Building Farm Resilience

Challenges and Prospects for Organic Farming

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Abstract

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Organic farming emerged as a social movement promoting social justice and ecological sustainability within agriculture. In recent years, the organic sector has grown substantially throughout Europe. One contributing factor is strong policy support from the European Union, based on the general understanding that organic farming is conducive for sustainable development. Austria provides a relevant example of this development, both in terms of the expanding organic sector and in terms of national policy support. For this purpose, an exploratory case study in Austria was chosen as the main setting of this thesis.

The concept of social-ecological resilience is found suitable as a framework to discuss sustainable agriculture in Europe since it takes the dynamics and interdependence of social and ecological systems into account. Social-ecological resilience has three defining characteristics: the amount of change a system can undergo while maintaining its functions and structures, the degree of self-organization, and the capacity for adaptation and learning.

The objective of this thesis is to increase understanding of the development of organic farming by exploring the relation between the IFOAM Basic Standards of organic farming, farmers' perspectives on organic farming, and the actual development of organic farming practices. A further objective is to develop the concept of farm resilience and to analyze organic farming within a social-ecological resilience framework.

Analysis of the case study shows that farmers exhibit dual perspectives on organic farming. They see it as a preferred farming practice that promotes sustainable development but also as an imposed policy that makes farmers more dependent on subsidies. The resilience analysis finds that organic farming builds farm resilience if interpreted as in the IFOAM Basic Standards, while current organic farming practice may compromise farm resilience. Thus, organic farming has the capacity to build farm resilience provided the IFOAM Basic Standards are translated into practice.

This thesis concludes that shifting the focus to qualitative aspects of organic farming is paramount during the current period of expansion. Farm resilience is found to be a useful concept to analyze farming systems; it also lends itself as an analytical tool for policy development.

Key words: farming systems research, sustainable agriculture, ecological agriculture, organic principles, traditional farming, EC Regulation 2092/91, Sölktäler, Marchfeld.

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Contents

Appendix

Papers I-IV

The present thesis is based on the following appended papers, which will be referred to by their Roman numerals:

I. Hadatsch, S., Milestad, R. & Ljung, M. Sustaining farming and farming sustainably. The (mis)match between farmers' perspectives and organic farming: a case study from an alpine region in Austria. In Buller, H., Hoggart, K. & Daugstad, K. (Eds.). *The Environment and Rural Development*. Ashgate. London, UK. (In revision).

II. Milestad, R. & Hadatsch, S. Growing out of the niche – can organic agriculture keep its promises? A study of two Austrian cases. (In press, *American Journal of Alternative Agriculture*).

III. Milestad, R. & Darnhofer, I. Building farm resilience: the prospects and challenges of organic farming. (In press, *Journal of Sustainable Agriculture*).

IV. Milestad, R. & Hadatsch, S. Organic farming and social-ecological resilience: the alpine valleys of Sölktäler, Austria. (In review, *Conservation Ecology*).

Papers II & III are printed by permission of the journals concerned.

Note on the authorship of the papers

Paper I: I wrote this paper drawing on valuable input from Sonja Hadatsch and Magnus Ljung. Sonja Hadatsch and I carried out the empirical study and wrote the project report. The paper was written as a contribution to a book, which will be published during 2003.

Paper II: The paper was initially written for a conference, and then re-written for publication. I wrote and edited the paper with input from Sonja Hadatsch. She and her colleagues carried out the first case study mentioned in this paper, while the second case study was the same as in paper I.

Paper III: Ika Darnhofer and I originally wrote the paper for a conference, and re-wrote it for publication. Ika Darnhofer and I worked together from the start to the final version.

Paper IV: I wrote and edited this paper drawing on empirical research from my cooperation with Sonja Hadatsch.

Moreover, I participated in formulating and writing the application and the report of the research project: *Flächendeckende Umstellung auf biologischen Landbau: Integrative Akzeptanz- und Wirkungsanalyse anhand ausgewählter Untersuchungsregionen. Programm Kulturlandschaftsforschung* (Bartel *et al.*, 2002). The empirical research for papers I, II & IV was carried out within this project.

Prologue

The road towards this final version of my thesis has been narrow and winding. I have traveled down for it over four years. Years which have been rich in experiences and learning – sometimes tiresome, but mostly enjoyable. Ever since I began as an agronomy student in Uppsala, the issues of sustainable use of natural resources and human survival on Earth have intrigued me – steering my path towards sustainable agriculture and organic farming. My background and training has given me a particular perspective – the view that humans depend on life-supporting ecosystems. Furthermore, farmers intrigue me. The lives they lead, the knowledge they have, and the sacrifices they make in order to produce food, fibers and landscapes is an inexhaustible source of inspiration. For me, the goal of agricultural research is to contribute to resilient farms and sustainable food systems – both in social and ecological terms. I hope that my thesis makes a positive contribution in this direction.

List of abbreviations and relevant concepts

This list provides the definitions and interpretations of the different concepts used in this thesis.

Adaptive cycle	A heuristic model of ecosystem dynamics with four phases of ecosystem development: exploitation, conservation, release and reorganization (Holling, 1986). The cycle embraces two objectives: growth and stability on the one hand, and change and variability on the other (Holling, 2001). The release and reorganization phases play a key role in resilience theory since they provide an opportunity for system renewal.
Agro-ecosystem	A complex of air, water, soil, plants, animals, micro-organisms and abiotic elements in a bounded area that people have modified for the purposes of agricultural production (Conway, 1991).
Agro-ecology	The area of study providing the basic ecological principles for how to study, design and manage agro-ecosystems that are productive, resource efficient, culturally sensitive, socially just and economically viable (Altieri, 2002). Agro-ecology emphasizes the interrelatedness of all agro-ecosystem components and the complex dynamics of ecological processes (Vandermeer, 1995). The way the concept is understood herein includes humans as part of the system.
CAP	The Common Agricultural Policy of the European Union.
Conventional agriculture	All agriculture that is not certified organic.
Conventionalization of organic farming	A process that the organic sector can undergo, after which it increasingly resembles the mainstream agriculture and food sector (Hall & Mogyorody, 2001).
Conversion to organic farming	The process a conventional farm goes through before it can be certified as organic.
EU	The European Union.
European Council Regulations	A binding regulation issued by the Council of the European Union (EC). Under the treaty establishing the European Community, the Council is the legislative body of the Community. It co-ordinates the economic policies of the Member States.

Farming systems research (FSR)	A set of methods for researchers to understand farm households and their decision-making for the purpose of increasing efficiency in the use of economic, social, human and natural resources for agricultural development. Originally FSR focused on small-scale and resource poor farmers in less developed countries (*cf.* Collinson, 2000a).
IFOAM	The International Federation of Organic Agricultural Movements, founded in 1972.
IFOAM Basic Standards	A set of principles underlying organic farming, formulated and revised by the IFOAM.
Institutionalization of organic farming	The process under which organic farming has been formalized in regulations, and accepted by policy makers and the agricultural market.
Organic farming	The collective concept for an alternative agricultural movement that emerged during the 20th century. The EC Regulation 2092/91 defines what is now termed organic farming in the EU. Other terms for organic farming are organic agriculture, biological agriculture, and ecological agriculture. There are also more specific branches within organic farming, *e.g.* biodynamic agriculture. 'Organic' is the common English term.
Perspective	Evaluation and description of a phenomenon (object) from the subject's different mental positions. There may be multiple perspectives represented in a group, but perspectives can also be shared within the group. When one person expresses multiple perspectives in similar contexts, this is called multi-perspectivity (Lüscher, 1990; Ljung, 2001).
Resilience	The capacity of a system to undergo disturbance while maintaining its functions and controls (Holling, 1986). Resilience is measured by the magnitude of disturbance a system can tolerate and still persist (Gunderson, 2000). Characteristics of social-ecological resilience are: buffer capacity, self-organization, and adaptive capacity (*cf.* Carpenter *et al*., 2001).
Sustainable Development	Progress that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987).

Systemic thinking	The idea that whole entities are more and possess different characteristics than the sum of their parts. It is concerned with processes, interactions and change (*cf.* Flood, 1999). Systemic thinking reveals dynamic complexity and is contextual. A consequence of systemic thinking is that the observer is part of the system (Ison & Blackmore, 1997).
Traditional farming	Farming practices that farmers have developed or inherited throughout centuries. These are normally complex, adapted to local conditions and have helped farmers to manage environments to meet their subsistence needs without external inputs (Bätzing, 1991; Gliessman, 1998; Altieri, 2002).
Traditional ecological knowledge	A term used to describe the knowledge of indigenous cultures about their environment and the management practices that build on that knowledge. An attribute of societies with historical continuity in resource use practice (Berkes, Colding & Folke, 2000).

Introduction

As the world changes at an increasing speed and as the planet becomes more and more dominated by humans (Vitousek *et al*., 1997) it is vital to grapple with the interdependence between humans and ecosystems. Humans depend on the capacity of ecosystems to provide ecological goods and services (de Groot, 1992; Daily, 1997). Food and fibers from agriculture are essential and obvious examples of these goods. Agriculture can be considered a linked social-ecological system since people manage natural resources for their own purposes and in turn, respond to feedback from the ecosystem. Humans need to understand the dynamics of the linked agro-ecosystems in order to secure food production. Organizations and institutions that cope with both the dynamics of the agro-ecosystem and the social system are highly relevant in this respect (*cf.* Berkes & Folke, 1998; Berkes, Folke & Colding, 2003). In my view any research that strives to understand farming activities qualitatively, needs to do so from a social and ecological perspective simultaneously. The integrated theory of resilience, as developed by the Resilience Alliance, offers a framework for this (Holling, 1973; Berkes & Folke, 1998; Peterson, Allen & Holling, 1998; Gunderson, 2000; Carpenter *et al*., 2001; Gunderson & Holling, 2002; Berkes *et al*., 2003).

