

Changes as triggers and as results of farmers' experiments: examples of organic farmers in Austria

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Abstract: Experimentation is an essential tool for farmers to develop their farming systems according to emerging changes, site-specific conditions and their personal needs. The present study examines the interrelation of changes and experiments. Which role do changes play as triggers of experiments? Which changes result from farmers' experimentation? To answer these questions, nine selected cases of Austrian organic farmers are presented and examined. The case studies reveal different types of external and internal changes as possible triggers for experiments. The cases demonstrate that a combination of different factors is involved in the initiation of an experimentation process. These nine case studies were also utilised to demonstrate the importance of changes at farm level, or personal level, as results of farmers' experimentation. Changes and modification of working methods, products and farm systems, as well as increase or modification of existing knowledge as result of experimentation highlights the importance of experiments within the learning processes. The study demonstrates that changes are no isolated occurrences, leading to a single reaction, but that change processes evolve successively or interwoven with each other.

The presented cases are examples for possible interrelations of changes and experimentation processes of farmers. As analysis is currently going on, the results presented in this paper are first insights into this complex interrelation and require further investigation to achieve in-depth comprehension of the topic.

Keywords: farmers' experiments, external and internal changes, organic farming, Austria.

Introduction

Ever-changing ecological, economic and social conditions have always characterized the reality farmers faced in their practical work. History of farming shows how farmers have continuously developed and adapted their farming systems to cope with constraints and to create opportunities out of change. Farmers are therefore actively engaged in experimentation as part of their farming routine and have an intimate knowledge of their local environment, conditions, problems, priorities and criteria for evaluation (Chambers et al., 1989, Rhoades and Bebbington, 1995, Sumberg and Okali, 1997).

Significant changes in agriculture are currently going on, resulting in challenging conditions for the farmers. In many countries farmers face a tense economic situation and criticism by the society due to modern agriculture's impact on environment and climate. Organic farming constitutes an alternative for a growing number of farmers all over the world (Vogl et al., 2005) that has experienced an increase in public acceptance and a growth "out of the niche" (Best, 2007).

Organic farming is especially site-specific, demanding detailed knowledge about the local conditions and good observation skills to being able to react to changes and constraints in an appropriate way. Conversion to organic farming in many cases implies a substantial change in the learning processes of farmers, which are different from the processes of adoption of "ready-made" innovations in conventional farm management. Farmers practicing organic agriculture must learn to apply general ecological principles to the time- and context-specific situation and to their own locality (Röling and Wagemakers, 2000).

An experiment can be described as "the action of trying anything, or putting it to proof; a test, trial; an expedient or remedy to be tried; a tentative procedure" (OED 1992). Experimentation is an essential tool for farmers to develop their farming systems according to site-specific conditions, emerging constraints and their personal needs. Through experimenting, farmers learn, gain experience, and innovate.

Changes in the context of this study refer to external or internal farm related factors that for specific reasons have become different. These changed factors may constitute constraints or opportunities for the farmer, depending significantly on the personality of the respective person. What is a constraint for one farmer can be seen as an opportunity by another farmer. Furthermore, farmers create opportunities by actively effecting change.

It is feasible to assume that experiments are key elements to maintain and secure the adaptive character of a farm in the face of continuously changing conditions. In a case study about family farms in the southeast of Austria, Jiggins et al. (2000) conclude that organic farmers in the studied region have proven to be a large, growing and creative force. Through experimenting, they create niches for their products, build up new market relations (e.g. box schemes, direct producer-consumer trading, community-supported farming, etc.) and create networks of suppliers, support organisations and information. Nine case studies of Austrian organic farmers are presented in this study, in order to examine the interrelation of changes and experiments. The study raises the following questions: Which role do changes play as triggers of experiments, and which changes result from farmers' experimentation?

