farm stay to the national development agency INDH.

The methods used mirror again the many facets of the pilot project’s work:

**Meetings** facilitated and visualized by project team members were organized for the women and for the person interested by the farm stay approach. Regular meetings were held to create a sense of necessity for regular exchange amongst the participants. During these meetings, legal requirements were explained and discussions were held on how people could better work together. Facilitated discussions were held to find out about possible common projects.

**Thematic workshops** brought together local actors (e.g. farmers, representatives from the community administration), experts and regional administration to discuss deeper certain issues (such as the development of prickly pears production in the region, the development of tourism facilities). In addition to presentations, discussions and group work, the workshops included field visits to ease understanding and to make discussions concrete and practical.

The **Accompaniment** of the associations was a needs-based support in the form of coaching, short training courses, facilitated meetings, etc. and specifically support in project implementation; having learnt from experience with other associations on how to avoid mistakes, the project team allocated a big share of its resources for a longer lasting accompaniment process.

A trained food technologist conducted **food processing experiments** together with interested women to develop and test new products based on locally grown vegetables and fruits (cow feta cheese, Ajvar, harissa, jam made from figs and quinces, and conserved quinces and figs and vegetables).

**Awareness creation campaigns (VISION VERT)** which were organized in the frame of the overall project offered the possibilities for the pilot project members (specifically the members of the associations) to make their activities more visible within the Casablanca region, and to facilitate networking. The campaigns helped in linking the overall topic of urbanization and productive green spaces with the daily activities of the pilot project's participants.

The methods used and the results obtained during the second research phase of the pilot project are shown in the overview 4.

#### Overview 4: Methods and results of the transformation phase

	Methods used	specific/relevant knowledge
<b>Systems knowledge</b>	Regular research team meeting	local adapted solutions to develop the direct sale and the farm stay services.
<b>Target knowledge</b>	Workshops Meetings Accompaniment	Interests of people are better expressed Relations and conflicts between stakeholders are clearly identified Obstacles in group dynamics are identified as well Their motivations (or lack of motivation) to change practices are also better understood.
<b>Transformation knowledge</b>	Workshops Meetings Trainings Accompaniment Focus group interviews Experiments in processing and conserving local agricultural products	Development of concrete products (new processed products, labels, new stands) which can help women and local actors to improve their income. Improvement of linkages between agriculture and tourism through concrete products but also through the awareness of local actors. More communication between local actors and development of new activities independently of the project (cooperative, new processed products). Discussion of the associations with the local authorities.

#### 4 Experiences and conclusions: Merits and limits of the transdisciplinary research design

Transdisciplinary research wants to contribute to the development of solutions oriented towards the common goods and bridge science and life world. The action research approach and

the different methods applied in the pilot project have proven successfully to address complex life problems.

Taking time for the diagnosis, using various methods and events was helpful to understand the dynamics and major development challenges in the valley and to define actions in collaboration with different stakeholders. The different phases within the research process were necessary to generate the necessary knowledge to reach the objectives.

Being aware of the three forms of knowledge allows better communication and collaboration with the different stakeholders. Each has a different background and different interests in the project and therefore is concerned by a different form of knowledge. Farmers are clearly more interested in transformation knowledge; administrations have interests for target and transformation knowledge while researchers look for the three forms. The fact that the three forms are considered in the transdisciplinary research process improves collaboration with the different stakeholders of the project.

The flexible and participative approach of the Pilot Project has also proven its worth. Transparent communication within the team and with the stakeholders was absolutely necessary as communication is a key to reach the expected knowledge. The process is of course not without conflicts and misunderstandings as each actor has different interests.

The research process did not go on without difficulties. The participative approach has shown some risks: giving the inhabitants a voice can fuel conflicts and/or bring subliminal conflicts to the surface; quite a number of times, project members had to intervene when a member of the association used its position for their own benefit and to the detriment of the association. Moreover, it required a lot of effort to overcome local conflicts between neighbors, different associations and the three communities. The lack of transparency regarding objectives and the motivation of local associations and of the administration made cooperation difficult with some local partners. Political interests were not clearly expressed but caused great difficulties amongst local actor relationships. Any action in the valley caused rumors, so that certain actors immediately felt threatened and started 'counter actions', either to undermine the action or to assume control over it for their own purposes. It was difficult to find trustworthy local partners in the valley who were really interested in working with the project and ignore possible hearsay. Real cooperation with administrations was difficult as many were not as willing to communicate data and information as they could have. In the administration's opinion a research project should concentrate on research and administrations should be responsible for actions. The concept of action research was difficult to understand and accept by the administration which mostly thought the project should only propose concrete projects fulfilling the administration's criteria, which should then be implemented by the administration itself. But the interesting aspect of the research process was on one hand to give the floor to local actors so that they can express themselves. But it was also necessary to work with them to know better what people do not clearly express. It is a way to really reach the necessary knowledge regarding the stakeholder's interests. This however motivated in searching for solutions to work with uncertainties.

An inter- and transdisciplinary approach is absolutely necessary when working on urban agriculture. Many different actors are concerned by urban development and planning, agriculture, social or environmental issues and to address urban agriculture's issues, they have to work together. Our experience shows that every actor is important as they in one way or another always contribute to the production of valuable knowledge for the research process. The involvement of many different stakeholders allows a more intelligent appraisal of a problem. But in order to reach the expected knowledge, the methods used to bring people to work together and to collaborate are very important. The way a participative approach is carried out, meetings are conducted, communication is organized or actions implemented will have an important impact on the research process – and consequently on the generated knowledge.

The research approach has to be flexible as it deals with high uncertainty resulting from the lack of data, innovativeness of methods, action research going along with. That leads to a high need in communication between stakeholders which can be of course time and cost consuming. But it is absolutely necessary to get all actors involved within a project. All of them will not be always satisfied with the methods used or with results obtained as it is difficult to please everybody's interests. It is important to try to understand everybody's interest first, before starting to tackle a complex problem.

The action-research in the framework of a pilot project was necessary to generate concrete knowledge from the field and to obtain the necessary target and transformation knowledge regarding implementation of urban agriculture projects. The pilot project creates a mutually supportive interface between the academic and the everyday worlds and they are a social communication platform for networking the different actors, their roles and ideas. They helped to enlarge the transdisciplinary approach by including actors like farmers or private investors within the research approach. But in order to generalize or transfer the results of pilot projects, they first need to be de-contextualized, analyzed and re-contextualized before being applied in other contexts.

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