Agriculture is a fundamental human activity and crucial for survival on Earth. Agricultural practice has changed and co-evolved with human development. The changes occurring in food production over the last 50 years have been exceptional. The use of fossil fuels, pesticides, artificial fertilizers and machinery has boosted production in industrialized countries and in Green Revolution areas (Conway & Barbier, 1990; Björklund, Limburg & Rydberg, 1999). From a situation characterized by food shortages after World War II, the EU has grown to be a major player in the global food market and now in fact seeks to reduce excess production. However, progress in agricultural productivity has been achieved at the cost of long-term degradation of biophysical environments (Soule & Piper, 1992; Tilman *et al*., 2002). In addition, the social fabric of rural areas has changed radically as a consequence of specialization and intensification of agriculture (Pretty, 1998).

These changes sparked others. While the agricultural sector industrialized, organic farming emerged in several countries – partly as a reaction to the perceived negative consequences associated with industrial agriculture. Organic farming builds on agro-ecological knowledge and has a social agenda, that farmers should have a reasonable income and consumers should have safe, high quality food (*cf.* IFOAM, 2002). Organic farming is now recognized as one way to achieve sustainable development of agriculture (European Council, 2001). In the 1990s, policy makers in European national governments and in the EU granted substantial financial support to organic farms (Lampkin *et al*., 1999). In addition, agri-business discovered the potential in organic products and a viable organic market has emerged. Ever since policy makers, supermarkets, consumers and farmers embraced organic farming it has experienced an explosive development in Europe (*cf.* Yussefi & Willer, 2002).

This thesis is concerned with organic farming and its capacity to provide sustainable futures for farms and farmers. Resilience theory is used as a framework for this inquiry and an exploratory case study approach has been employed in order to investigate this topic. The introductory chapter begins with the objectives of the thesis and then gives a background on two central themes. First, current pertinent issues concerning organic farming and their development in a European context are presented. Second, the theories behind social-ecological resilience are explained. In the methodology section, my underlying assumptions, my framework, my research approach, and my methods of analysis are introduced. Subsequently, the results in papers I-IV are presented and discussed in three sections, corresponding to the specific objectives. Finally, conclusions are drawn and related to practice. The last section offers some thoughts for future research.

Objectives of the thesis

This thesis attempts to utilize resilience as a theory for assessing and exploring organic farming. The concept social-ecological resilience is used since it enables an exploration of the research objectives and understanding of the system in focus, and since the social and ecological nature of agriculture should be emphasized. Focus is on organic farming from a farmer's perspective. The outlook is European with an emphasis on Austria. Austria provides a telling example for other countries where organic farming expands. Therefore, there are two overall objectives of this thesis:

- to gain increased understanding of the current development of organic farming;
- to explore the capacity of organic farming to build farm resilience.

Specific objectives

The specific objectives of this thesis are:

- to explore the relationship between the organic principles as stated in the IFOAM Basic Standards and farmers' perspectives on organic farming (papers I, II, III & IV);
- to develop a concept of farm resilience (paper III);
- to analyze organic farming in a social-ecological resilience framework (papers III & IV).

The order of the papers reflects the research process. In paper I, the first analysis of the case study was carried out. Paper II places these results in a broader perspective. Paper III introduces farm resilience and paper IV applies resilience theory to the case study.

Background

Organic farming

Organic farming emerged as a movement with a social and ecological agenda for change based on a deep critique of mainstream agriculture (Michelsen, 2001a). Organic farming in Europe was pioneered in the 1920s by the Austrian Rudolf Steiner and the biodynamic agriculture he developed. Consequently, the first organic farm in Austria was biodynamic, established in 1927 (Vogl & Hess, 1999). Later Hans and Maria Müller built up so-called organic-biological agriculture in Switzerland together with Hans Peter Rusch, and in Great Britain, Albert Howard and Lady Eve Balfour were the most prominent founders of the organic movement (Lampkin, 1990; Conford, 2001). The driving forces were a holistic view of nature, concerns about the consequences of the industrialization of agriculture, a back-to-the-land movement, and research on soil fertility (Vogt, 2000).

The organic principles

In 1972, the International Federation of Organic Agriculture Movements (IFOAM) was founded. It formulated standards for organic farming. These were the starting point for the regulations now associated with organic products. Regulations are used to certify organic production, which in turn is a prerequisite for obtaining the organic label used to differentiate organic foods from conventional. This thesis uses the term 'principles of organic farming' interchangeably to mean the IFOAM Basic Standards. They are presented in Box 1.

Based on these principles, organic regulations require that organic farmers refrain from use of synthetic fertilizers, synthetic pesticides and genetically modified organisms.

Conversion to organic farming

There is a wide range of motives underlying a conversion to organic farming (*cf.* Östergaard, 1998). Padel (2001) distinguishes between farm-related motives (*e.g.* problems with animal health, soil fertility, erosion, and finances, or efforts to reduce the costs, change marketing strategies and secure the future of the farm), and personal motives (*e.g.* concerns for personal health, food quality, and the environment) behind a conversion to organic farming. Most often, a change in perspectives is undergone before a conversion takes place (*cf.* Östergaard, 1998; Norman *et al*., 2000). However, the decision to farm organically is not necessarily the result of a wish for an alternative lifestyle (*cf.* Kaltoft, 2001). Public subsidies to organic farming and a growing organic market are simultaneous with much of the striking increase of organic farms in Europe (*cf.* Organic Centre Wales, 2000). Jansen (2000) even goes so far as to suggest that organic farming may be the only solution for continued farming in the current EU context where farmers fail to survive economically within conventional agriculture.

Box 1. **The IFOAM Basic Standards of organic farming (IFOAM, 2002)**

Organic Production and Processing is based on a number of principles and ideas. All are important and this list does not seek to establish any priority of importance. The principles include:

- to produce sufficient quantities of high quality food, fiber and other products.
- to work compatibly with natural cycles and living systems through the soil, plants and animals in the entire production system.
- to recognize the wider social and ecological impact of and within the organic production and processing system.
- to maintain and increase long-term fertility and biological activity of soils using locally adapted cultural, biological and mechanical methods as opposed to reliance on inputs.
- to maintain and encourage agricultural and natural biodiversity on the farm and surrounds through the use of sustainable production systems and the protection of plant and wildlife habitats.
- to maintain and conserve genetic diversity through attention to on-farm management of genetic resources.
- to promote the responsible use and conservation of water and all life therein.
- to use, as far as possible, renewable resources in production and processing systems and avoid pollution and waste.
- to foster local and regional production and distribution.
- to create a harmonious balance between crop production and animal husbandry.
- to provide living conditions that allow animals to express the basic aspects of their innate behavior.
- to utilize biodegradable, recyclable and recycled packaging materials.
- to provide everyone involved in organic farming and processing with a quality of life that satisfies their basic needs, within a safe, secure and healthy working environment.
- to support the establishment of an entire production, processing and distribution chain which is both socially just and ecologically responsible.
- to recognize the importance of, and protect and learn from, indigenous knowledge and traditional farming systems.

Organic farming in the European Union

During the 1990s, policy makers and agri-business in the EU embraced organic farming. Since 1993 the European Council Regulation 2092/91 requires that organic fresh and processed food of plant origin must meet the standards specified in that regulation (Lampkin, Foster & Padel, 1999). In 1999, the regulatory framework for organic animal products was completed with EC Regulation 1804/1999 (Le Guillou & Scharpé, 2000). Currently, organic farming is fully endorsed as an integrated part of agri-environmental programs following EC Regulation 2078/92. Many EU countries have action plans for increasing organic

farming (*e.g.* BMLFUW, 2001b; Jordbruksverket, 2002). For example, Swedish goals are quite ambitious. By 2005, 20% of farmlands and 10% of dairy, beef and sheep production should be organic (Jordbruksverket, 2002). Moreover, a European action plan is planned (Lampkin, 2002; Yussefi & Willer, 2002). The policy support for certification in the EU meant that growth of the organic sector was obtained quicker, and included more farms, than could be expected otherwise (Michelsen, 2001a). In 2000, 141,283 farm holdings were certified organic or under conversion, a dramatic increase from the 14,824 holdings registered ten years earlier (Organic Centre Wales, 2002).

Institutionalization of organic farming

The rapid development of organic farming in the EU has brought about – and partly owes this success to – the institutionalization of organic farming. This institutionalization is the process under which organic farming has been formalized in regulations, and the resulting new social organization of organic farming (Michelsen, 2001a; Lynggaard, 2001). Institutionalization has involved a reduction in diversity in practices and philosophies. For example, the broader value-laden and ideological foundations of organic farming have been reduced to technical and quantifiable definitions and rules (Kaltoft, 1999). In the processing sector, specialization and commercialization has led to an incorporation of the organic sector in mainstream distribution channels. Originally, organic farming was considered to be almost synonymous with small-scale farming (Vos & Meeks, 2000), but this is no longer the case. For instance, the average farm size in Sweden is 36 ha, while the average organic farm is 65 ha (KRAV, 2000). While Michelsen (2001b) argues that uniform certification systems are paramount for the growth of organic farming, Woodward, Flemming & Vogtmann (1996) warn that the organic farming of the EC Regulation, of food industry and trade, is at odds with the principles of organic farming. Woodward, Flemming & Vogtmann (1996) argue that even if organic farming has managed its way into the global food market, the organic agriculture movement is as far away as ever from being able of bringing about sustainable development.

Trends in organic farming

One trend in organic farming is the phenomenon of conventionalization. This implies a development in which organic farms increasingly resemble industrial conventional farms. Some features of this trend include: farm enlargement, increasing debt loads with increasing capital intensification, replacement of labor by machinery and other industrial inputs, and export-oriented marketing rather than local selling (Hall & Mogyorody, 2001). Examples of this trend have been reported both in Europe (Tovey, 1997; Michelsen, 2001b) and North America (Guthman, 1998, 2000; DeLind, 2000; Hall & Mogyorody, 2001).