Interrelation of change and experiments

Maintaining the adaptive capacity of a farm implies the ability to cope with changes in both external and internal conditions (Milestad and Darnhofer, 2003). Experiments are central features to create and maintain the adaptive character of a farm. The circular model (Figure 1) illustrates that the interrelation of changes and experiments is not a linear event, but rather a complex, continuous process with changes emerging and influencing the process at different stages, or resulting out of the process itself. The model is based on Mak (2001), who illustrated farmer testing and recombination of new elements within their rice-based farming system. Mak concludes that continual experimentation helps farmers to match their farming systems to constantly changing circumstances.

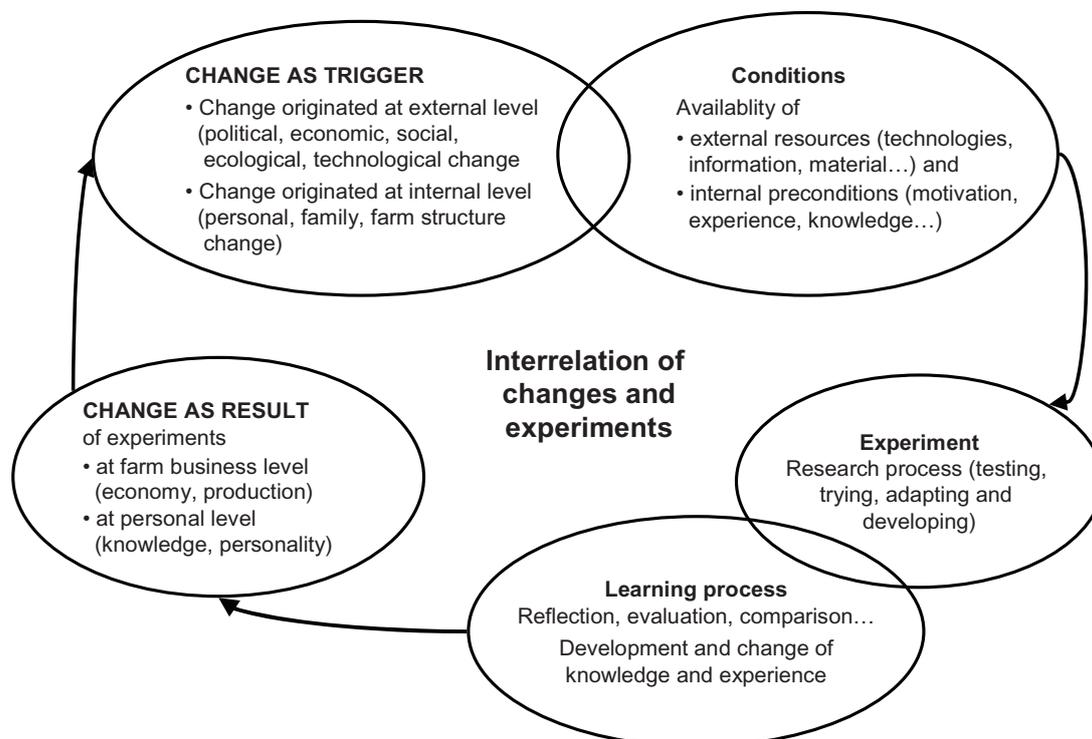


Figure 1. The interrelation of changes and experiments

Research methods and data evaluation

The present study is part of a comprehensive research project about organic farmers' experimentations and learning processes carried out during the years 2007 and 2008. Semi-structured interviews with organic farmers and other actors within the organic farming movement (such as advisors or representatives of organic farmers' institutions) were conducted. Farm walks and photographic documentation were carried out during the visits on organic farms to complement the perception obtained during the interviews. Emphasis was given to motives, triggers, methods and outcomes of experiments that organic farmers conduct. To reveal the continued processes of change throughout the history of the farm, a timeline was used at the beginning of each interview, asking the interview partner for major changes and events that occurred on his or her farm since the farmer has started working at the present farm. Asking the farmers for changes on the farm was based on the hypothesis that changes may be related to experimentation processes of the farmers.