As part of this process, a differentiation of the organic market can be seen where small-scale organic farms focus on local markets while at the same time larger farms can exploit the global organic market. They do not necessarily compete with each other (Coombes & Campbell, 1998; Hall & Mogyorody, 2001). However, the input-substitution approach to organic farming practiced by large-scale farms – in

which conventional inputs are merely substituted for organically approved inputs – is supported by the existing economic system. Thus, farmers choosing this path of organic farming have a competitive advantage (Allen & Kovach, 2000). Therefore, the differentiation of the organic market may soon disappear as small farms can no longer compete.

The organic principles represent a break with the 'high-external input – high output' paradigm and organic conversion requires farmers to abandon much of the knowledge they have from conventional production (Röling & Jiggins, 1998; Morgan & Murdoch, 2000). Organic farming is generally considered to be ecologically benign (*e.g.* Woese *et al*., 1997; Stolze *et al*., 2001; Mäder *et al*., 2002) and to favor rural economies and development (*cf.* Jansen, 2000; Pugliese, 2001). However, if trends towards more input substitution and increasing integration into mainstream structures continue (Lehmann, 2000; Rigby & Cáceres, 2001) the contribution of organic farming to rural employment and the environment will be reduced. Thus, if this trend continues, organic farming risks losing the capacity to build resilience in farms and agro-ecosystems. If farms and agro-ecosystems lose resilience they cannot contribute to sustainable development. In the following chapter, social-ecological resilience will be described and its relevance to this thesis explained.

Social-ecological resilience

Social and natural systems are interdependent and both are dynamic and complex (Holling, 2001). Humans need to understand this dynamism and complexity in order to manage ecosystems for their own ends *e.g.* to produce food and fibers. Sustainable development of the resources that ecosystems generate is a prerequisite for survival. Thus, humans must be able to build resilience in ecosystems (Berkes & Folke, 1998; Berkes, Folke & Colding, 2003). Only when the organic sector produces enough food and builds resilience in agro-ecosystems at the same time will it be a viable alternative to conventional agriculture.

Sustainable development and resilience are undoubtedly related, however, not all definitions of sustainable development capture the meaning of resilience (*cf.* van der Leeuw & Aschan, 2000). An important, fundamental difference between the two is that while sustainable development is always understood as a desirable outcome or process, in contrast, undesirable systems can also be highly resilient (Holling & Gunderson, 2002). In resilience terms, the goal of organic farming is to build resilience in desirable systems to promote sustainable development (*cf.* Folke, Berkes & Colding, 1998).

Ecological resilience

The concept of resilience emerged primarily from ecology and has mainly been used to discuss ecosystems, albeit with two distinct meanings (Gunderson, 2000). The first definition concentrates on stability at a presumed point of equilibrium, resistance to a disturbance and the speed of return to the equilibrium point. The level of resistance to disturbance and the speed of return to the equilibrium are used to measure resilience (*cf.* Pimm, 1984; O'Neill *et al*., 1986; Tilman &

Downing, 1994). Holling (1996) refers to this kind of resilience as engineering resilience. The second definition of resilience emphasizes conditions far from any equilibrium state, where disturbances can flip a system into another regime of behavior or stability domain (Holling, 1973). In this definition, the measurement of resilience is the magnitude of disturbance that can be absorbed before the system changes the variables and processes that control behavior. This is called ecological resilience (Holling, 1996; Gunderson, 2000). Holling and his colleagues in the Resilience Alliance suggest that the latter definition is more useful based on numerous studies on ecosystem functioning (Holling, 1973, 1986, 2001; Gunderson, Holling & Light, 1995; Peterson, Allen & Holling, 1998; Gunderson, 2001; Carpenter *et al*., 2001).

The adaptive cycle

The traditional view of ecosystem development has focused on two main functions of ecosystems: exploitation (r-phase) and conservation (K-phase). Exploitation is the rapid colonization of recently disturbed areas – where fast consumption and reproduction is a winning strategy. Conservation is the slow accumulation and storage of energy and material – where efficiency is the winning strategy (Clements, 1916). Ecological resilience is based on a complementary understanding of ecosystems dynamics. Holling proposed the adaptive cycle, as a heuristic model of ecosystem dynamics (see Figure 1), describing four phases of system development (*e.g.* Holling, 1986; Holling, 2001; Gunderson & Holling, 2002). Thus, he added two additional functions of ecosystems: release (Ω-phase) and reorganization (α-phase). In the release phase, the tightly bound accumulation of biomass and nutrients has become increasingly fragile until a release is suddenly triggered by a disturbance, *e.g.*, a forest fire or insect pest. In the reorganization phase, nutrients are reorganized so that they become available for the next phase of exploitation (Holling, 1986). The non-linear and complex character of ecosystems increases the importance of specifying the scale under observation. Also, the interaction across scales is critical (*cf.* Peterson, Allen & Holling, 1998). The concept of a 'panarchy' was coined to illustrate the nestedness of adaptive cycles and to provide a context for linking processes across scales (Holling, 2001; Gunderson & Holling, 2002). The model was originally developed for ecosystems, but is now applied to other systems as well (Gunderson & Holling, 2002). The adaptive cycle and panarchy will not be discussed further, except to conclude that social and natural systems are treated as equally important, and that panarchy theory has evolved into an exciting interdisciplinary field.

Resilience of social-ecological systems

To summarize, Holling's model views ecosystems as unpredictable, self-organizing, non-linear, multi-equilibrium systems. Living systems are also considered to be open (*cf.* Capra, 1996). In order for people to cope with change, uncertainty and surprise, and to maintain development options in face of change, management of resilience in the linked social-ecological system is necessary (*cf.* Resilience Alliance, 2003). Ecological resilience was briefly touched upon above and is defined as the capacity of a system to undergo disturbance while

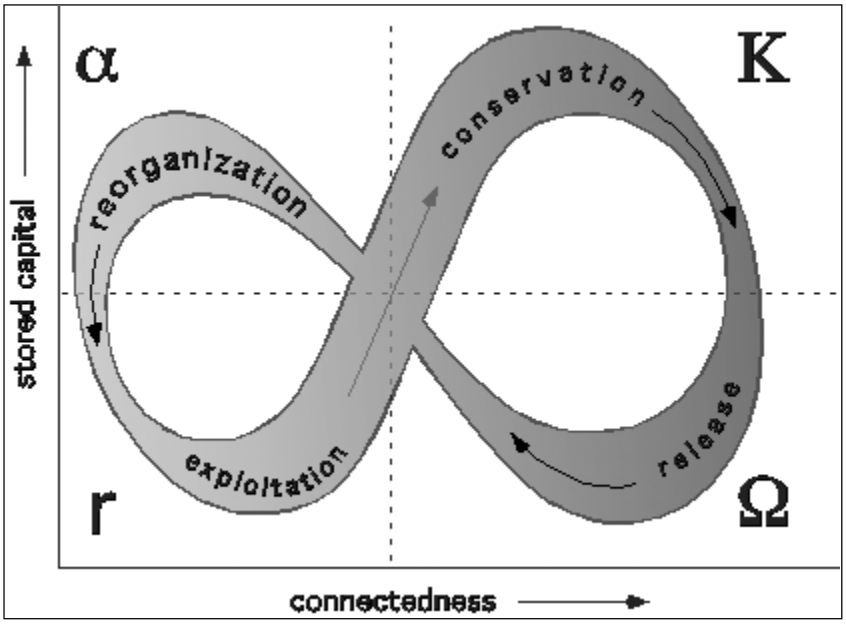

Figure 1. The adaptive cycle: Connectedness and brittleness increases in the K-phase. Stored capital is released in the Ω-phase and reorganized. Adapted from Holling & Gunderson (2002).

maintaining its key functions and controls (Holling 1973; Holling, 1996; Gunderson, 2000). Ecological resilience is measured by the magnitude of disturbance the system can tolerate and still persist (Holling, 1996). Yet, this thesis is concerned with the linked social-ecological system. Carpenter *et al*. (2001) provide a definition of social-ecological resilience, suggesting it reflects the following properties:

1. The amount of change the system can undergo and still remain within the same domain of attraction, that is, retain the same controls on structure and function (buffer capacity).
2. The degree to which the system is capable of self-organization (versus lack of organization or organization forced by external factors). Another expression for this would be the capacity for reorganization.
3. The degree to which the system can build the capacity to learn and adapt. Adaptive capacity is a feature of resilience that reflects the learning and appropriate action in response to disturbance (Gunderson, 2000).

This definition is used as a point of departure in papers III and IV. Folke, Colding & Berkes (2003) suggest that in order to build social-ecological resilience four additional aspects are crucial:

- Learning to live with change and uncertainty,
- Nurturing diversity for reorganization and renewal,
- Creating opportunity for self-organization,
- Combining different types of knowledge.

Social-ecological resilience in farming systems

Literature about farming systems (*e.g.* Dent & McGregor, 1994; Pretty, 1998, 2002; Röling & Wagemakers, 1998; Cerf *et al*., 2000; Collinson, 2000; Ellis, 2000), and agro-ecology and agro-ecosystems (*e.g.* Conway, 1985, 1987, 1991; Marten, 1988; Carroll, Vandermeer & Rosset, 1990; Gliessman, 1998; Altieri, 1995, 2002) has much in common with resilience theory. Farms can be considered as learning systems in constant co-evolution with their environment. Conway (1987) describes agro-ecosystems as self-organizing, self-regulating systems. In this sense, sustainable development of farms is a measure of the persistence of individual farmers or farm families as learners and co-evolvers who are continuously trying to improve the quality of their ecological relationships (Sriskandarajah, Bawden & Packham, 1991). Bawden (1991) argues for a shift in thinking in agriculture from thinking about productivity to thinking about persistence. There are a number of concepts that are also dealt with in these fields that pertain to resilience theory, *e.g.* adaptation, diversity, vulnerability, risk management and change, to name but a few. In the following discussion on farm resilience I try to show how farming system research, agro-ecology and resilience theory can be matched.

Resilience of what to what – farmers' perspectives

As agricultural research and development generally aim to improve systems, success depends upon being clear about: a) what constitutes an improvement; and b) exactly which system is to be improved (Spedding, 1979). This statement is similar to Carpenter *et al*.'s (2001) assertions regarding resilience, namely that one must specify which system configuration and to what changes a system's resilience should be assessed, *i.e.* the resilience of what to what. The socially preferred system state, *i.e.* the desired system state, is a matter of interpretation and interchange between ecosystems and humans. Therefore, a relevant point of departure in the case of agriculture and changes in the realities of farmers is the perspective of farmers. Understanding farmer decisions is a prerequisite for progress in agricultural development (Collinson, 2000b). Participation of farmers in research that covers topics like this thesis is useful for a number of reasons. First, farmers have knowledge vital for the management of agro-ecosystems (Scoones & Thompson, 1994). Second, if, *e.g.*, decision makers, researchers and farmers cooperate, different kinds of knowledge are used and efficiency is enhanced (*cf.* Jiggins & Röling, 1998). Third, if local people are influenced by research, democratic principles demand that local natural resource managers are involved in decision making (*cf.* Ljung, 2001). This could increase acceptance and implementation of difficult decisions on resource use to a higher degree than at present. Consequently, involving the resource users is not only a matter for policy, but also for research. This leads on to the next section, which deals with the research methodology.

Research methodology

The choice of methods arises from my assumptions about the world and how people behave. My assumptions, framework, research approach, and the methods used are all discussed in this section. They can be likened to an hourglass (Figure 2), since the research follows a process of concentration and limitation in the first part, which then opens again to broader conclusions in the second part. Underlying assumptions contribute to the choice of framework, which leads on to the approach. The choice of methods follows from the case study approach. The outcome of the empirical study is then analyzed with literature and theories and finally critically reflected upon. The hermeneutic spiral illustrates the iterative dynamic between empirical data, theory and literature throughout the research process (*cf.* Ljung, 2001).

Assumptions

A systemic view

In this thesis, phenomena are understood with a systemic view. Systemic thinking is concerned with process and change – it implies that the research results are put in relation to the context in which they were developed (King, 2000). Thus, the interaction between the system and its context is the focus for the exploration. The systemic view also means that those who participate in formulating the system determine its boundary (Ulrich, 1996; Callo & Packham, 1999). This means an action can have different outcomes depending on the system scale and that

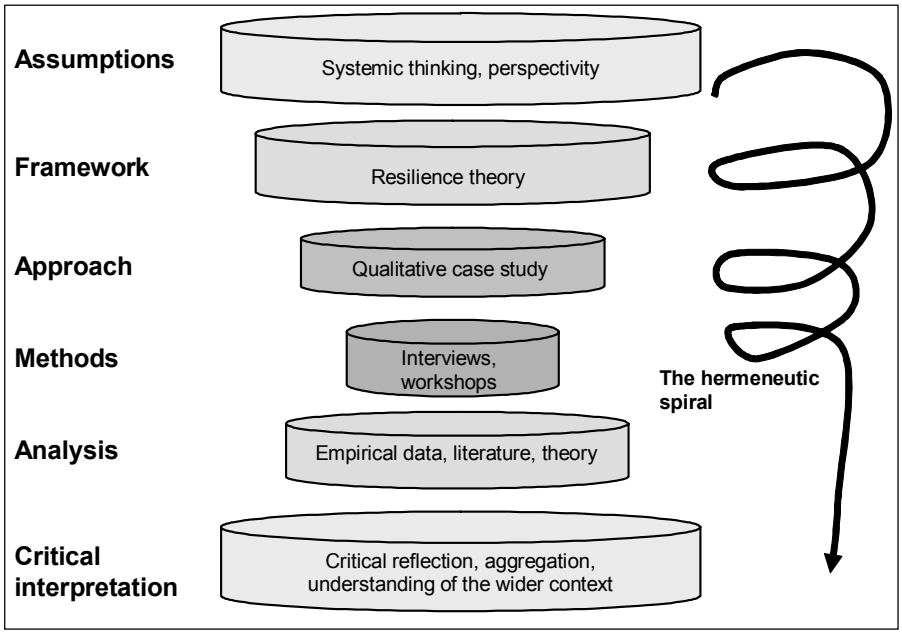

Figure 2. An hourglass-shaped description of the research process.

systems are considered as open to communication with their surroundings (*cf.* Capra, 1996). The farms in the case study and the farmers' social world are considered as systems – the farm is seen as a whole with its biophysical realities and different social and individual goals.

The perspective of the researcher in a situation is critical to the systems being studied; the researcher is not outside the system he or she studies (Sriskandarajah, Bawden & Packham, 1991; Callo & Packham, 1999). According to this view, people, researchers included, are integrated parts of the world that they try to describe, since the world exists independently of humans, but not outside of them. An interesting approach of system analysis is Flood's systems windows, which focus on different aspects of the same system under study (Flood, 1999). These four windows are: processes (events occurring in a system), structures (organizational functions and forms of coordination, communication and control), meaning (values, norms, ideologies, and emotions of people in a system) and knowledge-power (people in a position of power determine what is considered valid knowledge and action) (Flood, 1999). The last window is vital in order to see the system from a critical point of view and to question the processes, structures and different meanings that come forth in the system described. Instead of defining system boundaries, we could talk about 'observation windows' as long as we interpret the system as open, interactive, and operating at different scales.

When considering Flood's system windows, 'sensitivity to issues of power' (Callo & Packham, 1999) becomes vital, *i.e.* power relations have to be taken into consideration in order to understand the system. Similarly, organic farming is influenced by the context (world market, economic system, policies) in which it exists. I will come back to this in the discussion and conclusion of papers I-IV.

Perspectivity

Perspectivity describes my assumptions about what happens in social situations, including what happens in an interview. A perspective is a description of a phenomenon from a specific mental position (Ison & Blackmore, 1997). Nevertheless, individuals can interpret reality in similar ways, that is, perspectives can be shared between people (Ljung, 2001). I take account of different perspectives presented to me by farmers in order to develop a shared perspective. The nature of perspectives are not explored as such in this thesis, but I am aware of the 'multiple perspectives' occurring in a group and between groups, and the possibility of 'multi-perspectivity'. Multi-perspectivity implies that one and the same person can express different perspectives in similar contexts (Lüscher, 1990; Lindström, 2001). In other words, every perspective is limited in the sense that it is relational and contextual. Consequently, when a farmer expresses a view or answers an interview question, it is embedded in a specific, limited, perspective. To assume this has repercussions on the methods used to collect reliable data. Farmers have specific knowledge about sustainable uses of natural resources and agro-ecosystems that other groups in society do not have. Farmers know how to manage the agro-ecosystem in order to produce food and fibers, they have knowledge about nutrient cycling on the farm and they constantly develop new ecological knowledge. Further, when I interpret what farmers say, it is an

expression of my own perspective. Still, I can try to consider the perspective of the farmer in order to understand and build a patchwork of perspectives that overlap and complement each other. Accordingly, the diversity of perspectives is a resource that can be taken advantage of by using the methods chosen.

Perspectivity also implies that all statements about the nature of reality are interpretations. Humans can only assess nature through their mind and, therefore, values, emotions and perspectives are important aspects (Sriskandarajah, Bawden & Packham, 1991). Thus, humans are part of nature and the world exists independently of humans – only a representation of the world in the human mind and language is possible (Löfberg, 2001). Individuals develop perspectives that can be shared in a group. Other groups may have different shared perspectives, *e.g.* policy makers versus farmers (see Figure 3).

I will not enter into a discussion about the nature of knowledge and learning in this thesis, except to say that knowledge is the outcome of a dynamic, collaborative process between co-learners (Sriskandarajah, Bawden & Packham, 1991; Daniels & Walker, 2001). It is created when perspectives meet and new

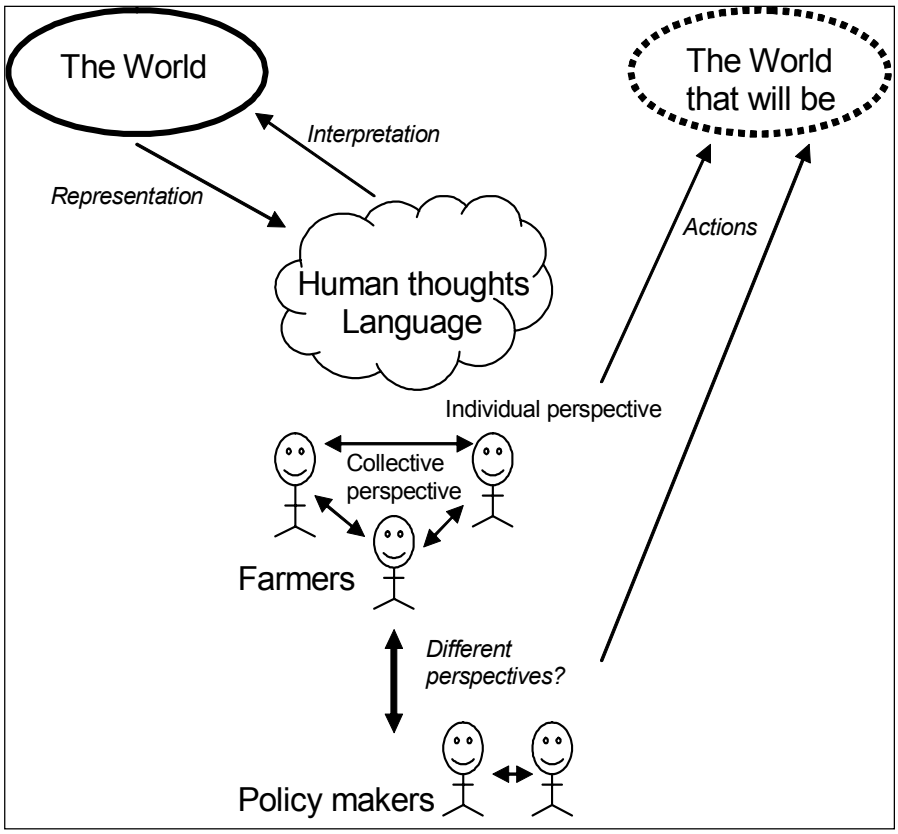

Figure 3. Humans cannot conceive the world directly, only a representation of it in the human mind and through language. Perspectives can be individual, but can also be shared collectively within a group. Human actions shape the world that will be, i.e. the future.

perspectives emerge (Ljung, 2001). Learning about others' perspectives is the basis of a shared perspective. When carrying out workshops in the case study area, perspectives of sustainable agriculture and organic farming were exchanged and a joint description of the desired system state was formulated.