The interviews were recorded after prior informed consent. Data analysis started with the transcription of the digitally recorded interviews. Coding of the transcripts using the software package ATLAS.ti was carried out. ATLAS.ti is a software that enables the analysis of qualitative data, offering tools to manage, extract, compare, explore, and reassemble pieces from large amounts of data in systematic ways. The present study describes and discusses preliminary results obtained through the analysis of nine case studies of organic farmers.

Case study of organic farmers in Austria

Intermediate results obtained from semi-structured interviews show different roles that change might play in relation to experiments. The cases represent examples for possible interrelations of changes and experimentation processes of farmers. As analysis is currently going on, the results presented in this paper are first insights into this complex interrelation and need further investigation to achieve in-depth comprehension of the topic.

Changes as triggers of experiments

Two different types of changes to farming systems are distinguished (Figure 2): First, external change can be defined as change originated outside the farm level. External change occurs in the political, economic, social, technologic, and ecologic environment. Second, change originated within the farm level (farm, family and farmer) is referred to as internal change. Internal changes may concern labour organisation, work cycle, organisation of production, income activities and budgeting (Mak, 2001).

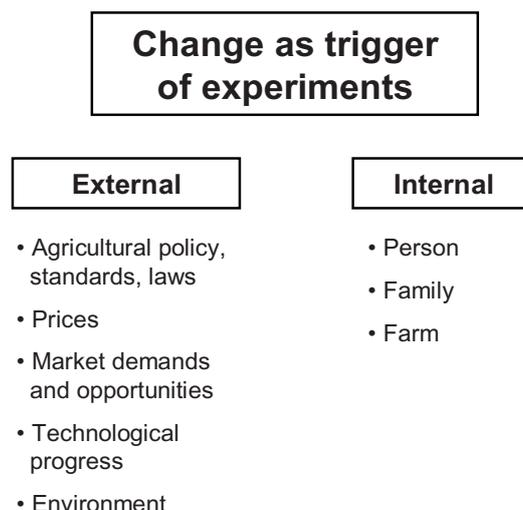


Figure 2. Different types of change as trigger of experiments

External change

Five different changes originating outside the farm level are presented as examples for external change involved in the initiation of farmers' experiments (Table 1): changes in agricultural policies and standards refer to modifications of or addition to established regulations. Changing prices can be increases or decreases in price levels for agricultural products. Changes in market demands mainly regard to new market opportunities taken up by the farmers. Technological progress refers to new developments in technology (e.g. machinery, information technology). Ecological change refers to changes in the natural environment (e.g. occurrence of pests and diseases, changes in physical conditions, like precipitation, temperature or wind force). These external changes frequently interact; e.g. change in agricultural policies is likely to have significant effects on prices of certain agricultural products.

Table 1. External change as trigger of experiments.

Case	External change in	Example
1	Agricultural policies / standards	Implementation of milk quota system triggers manufacturing of milk products
2	Prices	Increased number of competitors triggers cultivation of alternative crop
3	Environment	Increase in erosion and wild pig population triggers cultivation of clover grass in stead of maize
4	Market demands and opportunities	Cultivation of green asparagus to provide supermarket chain
5	Technological progress	Access to information through the internet triggers initiation of worm-composting

In the following, one case is used to illustrate each change factor. The interviews were conducted in German. The following sections of the interviews were translated to English by the author.

Case 1 – Change in agricultural policy

The implementation of the milk quota system in 1984 was triggering the processing of milk products at the farm. The farmer, a 52 year old woman, remembers the change vividly:

“I really got angry about that [the milk quota regulation], and I thought, ‘I am not going to give our milk away as a gift.’ And so I started to produce curd cheese. (...) The quality was lousy at that time, from today’s point of view. But the people bought it. It was really great that the customers supported these steps of development.”

In the following years the woman continuously broadened the range of milk products manufactured on the farm through experimenting with the most appropriate recipes.

In this case the change in policies has acted as trigger. The woman faced this change actively and decided to create a market opportunity out of this problematic situation. In addition, the demand for homemade curd cheese has been expressed by some neighbours, so customer demand was also an influencing factor for the decision of the woman to experiment with the elaboration of this particular milk product.

Case 2 – Changing prices

In this case the 47 years old farmer has been cultivating anise seed already for some years, conducting continuous experimentation to find the most appropriate variety for his soils, as well as the best harvesting method to achieve an appealing light-green colour of the seeds. After some years the increased number of competitors caused a price decline for anise, so the farmer decided to stop cultivating anise seed and instead started the cultivation of vegetables for deep-freezing. He has become well known for his knowledge about vegetable growing. In the following the farmer briefly describes one of his experiments:

“It’s like that; many cultures just happen because firms or traders call me and ask me if I couldn’t grow that for them. Once I did something for Switzerland: Dried pole beans. Things that I even didn’t know that they existed. (...) It [the drying of the beans] was considerably more difficult than I would have thought.”

The case of this farmer gives an example of falling prices as a trigger to start experiments with alternative crops. The strategy of shifting to alternative crops as soon as the number of competitors rises and the prices decline is characterized by the farmer as typical farming strategy of him. He regularly applied this shifting strategy on his farm. The farmer mentioned curiosity and a certain “spirit of research” as factors that considerably influence his propensity to conduct experiments. As he puts it:

“I don’t rest on things that I already know how to do.”

Case 3 – Environmental change

After having converted to organic farming in 1994 (at the age of 40), the dairy farmer had to change from the cultivation of maize for cow feed to clover grass, mainly because of the following reasons:

“First, the hillside situation and the inclination, we couldn’t do mechanical weeding, when we hoed we had the erosion. The next thing was the wild pigs. The wild pigs escalated more and more.”

Experiments with different mixtures of clover grass for making silage started at that time and are still going on. The farmer changed from commercial mixtures to self-made mixtures, because commercial seed breeding has developed increasingly precocious clover grass for intensive production, i.e. the grass matures early in the year and therefore gets hard and woody, which is not suitable for his practice of late mowing. He currently uses red clover seed harvested at his farm, and mixes it with different types of commercial pasture seed mixtures.

In the present case, an important factor that caused his shift to clover grass was the increased erosion, which is a result of the farmer’s modified land management in the form of mechanical weeding. The initiation of mechanical weeding in turn resulted out of his conversion to organic farming, a change that originated at the farm level. The external environmental change is represented by the increasing wild pig population that has considerably damaged his maize fields. This environmental change constitutes an additional factor for the farmer to decide shifting from maize to clover grass.

Case 4 – Changed market demands

In 1994 the farmer stopped milk production. At that time he was 30 years old and was searching for an appropriate production alternative in vegetable growing. To explore the market opportunities for different vegetables, he decided to approach the buying agent of a big international supermarket chain. In a personal conversation, the representative of the supermarket commented that he would be interested in green asparagus to supply the company:

“In whole Austria he couldn’t get green asparagus, because some 10 or 12 years ago green asparagus had the image of being inferior white asparagus. (...) And already at that time he [the buying agent] said, ‘That is coming’ and he could need that. And so I started the experiment.”

In the first years after having started to grow green asparagus the farmer faced several constraints. The planting density a plant breeder had recommended turned out to be too high, causing a lot of manual work, as machines were not able to pass in the densely grown rows. Pests were also a considerable problem. Continuous experimentations, observations and modifications over the years lead to satisfying solutions.

The fundamental condition for the start of asparagus cultivation was the farmer’s decision to explore the market opportunities. The changed market demand gave the impulse to start experimenting with asparagus production. As mentioned above, an important internal change had already happened before: the decision to quit dairy farming to become more independent from daily farm work. The cultivation of vegetables resulted in more independence for the farm family, due to seasonal work peaks followed by periods of spare time.