Framework

The perspective that I choose, or: the window that I look through, is social-ecological resilience. As elaborated in an earlier section of this thesis, social-ecological resilience builds on theories and empirical studies describing the functions and dynamics of ecosystems, and the premise that humans and nature are interdependent (*cf.* Berkes & Folke, 1998; Gunderson & Holling, 2002; Berkes, Folke & Colding, 2003). Resilience theory is useful for understanding the complex issues characteristic of farming, and the models represented in this framework are useful for understanding the human – ecosystem interface that defines farming. The results from the empirical study are analyzed within a social-ecological resilience framework, and organic farming is also analyzed in the resilience framework.

A case study approach

Organic farming, farm resilience and sustainable agriculture are complex issues and contemporary phenomena. Part of the objectives of this thesis are of an exploratory nature. Given these preconditions a case study approach is appropriate (*cf.* Yin, 1994). The approach is interdisciplinary since a number of topics are mixed and since methods are used that are not common in agricultural sciences. The study applies qualitative methods. The analysis builds on interpretations and processing of data collected through interviews, workshops and literature. A qualitative study emphasizes 'lived experiences', locates the meanings, perceptions and assumptions of people, and connects these to the social world around them (Miles & Huberman, 1994, p. 10). Qualitative and quantitative studies can complement each other, illuminating different aspects of the same research problem. This was true for my research project from which results were used in paper II.

Many social phenomena can be studied through case studies. A case is often unique and offers richness in details rather than generalizations, and understanding instead of explanations. Case studies lend themselves to study complex issues while retaining the holistic characteristics of real-life events (Yin, 1994). In order to create a rich picture of the situation, and to enhance the validity and reliability of the results, multiple methods of data collection and analysis have been employed (*cf.* Jackson, 1997). The case study presented in this thesis was embedded in a larger research project. Therefore, results could be validated across disciplines and research groups and data could be drawn from different sources. Further, interviews and workshops were not only used for data collection, but also for joint analysis and validation of previous results. A single case as the empirical study presented in this thesis cannot be generalized to a population, but may be

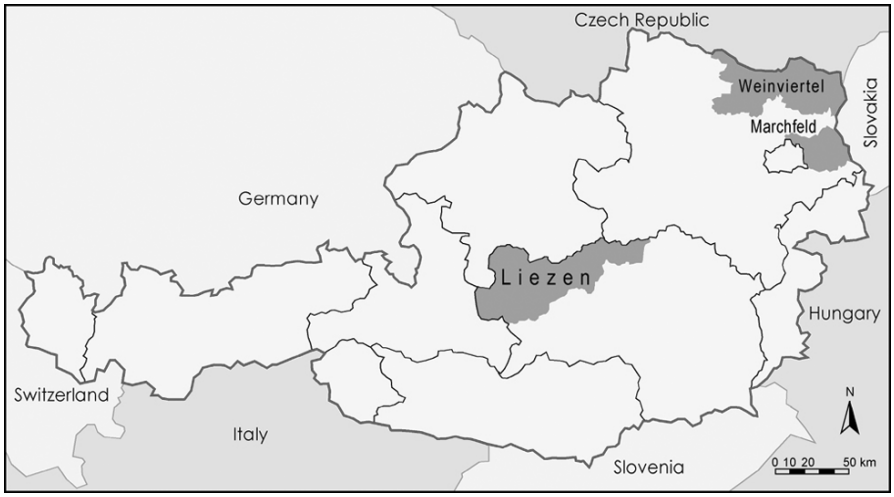

Figure 4. Austria, regions relevant for this thesis are highlighted. Liezen and Weinviertel were the focus of the Austrian research project in which the Sölktäler case study was carried out (papers I, II & IV). Marchfeld was used as a comparison to Sölktäler in paper II.

used to test theoretical propositions since data collection is guided by earlier development of a relevant theory (*cf.* Firestone, 1993; Schofield, 1993; Yin, 1994). My study aims to increase knowledge about organic farming, but also to increase understanding of the complexity of organic farming and its development.

The case study setting

When this research was begun, Austria was the leading EU nation in terms of number of organic farms. As of 2002, Austria still has the highest rate of all EU countries with 9% of all Austrian farms certified as organic (BMLFUW, 2001a; Yussif & Willer, 2002). In respect to the growth of organic farming, Austrian experiences are relevant for all countries that wish to expand organic farming.

Austria is a republic in Central Europe with 8 million people, surrounded by Germany, Italy, Switzerland, Slovenia, Hungary, Slovakia and the Czech Republic. The Alps dominate the country and are the basis for a vital tourist industry. There are approximately 200,000 farms and they average 15 ha in size – both conventional and organic farms (BMLFUW, 2001d). Apart from a few lowland areas in the Northeast, agriculture in Austria is practiced in mountainous areas and under severe conditions.

The case study was part of the second Austrian Landscape Research program (KLF II). The project *Flächendeckende Umstellung auf biologischen Landbau: Integrative Akzeptanz- und Wirkungsanalyse anhand ausgewählter Untersuchungsregionen* (Full conversion to organic farming in two regions) developed scenarios to investigate a full conversion to organic farming in two Austrian regions: the lowland Weinviertel region, northeast of Vienna, and the alpine Liezen region (see Figure 4) (Bartel *et al*., 2002). The *Naturpark Sölktäler*, which

is situated in Liezen, was chosen as a case study for this thesis (see highlighted section of Figure 5). A Naturpark is a conservation area under a certain degree of protection. There were two main reasons for this choice. First, Sölktäler has a high percentage of organic farms – 30% of all farms in Liezen and 50% in Sölktäler are certified organic. Of the total 103 farms in the two Sölktäler valleys, 53 are certified organic (BMLFUW, 2000). Second, farmers were motivated to participate in the research. During 1998, two workshops were held together with the Institute of Organic Farming at the Agricultural University in Vienna, representatives from the Naturpark, and farmers. A list of priorities for research emerged from these meetings that was integrated into the research project.

The Naturpark Sölktäler is a 277 km^2 large area with mountains and two valleys. It consists of the large and small Sölk valleys (Großsölk and Kleinsölk) with a population of 1700 inhabitants. Kleinsölk is a municipality, while the larger valley

Figure 5. Austria with the Liezen region enlarged. The three municipalities in Naturpark Sölktäler, in which the case study was carried out for papers I, II and IV are highlighted.

Table 1. *Each of the different phases of the interviews in the study in Sölktäler had differentaims, and used sets of criteria in order to choose from recommendations*

	Aims	**Selection criteria**
Phase 4	Explore research questions Prepare for workshops	Agricultural school teachers: • Willing to participate Agricultural school pupils: • Recommended • Willing to participate • From Sölktäler or nearby • Planning to be a farmer
Phase 3	Same as Phase 2	Farmers: Same as Phase 2
Phase 2	Explore research questions Further recommendations Prepare for workshops	Farmers: • Recommended • Willing to be interviewed • Level of activity in community • Age • Gender • Geographical site • Different farm/production situations
Phase 1	Focus on problem statement Overview of stakeholders Recommendations for interviews	Key informants: • Connect to pre-workshops 1998 • Gender • Geographical site • From agricultural sector or not

harbors two: Großsölk and St. Nicholai. The mountains, alpine pastures, waterways, small lakes, forests and farms are the structuring elements of the landscape. The Naturpark offers low-intensity tourism such as trekking and hiking.

The Marchfeld region, also shown on the map in Figure 4, served as the comparison with Sölktäler in paper II. Marchfeld is a lowland area with intensive arable cropping – and large scale farms in the Austrian context: the proportion of farm sizes over 30 ha is considerably higher than the Austrian average (Hadatsch *et al*., 2000). Marchfeld is a contrast to Sölktäler in almost all aspects.

Methods

Different methods were combined in order to gain a rich picture of a complex situation. While the overarching Austrian project gathered 13 researchers, my

colleague Sonja Hadatsch and I planned and carried out the Sölktäler case study alone, only supervised by the project management group. The methods of sampling at all levels of this study can be described as intentional (*cf.* Miles & Huberman, 1994). This means that sampling was not random, but aimed to obtain a rich picture from a few qualitative interviews. Semi-structured interviews were selected as the prime source of data for the case study – it was important to capture farmers' perspectives and get an idea of their reality (*cf.* Kvale, 1996). Interviewees were sampled with the snowball sampling method (*cf.* Miles & Huberman, 1994). Key informants in the first interview phase recommended further interviewees that could further enrich their account (see Figure 6 and Table 1). After each interview, more recommendations were generated and new interviewees selected. There was a constant dynamic between sampling and data collection.

The interviews were documented on tapes and transcribed. In addition, the researchers wrote research diaries and discussed each interview immediately afterwards. There was no pre-determined number of interviews. Instead, we interviewed 'as many subjects as necessary to find out what [we needed] to know' (Kvale, 1996, p. 101). This empirical saturation occurred after three visits to the area and signaled the end of the interview process. At that point, too few new issues were raised in the interviews in relation to the time necessary to continue with them.

There are a multitude of issues to be aware of in a study principally based on interviews. Alvesson & Deetz (2000) argue that there are certain problems that cannot be avoided simply by working as rationally as possible. Statements in interviews are context based; interviews are snapshots of a situation. In addition, forces difficult to identify, *e.g.* multiple identities, ideologies and politics, influence the interviewee (Alvesson, 1999). Hence, modesty and a critical stance are called for (*cf.* Alvesson & Deetz, 2000). In order to come to terms with some of the problems of research interviewing, and in order to secure validity of the results, a number of measures were carried out (*cf.* Waldenström, 2001). First, all interviews were conducted with two researchers so that they could be discussed afterwards. Second, both recorded tapes and notes were collected from each interview. Third, we related the results from the interviews with other results from the project. Fourth, a series of workshops were held with the interviewees in order to validate interview results, reflect and discuss the outcome of the interviews. Since we were two researchers, we could take turns as facilitators and researchers during the workshop process (*cf.* King, 2000). The workshops were also aimed at creating a learning environment in which farmers and researchers could take the perspective of the other (Ljung, 2001).