Case 5 – Changed technology

In the year 1998, when the farmer was 28 years old, he found information about worm composting in the internet and was fascinated by the idea:

“At that time I have been one of the first ones that had access to the internet; I think it was via Germany. (...) I was fascinated that it was possible to send an E-mail in real time to a professor in America, somebody who is the leading scientist worldwide [for this topic] (...). The know-how [about worm composting] was very concentrated there, discussion fora and all sorts of things already existed and you were able to learn a lot, and then all the literature you could order online. (...) Then I started to play around and try by myself.”

Over the next years the farmer built up his own small-scale worm-composting plant and is currently planning to patent the compost harvesting mechanism that has been developed by him.

The farmer used the opportunity offered by technological advance in the form of the internet. In this case the internet was not indispensable to initiate those experiments, but facilitated the access to information and know-how.

Internal change

Internal changes are defined as changes originating at the farm level (concerning the farmer, the family and the farm). At the level of the person, changes are due to internal reflections caused by observations, new information or experiences. At the family level, changes concern the structure of the family and/or individual changes in the life of family members affecting the family (e.g. beginning or termination of partnerships, birth of children, occupational changes). At the farm level changes are related to different properties and elements of the farm (e.g. farm production, buildings, acreage, equipment). Data evaluation revealed examples for internal changes at different levels (Table 2).

Table 2. Internal change as trigger of experiments.

Case	Level / Kind of internal change	Example
6	Level of person	Observations triggered documentation of supporting and inhibiting effects of different plants in the vineyard
7	Level of family	Retired father cultivates vegetables, excess produce triggers experiments with tinned vegetables
8	Level of farm	End of dairy production leaves pastures without use, start of free-range geese keeping
9	Not influenced internal change	Accident on the farm and long convalescence triggered experiments with organic vegetable growing

Case 6 – Change at the level of the person

In 1988, at the age of 36, the farmer and wine grower won the environmental citizen prize of the province for his study on supporting and inhibiting effects of plants growing in vineyards. The study started with an interesting observation:

“We were planting a new vineyard and my father still had a say at that time and said, ‘We plant a sack of potatoes for subsistence.’ (...) In the rows between the vines there was enough space, and so we always laid one potato between two vines. (...) The potatoes were growing beautifully, but the vines not at all. (...) There was a three year-long depression of growth because of the potatoes. Meanwhile we know that all solanaceous plants, like the potato, are antagonists of the vine. (...) That prompted me to observe, which plants go with the vine. (...) At that time I surveyed virtually all the plants growing here, which ones are supporting and which ones are inhibiting the growth of the vine.”

In this case, the observation of the potatoes in the vineyard caused an intensive process of internal reflections, triggering the farmer to survey plants in vineyards and their effects on vines.

Case 7 – Change at the level of the family

The interviewed woman is not descended from a farm family. When she married a farmer she herself became a full-time farmer. When her father retired, she was about 30 years old. Her father, an enthusiastic hobby gardener, started to cultivate vegetables on a plot at his daughter’s farm, because he had enough time in his retirement:

“He wanted a plot, and then he worked the plot on his own. Over the years it became bigger and bigger (...). Then there were too many zucchini, there were too many tomatoes, and so I started to search for ideas, ‘How can I make use of this, what can I do?’ And I was like a sponge, I am still like this, when a customer or somebody else says, ‘There is a fantastic recipe!’ then I try that. When I think this could work well, I do it.”

The vegetable harvest was overwhelming and she had to find ways to deal with it. So she started to experiment with different recipes to preserve the vegetables. The recipes she used to produce tinned vegetables are her own creations as well as ideas from other people (e.g. friends, neighbours, customers of her farm shop), often modified and improved by her. She also conducted experiments regarding the production process of the tinned vegetables, basically to save labour.

Case 8 – Change at the farm level

In this example, the 23 years old farmer remembers how his father has stopped dairy farming:

“We had 25 milking cows and we threw them out, now we only have our six suckler cows. But we had a crazy acreage of pasture at that time. Then we said, it is really a pity, because selling the hay doesn't pay. And so we started with the geese.”

This case illustrates how a causal chain of different external and internal changes triggered the experiment of free-range geese keeping: First, the end of dairy farming, a decision made by the farmer's father; and second, the lack of use of the pastures. Due to the low price for hay the farmer had to think about alternatives to make use of the pastures. Another important external factor appeared at the same time: A regional organisation arranged a meeting about free-range geese keeping. The change at the farm level, in the form of the unused pastures combined with the information input offered by the meeting triggered the initiation of the experiment of geese keeping. In the beginning the geese were slaughtered and plucked by a regional organisation. But the farmer was not satisfied with the quality of plucking, because the skin of the slaughtered geese was frequently disrupted. So they started experimenting with hand-plucking at the farm:

“We have always been slaughtering the chickens on our own, and we had three ducks each year. Therefore we knew approximately, with the steamer and that. The grandmother still knew about that, she was still quite fit at that time. And all these experiences we brought together. And now we already do it [hand-plucking] for 10 years and it works very well.”

Case 9 – Not influenced change

In this case the farmer talked about a change at the personal level that he had no influence on: a working accident the farmer had at the farm in 1987 at the age of 41. At that time he was still a conventional vegetable grower, based on intensive greenhouse production:

“After the accident I didn't really recover, and then I consulted an alternative practitioner. (...) During the conversation he said it would be advisable to convert to organic farming, because that would also improve my health. And in 1987 I already had met some organic farmers. Then I took a course and in 1989 we experimented with organic production in the greenhouse, without having converted officially. (...) We actually were quite successful, and then we officially converted to organic farming [in 1990].”

In this interview the farmer mentioned the accident as one of the most important changes that has happened in his life, causing a chain of further changes that in consequence resulted in the initiation of experiments with organic vegetable growing. An important impulse to consider converting to organic farming was the advice of the alternative practitioner. This caused a more intensive contact with organic farmers and interest in different courses about alternative farming systems. His own experiments with organic vegetable production were finally the most significant motivation to officially convert to organic farming.

Changes as results of experiments

Changes as results of experiments can be divided into changes at the level of the farm business and at the level of the person (Figure 1). At farm business level, experiments may result in changes concerning the production level (e.g. dimension and organisation of the production, changed production methods), and/or the level of economy of the farm business, regarding sales, marketing or economic autonomy of the farm. At the level of the person, experiments may cause changes regarding knowledge, like increase of knowledge and experience or modified knowledge, affirmation or falsification of a hypothesis, and/or changes regarding personality, like satisfaction and contentment with the private or work situation, as well as reputation, e.g. within the (farming) community.

Changes that farmers effected through their experiments are illustrated by means of the same nine case studies already presented in the previous chapter. It can be assumed that in most of the cases changes concern several aspects of the farm business level as well as the personal level. In the following, not all the changes that actually resulted out of the experimentation process are described, but only the main change for each of the nine cases is specified (Table 3).

Table 3. Different types of changes as results of experiments.

Case	Main change regards	Example
1	Farm business level (economy)	Manufacturing a variety of milk products caused an expansion of direct marketing
2	Personal level (personality)	Considerable practical knowledge in crop production caused good reputation as skilled cultivator for demanding crops
3	Personal level (knowledge)	Trials with grassland mixtures generated in-depth knowledge about their qualities within crop rotation and suitability as cow feed
4	Farm business level (production)	Cultivation of asparagus enables periods of spare time
5	Farm business level (economy)	Continued improvement in processing of worm-compost created a high-quality product that promises good sales
6	Personal level (personality)	Farmers' survey on plants in vineyards resulted in in-depth knowledge about inhibiting and triggering plants for vines
7	Farm business level (production)	Manufacturing tinned vegetables broadens the product range of the farm shop
8	Farm business level (production)	Shift from dairy cows to geese keeping caused reorganisation of animal husbandry
9	Personal level (personality)	Conversion to organic farming resulted in personal contentment and increased enthusiasm for farm work

Discussion and conclusion

The study demonstrates how organic farmers deal with change in a creative way, by taking change as trigger for experiments. Furthermore it is shown, which changes result from farmers' experimentation, highlighting how farmers effect changes through experimenting.