The data collected in Sölktäler included transcribed interviews, notes from interviews, flip charts from workshops and group interviews, and research diaries. In order to understand this vast amount of material, three steps of analysis were followed:

1. Data reduction,
2. Data display,
3. Conclusion drawing and validation (*cf.* Miles & Huberman, 1994).

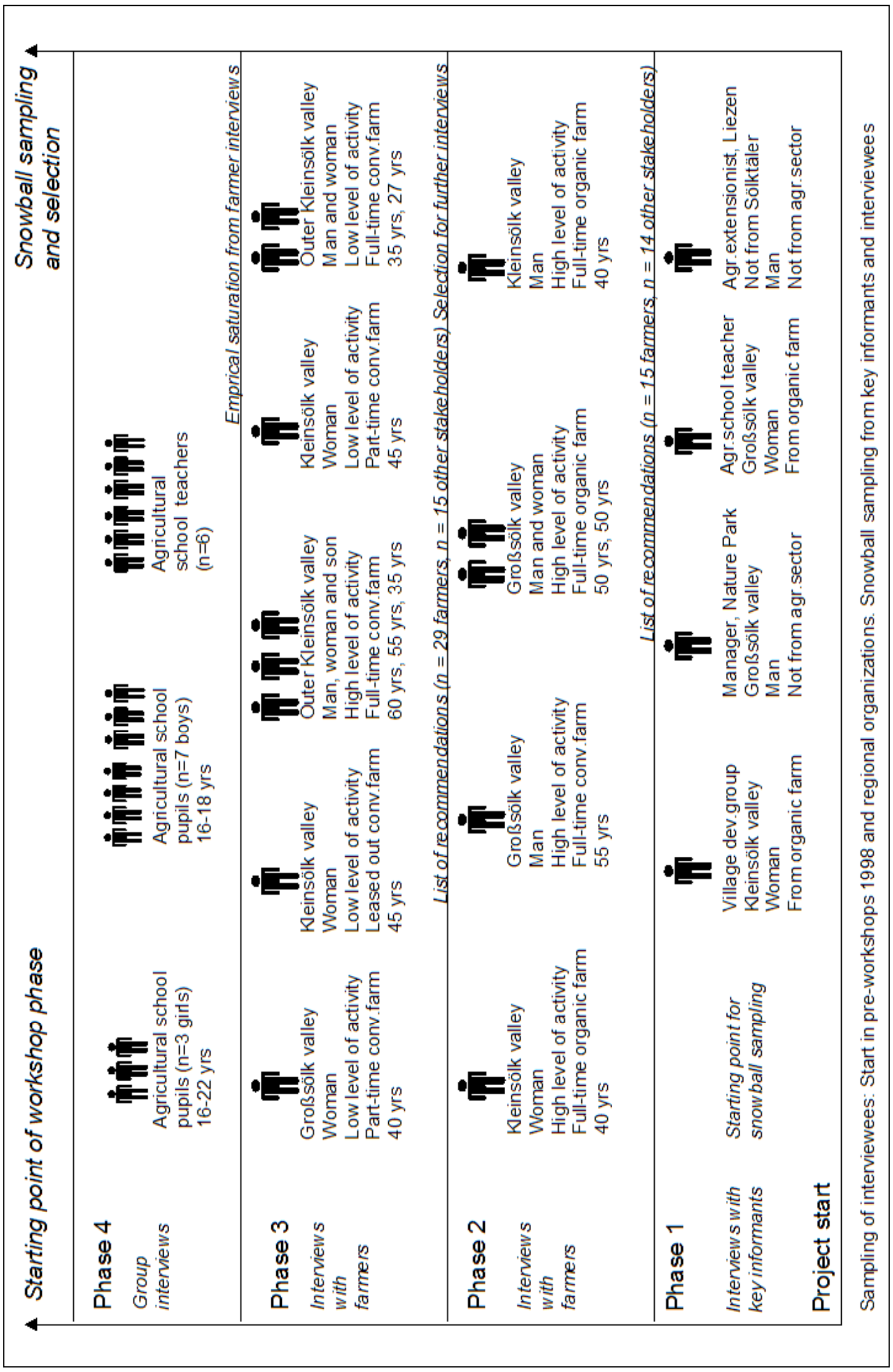

Figure 6. The sampling procedure in the Sölktäler case study, showing the interview phases. Starting with pre-project workshops during 1998, key informants were sampled who then recommended interviewees in the valleys. Research questions were refined in the process.

Data reduction implies that the continuous process of selecting, focusing, simplifying and abstracting of data is made conscious. The transcripts were organized in a set of codes, *i.e.* themes illustrating pertinent issues in the material and research questions. From the coded text different forms of data display were used: extended texts, summaries of interviews, illustration of results in graphs, tables, charts and mind-maps, to discover patterns in the data and summarize findings (*cf.* Weisbord & Janoff, 2000). Displaying data in different ways facilitates conclusion drawing. Interview results were validated together with interviewees and key informants. The project's research group also participated in the data validation. Literature from similar studies was consulted in order to assess the reliability of the results. After this first round of analysis, further layers of analysis were carried out. These are described in the section below.

Analysis – more turns in the hermeneutic spiral

Since the results of the empirical work should be related to the development of organic farming, and since it should be possible to draw conclusions relevant for other contexts than the Sölktäler valleys, the second level of analysis was carried out within the resilience framework using appropriate literature on organic farming, agriculture and resilience (*cf.* Berkes & Folke, 1998; Gunderson & Holling, 2002; Berkes, Folke & Colding, 2003). The resilience analysis is the synthesis of the empirical study and literature reviews, *i.e.* I look through my 'resilience window' at the case study. Also, the interaction with other researchers and colleagues was conducive for this analysis since joint reflection brings new insights.

The hermeneutical circle can characterize this interpretation of meaning (Kvale, 1996). Hermeneutics suggests that the 'meaning of a part can only be understood if it is related to the whole' (Alvesson & Sköldberg, 2000, p. 53). The hermeneutic process is dynamic with the aim to develop an understanding of the different parts of collected data, as well as the whole context (*cf.* Alvesson & Sköldberg, 2000). As the understanding of the phenomenon increases, it becomes part of a constantly evolving pre-understanding. Thus, after one cycle the interpreter stands in a different position than at the start (Ljung, 2001). 'You start at one point and then delve further and further into the matter by alternating between part and whole, which brings progressively deeper understanding of both' (Alvesson & Sköldberg, 2000, p. 53). This process is illustrated by the hermeneutic spiral, which is depicted in Figure 7 (Alvesson & Sköldberg, 2000).

Analysis – critical interpretation

In the analysis phase, research is concluded and critically assessed. The outcome of this analysis is a reflection of my own interpretations and aims to move from the case study to an overall system understanding of organic farming. This is an aggregated level of analysis in order to understand and see potentials and possibilities as well as constraints and driving forces. Alvesson & Sköldberg (2000) call this analysis critical interpretation since it is carried out from a critical stance (Table 2).

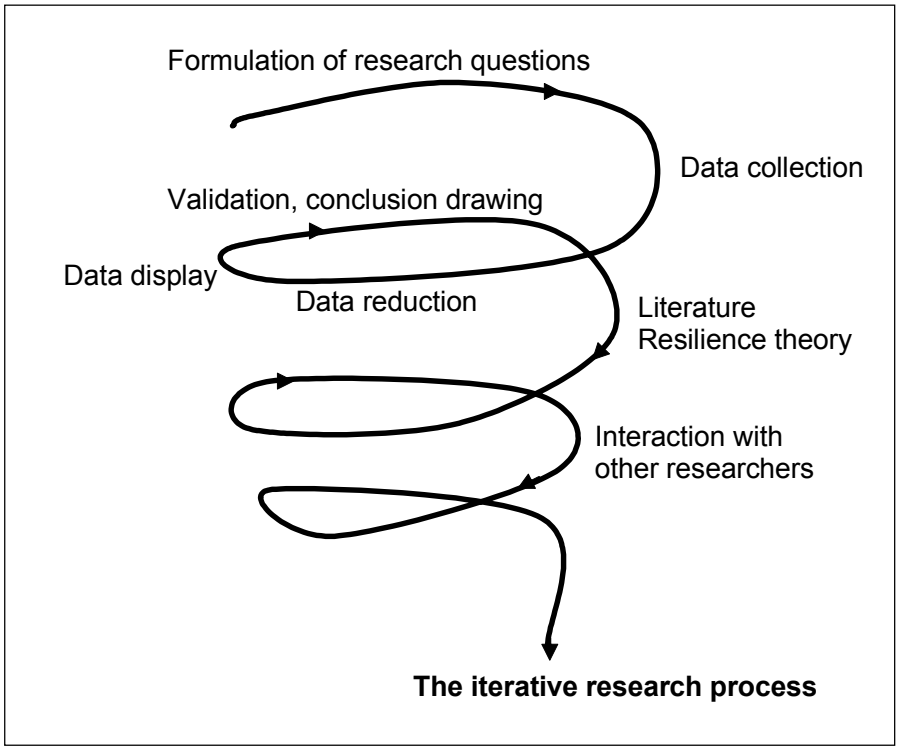

Figure 7. The hermeneutic spiral describes the iterative research process.