What changes trigger farmers' experiments? The case study presents examples for two categories of changes: external changes, originating outside the farm level, and internal changes, originating within the farm level. Emerging changes can act as constraints or as opportunities for farmers. It depends on the personality of the farmer if a change is experienced as constraint or as opportunity, and on the ability of the farmer to create opportunities out of ever-changing circumstances.

In a case study of New Zealand coping strategies of family farms that have been facing radical economic reforms are demonstrated. The reforms implemented by the government exposed the farmers to the unpredictable developments of the global market. At the farm level, adjustment strategies included modifications in farm scale and type, reductions in farm and/or household expenditure, reorganisation of labour (such as off-farm work and utilisation of contracted labour) and alterations of physical and economic farm practices. Problematic effects resulting from these changes are the lack of time because of off-farm work, the reduced attachment to the farm and the stress resulting from on- and off-farm work burden, as well as the oppressive economic situation of the farm (Johnsen, 2004).

The situation described in the case study of New Zealand is comparable with experiences of farmers in the alpine areas of Austria that are confronted with low prices for milk and the limited production alternatives because of geographic and climatic conditions. Most of the organic farmers interviewed in alpine regions reported lack of time due to off-farm work and a tense economic situation. These factors were even mentioned as inhibitors of experiments and on-farm trials. A farmer put this situation into words:

"You need so much time for breadwinning. We have to work off-farm, we are 'moonshine-farmers': During the day we work for the company and at night we come home and toil on the farm. And then we often don't have the time to sit down and think: (...) Why is it like this? How could it work in a different way? What else could I try? "

A contrasting case study from France demonstrates that lack of time is not only a possible inhibitor of experimentation, but may as well be a powerful trigger to start experimenting with labour-saving solutions. In the case study dairy farmers in Central France conduct experiments with different types of simplified dairy herd management, adapting even radical innovations on milking practices (Cournut and Dedieu, 2006).

Change acting as an opportunity, like emerging market opportunities, triggered interesting experiments by the interviewed farmers. According to Bentley (2006), peasant farmers in Latin America experiment to adapt to changes in their economic environment. Bentley presents case examples referring to experiments with commercial vegetable growing triggered by expanded market opportunities. In the case of changes acting as opportunities, the personality of the farmer again plays an important role. The farmer decides if the opportunity is detected and taken up to benefit the farm enterprise.

In the majority of the cases a combination of different changes, as well as factors that are no changes (e.g. availability of resources, personal motivation to experiment) is triggering the experimentation process. Because of the complex interaction of different factors influencing the initiation of an experiment, it is probable that not all triggering factors, like changed information sources, changed interests and/or changed personal contacts, have been explicitly discussed in the interviews.

Considering the role of changes as results of experiments it is feasible to draw the conclusion that every experiment results in a bigger or smaller change in knowledge, in the form of increase or modification of existing knowledge. It is by experimenting that farmers learn about their social, economic and ecological environments. Environments are always changing, frequently due to the very process of experimentation (Rhoades and Bebbington, 1995).

Finally, the study demonstrates that changes are no isolated occurrences, leading to a single reaction, but that changes cause continuous change processes, evolving successively or interwoven with each other. Each variation of a given practice is not an abrupt or discrete event, but is enacted through a series of ongoing adaptations and alterations that draw on previous variations and mediate future ones (Darnhofer, 2006).

Farmers' experiments are strategies to deal with ongoing change. Furthermore experiments are tools to design and develop farming systems according to the farmers' needs. The personal characteristics of a farmer are likely to be the most significant factors in the interrelation of changes and experiments, because it is the farmer who decides how to face changes, how to turn changing circumstances into opportunities, and how to generate beneficial changes through experimenting. The importance of personal factors in the interrelation of changes and experiments will be central for further analysis.

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