Critical theory claims that social phenomena must always be viewed in their historical contexts. The idea is that social conditions are historically created and influenced by the asymmetries of power and special interests, and that they can change radically (Alvesson & Sköldberg, 2000). All through the research process insights are generated; through empirical work, the analysis through literature and theories, and the final critical analysis. This process can open new windows and lead to new inquiries. Whereas the qualitative study in this thesis aims at understanding farmers' perspectives, critical thinking is needed in analyzing the material. As pointed out earlier, ideological and structural forces may be operating on those being interviewed (*cf.* Alvesson & Deetz, 2000). The critical stance is also useful in order to discern the driving forces behind a development. The overall process of analysis is a mirror of the assumptions made in the beginning of the research. Accordingly, the researcher interprets the material, describes it and interprets it anew. This research is an iterative process, which is still ongoing (described earlier by the hermeneutic spiral earlier).

Table 2. *Levels of interpretation. Adapted from Alvesson & Sköldberg (2000, p. 250)*

Aspect/level	Focus
Interaction with empirical method	Accounts in interviews and workshops
Interpretation	Underlying meanings; linking empirical data with literature and resilience theory
Critical interpretation	Power relations, driving forces; understanding the wider context of the research issues from a critical stance

A note on validity

Validity implies whether or not the research objectives have been explored in a convincing way. It is the adequacy of research data in relation to the objectives (Waldenström, 2001). Depending on the nature of the objects under study, different sciences have different means of evaluating validity. In the case of interpretation of human activities and social phenomena validity is complex. According to Kvale (1996) the interpretative process itself is vital for validity, especially in qualitative research such as this thesis. In fact, all stages of qualitative research need to consider validity (Kvale, 1996). Kvale also argues that credibility rather than claims of truth is a central criterion. Validity can be claimed when many independent investigations converge – as I have tried to show for the Austrian case study in this thesis.

Discussion – Results

The specific objectives of the thesis as described above structure the discussion of my results in papers I-IV. The first part of the discussion grapples with the relation between organic principles and farmers' perspectives. The second part deals with the concept of farm resilience. The last part discusses organic farming in a social-ecological resilience framework.

The relation between organic principles and farmers' perspectives

The relation between farmers' perspectives on organic farming and the IFOAM organic principles is multi-faceted. First, there are multiple perspectives on what organic farming is in the literature and among practitioners. A farmer can take different perspectives on organic farming depending on which aspects of organic farming he or she speaks of. Second, the organic principles as stated in the IFOAM Basic Standards, only partly overlap with the general aims of EC Regulation 2092/91 (*cf.* Le Guillou & Scharpé, 2000; IFOAM, 2002). Third, the motives behind conversions to organic farming differ, as well as the degree to which the organic principles are known and strived for. In the process of translating organic principles into regulations, only elements that can be measured are useful. These need to be assessed in inspections, and if successful, the farm or

enterprise can be certified as organic. All these issues may confuse the discussion of what organic farming is.

Two aspects of organic farming in Sölktäler

In the Sölktäler context, where 50% of all farms are certified organic, most farmers in the interviews and workshops claimed that organic management could be likened to the environmentally friendly traditional agriculture that has been practiced in Sölktäler over many generations. A low level of mechanization, limited usage of external inputs, reliance on local agro-ecological knowledge, use of alpine summer pastures and a well-grazed and mowed landscape characterizes this form of agriculture. It is an important aim to prevent the forest from spreading onto farmland. Therefore, much effort is invested into the management of grasslands. What is considered as traditional in Sölktäler is, in fact, dynamic since agricultural practice changes both continuously and suddenly. For example, in Sölktäler, subsistence farming has gradually been substituted for by market driven production. Today, only dairy production is competitive while grain and potato production ceased entirely in the 1960s (*cf.* Loiseres-Leick, 2000).

Farmers' experiences with organic farming are strongly connected to EU policies in Sölktäler. Organic farming renders the highest level of financial support in the Austrian Agri-environmental Program (BMLFUW, 2001c). Practically all farmers in Sölktäler take part in the Agri-environmental Program 'ÖPUL'. Different levels of support are available. Even though organic products generate higher prices for the farmers, organic farms receive more financial support than conventional farms (Schneeberger & Lacovara, 2002). Sölktäler farmers associate EU policies with dependence on subsidies and top-down approaches. The fact that the CAP rewards organic farming casts a negative light on organic farming in the perspective of farmers. The two-edged feature of organic farming from the point of view of Sölktäler farmers is depicted in Figure 8.

Although Sölktäler farmers' notion of sustainable agriculture corresponds well with the organic principles (see paper I), farmers seem to be only partly aware of this match. Farmers identify organic farming with the EC Regulation and EU policies. For farmers in Sölktäler, organic farming does not go deep enough to be part of their identity. Conversion is considered as a necessity for small-scale farmers who produce low yields of milk – these farmers rely on support to obtain

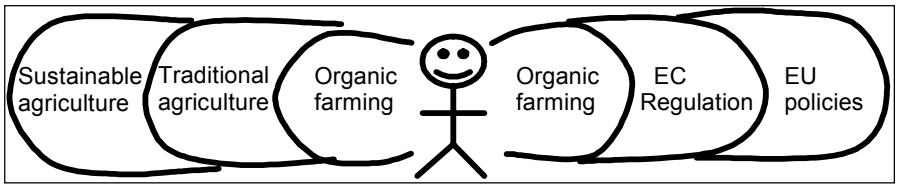

Figure 8. Sölktäler farmers have multiple perspectives of organic farming depending on the context. Organic farming is associated with both sustainable agriculture and top-down approaches of the EU.

an acceptable income. Farmers reject the division between organic and conventional farmers (papers I & IV).

Langer (2002) analyzed converting farms in Denmark. She noted that these farms did not reduce their livestock density, but that the converting farms generally had a lower livestock density than average conventional farms. This is similar to the situation in Sölktäler, where farm management hardly changed after conversion. The shift in practice between conventional and organic farming is small in Sölktäler. Farmers do not see any differences between the two. Most conversions to organic farming in Austria have occurred in areas where conversions were easy to carry out (*cf.* Groier, 1998; Kirner & Schneeberger, 1999a, 1999b). This holds true for Sölktäler where agriculture is environmentally benign. Nonetheless, certification without incorporation of the principles of organic farming can undermine organic farming. The organic farming principles entail a thorough critique of the conventional food system (*cf.* Morgan & Murdoch, 2000). The principles presuppose that converting farmers gain an understanding of the limitations of the mainstream food system. Many farmers who convert their farms to organic management are not confronted with this critique, however. For example, this challenging aspect of organic farming is hardly acknowledged in the Sölktäler context. Despite the large numbers of organic farms, there is no desire to critique the mainstream system. Farmers are eager to sustain social cohesion and to cooperate. They are reluctant to divide the farming community into two halves – organic and conventional.

Michelsen *et al*. (2001) call this kind of avoidance of conflict between conventional and organic farming 'pure cooperation', a situation characterized by silence on the differences in farming systems. In the case where organic farming is considered more or less equal to extensive farming, Michelsen *et al*. (2001) warn that it is difficult to maintain the distinctiveness of organic farming, that one should expect to find few and weak organizations that forward the ideas and interests of organic farming, and that this situation cannot be expected to promote a continuing dissemination of organic farming (Michelsen *et al*., 2001). This cooperation might be favorable for joint decision-making and social cohesion in the farming community, but may also preserve rigid structures in need of questioning and change (*cf.* Bätzing, 1991; Rohrmoser 2001).

Development of organic farming in Sölktäler

The Sölktäler case study presented in papers I and IV shows that there are a number of supportive factors for a further development of organic farming in this area. Traditional farming practice, knowledge and culture can be sustained and developed with organic farming. In times of BSE (Bovine Spongiform Encephalopathy) and Foot and Mouth Disease, the organic label can offer some security for farmers in general, and for cattle breeders in particular. Also, 'organic' is an additional quality of food produced in Sölktäler, appreciated by tourists. The farmers also acknowledge the innovative potential of organic farming.

The changing gender roles are also a potential for a further development of organic farming. Two issues contribute to this assertion. First, women are de jure farm managers to a higher extent than before. This is because husbands

increasingly go off farm to work. Since farm managers are only allowed subsidies if additional income is under a certain limit, the woman has taken the role as a farm manager. In combination with the fact that women are often the de facto farm managers also, this gives them increased power over the farm. Second, women are responsible for housekeeping and gardening, and many of them take an interest in health – for people, animals and the landscape (*cf.* Egri, 1999; paper I). This interest is transferred to the rest of the farm as female farmers take over responsibility of most of the farm management (*cf.* Jansen, 2000).

Organic principles – organic practice

I will now broaden the view to the two cases examined in paper II to illustrate that organic farming fosters ecological, economical and social aspects of sustainable development under certain circumstances (see summary of results in Table 3). Organic farming reduces negative environmental impacts from agriculture, gives growers better income, maintains traditional farming practices and enhances trust among consumers. However, organic farming is not synonymous with environmental safety of farms in all instances, it depends on the behavior of individual farmers. Also, the organic market has been incorporated into the conventional food system to a large extent – the cooperation between organic farms and supermarket chains being an example of that. By accepting and participating in the global food market, the organic movement has moved from being 'alternative' to being mainstream (Michelsen, 2001a). On the one hand, this development has resulted in more conversions and more consumers gaining access to organic food. On the other hand, this can compromise the ideals of organic farming and thereby the resilience of organic farms (paper III).

Organic farming is both a technical management strategy and a political struggle. At present, the first characteristic dominates (Allen, 1996). In the current situation it seems that if organic farming is to fulfill its aim of environmental safety, organic farming has to be pushed either by farmers and consumers or by governmental subsidies for desired practices and/or penalties for undesired practices. In other words: 'being knowledge rather than input intensive, organics needs affirmative action from the state' (Morgan & Murdoch, 2000, p.171). Economic viability for organic farms can only be achieved through cooperation with market actors or governments to compensate farmers for the extra labor and lower yields. If this does not happen organic farming may soon experience conditions similar to industrial conventional agriculture where farmers' efforts and knowledge are replaced with fossil fuel, machines and external inputs. The social aims in the organic principles can be fulfilled if organic farming increases its dialogue with society, which it is interdependent with. One example would be direct links between farmers and consumers, such as farmers' markets where consumers and farmers have a direct contact. These issues are vital if organic farming is to build farm resilience for organic farms. Before this can be assessed, however, the concept of 'farm resilience' needs to be defined. This is the topic of the next section.

Sölktäler	Marchfeld
Organic farming and environmental safety	Organic farming and environmental safety
• Sustained traditional, environmentally benign practices • Physical degradation not halted – depends on the interests of the farmer	• Beneficial for water quality • Ecologically valued landscape elements and habitats only protected if the farmer is interested
Organic farming and economic viability	Organic farming and economic viability
• High milk prices • Lack of marketing channels	• Cooperation with supermarket chains enables conversion
Organic farming and social justice	Organic farming and economic viability
• Organic products create positive image • Labor intensive	• Labor intensive • Increased need for hired labor

Table 3. *Summary of the results in paper II. Comparison between two Austrian regions: the alpine Sölktäler and the lowland Marchfeld*

Farm resilience

One objective of this thesis is to develop the concept of farm resilience. For this, I build on the definition of social-ecological resilience offered by Carpenter *et al*. (2001). As stated before, the authors stress the importance of formulating a desired system state, which needs to:

- withstand disturbance (buffer capacity),
- be able to reorganize after disturbance (self-organization), and
- have the capacity for learning and adaptation in the face of change (adaptive capacity).

This definition is metaphorical, albeit based in empirical studies. In my view, a high degree of self-organization and capacity for learning and adaptability are preconditions for buffer capacity. In the background section, it was suggested that social-ecological resilience and the fields of farming systems research and agro-ecology share many concepts and that resilience could be a useful concept for farming systems. A few of these common concepts will now be elaborated on, leading into the development of the concept of farm resilience, as formulated in paper III.

Buffer capacity

Stability of agro-ecosystems is, according to Conway (1991), 'the constancy of productivity in the face of small disturbing forces arising from fluctuations and cycles in the surrounding environment'. In the resilience literature, this is discussed as the capacity to buffer changes (*cf.* Holling, 1973; Carpenter *et al*., 2001). At the farm level, buffer capacity allows the farmer to adapt to changes and also determines the range of possible future options (Holling, 2001). One of the functions of institutions, *i.e.* the norms and rules of society (Ostrom, 1990) is to confer stability. Stewardship of the land, and not merely management, is necessary for the continuation of farming systems. This means that there is an ethical

dimension to management, congruent with the ecological knowledge and practices of many indigenous cultures (*cf.* Altieri & Hecht, 1990; Berkes, Colding & Folke, 2000).

Self-organization

Self-organization is a property of agro-ecosystems (Conway, 1987) as well as of natural systems (Levin, 1999). More concretely, self-organization of farming systems can be understood as the ability of a group of farms to form flexible networks as well as the ability to be involved with the social, economic and institutional environment on other scales than local. Regular exchanges and reciprocity between people increase trust and enable co-operation (Pretty, 1998). Networks can create flexibility in problem solving and a balance of power among interest groups (Scheffer, Brock & Westley, 2000). Cooperation and networks among farmers can decrease dependence on external institutions for information and expertise (Morgan & Murdoch, 2000). Knowledge of local agro-ecosystems can decrease dependence on external inputs and thus increase the degree of self-organization.

Vulnerability and change

Vulnerability applies to social, economic and natural systems alike. Ellis (2000) defines it as a high exposure to risk, shock and stress. Vulnerability has been described as the antonym of resilience (Folke *et al.*, 2002). In order to avoid vulnerability, risk management is needed. Risk management implies planning in order to spread risks on the farm (Ellis, 2000). Building resilience on the farm can be considered as a sort of risk management, a way to create space for failure. Especially resource-poor farmers have to consider productivity and risk simultaneously (Hart, 2000). Change is a normal element of the farm environment (*cf.* Holling, 1986; Gliessman, 1998). Maxwell (1984) identifies four different kinds of change: normal variation, shocks, cycles and trends. Normal variation, cycles and trends can all, to certain extent, help the farmer learn about the farming system, in order to avoid larger crises (Maxwell, 1984). This contributes to the capacity to buffer changes. Managing a farm requires continuity in a changing environment, which present the farmer with disturbances (Gliessman, 1998).

Diversity

Diversity is a key component of resilience in both natural and social systems (Gliessman, 1998; Ellis, 2000; Folke, Berkes & Colding, 2003). Diversity retains the capacity to reorganize the system, vital, and sudden changes can be mastered without collapse. Diversification strategies are not only means of risk avoidance, but also are an integral part of farm business strategies for many European farmers (Corcoran & Dent, 1994). Diversity of income sources is also central in the Sustainable Rural Livelihoods literature (Chambers & Conway, 1992; Scoones, 1998). A related term is flexibility. Flexibility in farm management allows farmers to test practices and develop farming systems that meet a complex of family objectives and climatic variation (Collinson & Lightfoot, 2000).

Adaptive capacity and learning

Adaptability is described by Marten (1988) as the enhancement of an agro-ecosystem's capacity to respond to disturbances in a way that keeps the agro-ecosystem functioning within acceptable limits for production. Adaptation may be positive or negative; positive if it increases security (*cf.* Holling, Gunderson & Peterson, 2002). Negative adaptation can result in more vulnerable livelihood systems over time (Ellis, 2000). The need for adaptation is always present since a good farming practice today can turn into a bad one tomorrow (Portela, 1994). Diversity of possible responses is vital to adaptability (Marten, 1988). Learning is connected to adaptability (Carpenter *et al*., 2001). Learning provides an alternative for crisis (Röling & Jiggins, 1998). 'Learning rejects the failures, secures the successes and stimulates further adaptation' (Collinson & Lightfoot, 2000). In order to learn, feedback mechanisms are necessary (*cf.* Levin, 1999). They allow farmers to receive signals from the agro-ecosystem, process and interpret these signals, and subsequently respond with adequate changes in farm management. Coping refers to the methods used by farming households to survive when confronted with unexpected livelihood failure (Ellis, 2000). Coping strategies are short-term responses to fast changes, but can develop into adaptive strategies (Berkes & Jolly, 2001).

The elements of farm resilience

In paper III, a list of the elements of farm resilience was created from a shorter version of the previous discussion. The list is an attempt to make resilience operational for farming systems. However, it is a theoretical construct based on literature – it is a point of departure for discussions about farm resilience. Farm resilience is summarized as:

1. Understanding cycles of natural and unpredictable events – this allows the development of ecological knowledge and site-specific management (*cf.* Röling & Jiggins, 1998).
2. Diverse and flexible on-farm and off-farm activities to stabilize the farm system (*cf.* Ellis, 2000) – nurturing diversity allows farmers to spread risks and create buffers (Folke, Colding & Berkes, 2003).
3. Stewardship, *i.e.* integration of ethical considerations into farm and landscape management.
4. Relying on cooperation and networking between farmers for information exchange and innovations rather than external institutions.
5. Support networks based in the local community.
6. Decreased dependence on external inputs – reliance on knowledge about the agro-ecosystem for sustained farm production.
7. Learning mechanisms – these allow the farmer to respond to signals of change and to integrate the experience in farm management. Farmers' abilities to exploit opportunity and to adapt is also part of this (*cf.* van der Leeuw & Aschan, 2000).
8. Feedback mechanisms – incorporating feedback from, *e.g.* the agro-ecosystem or consumers in farm management by monitoring change.

Resilience of what to what in Sölktäler

An important point to consider when using resilience theory is that both undesirable and desirable system states can be resilient. In other words, for each assessment of resilience, the 'resilience of what' and 'resilience to what' should be defined (Carpenter *et al.*, 2001). In Sölktäler, farmers expressed their desired system in interviews and workshops (papers I & IV). Two system states were identified in Sölktäler: One in which agriculture thrives and sustains a large community and the other in which the forest dominates and there are fewer incentives for people to live in the valleys. The former is the preferred system state of farmers in Sölktäler, which they described as exhibiting six characteristics. The six features of this desired system are a description of their current situation and what they are used to – as well as the type of system that they prefer in the future. This system state is disturbed by structural changes and changes of values in society that now influence the farming community. Figure 9 illustrates the desired system as formulated by Sölktäler farmers in the case study (paper IV). Disturbances that farmers believe threaten their preferred system state are also depicted. The disturbances identified by the farmers are potential sources of vulnerability, but also potential sources of renewal for the system.

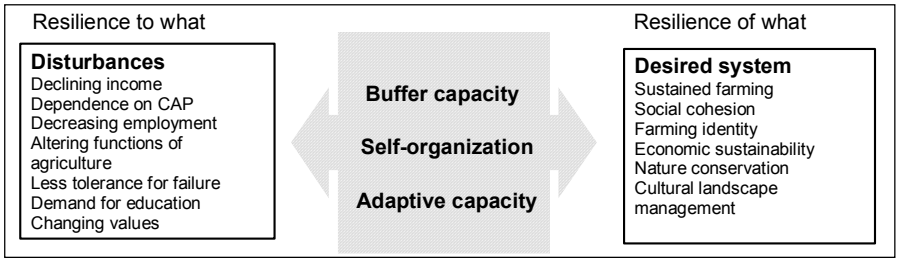

Figure 9. Resilience of what to what in the Sölktäler context as described in paper IV.

In Sölktäler, buffer capacity is enhanced by the sustenance of traditional farming practices and knowledge. Farmers are well aware that agriculture plays an important role for the social and ecological life in the valleys. Farmers in the Alps learned to live with the disturbances caused by the rough climate and geography (*cf.* Netting, 1981; Bätzing, 1991). The degree of self-organization is relatively high, albeit decreasing, according to farmers. There are institutions for cooperation between farmers and most farmers rely on a number of income sources (paper IV). Diversity is nurtured in a number of ways: agriculture maintains a patchy landscape, which is beneficial for tourism. Traditional farming practices are kept alive. The fact that dependence on agricultural subsidies and support programs is high can be seen as both a positive and negative adaptation depending on how these financial funds are used. In some cases they are invested in innovations such as farmers' markets, small processing plants and village development. Thus, large parts of the farming community can self-organize with the help of subsidies from outside the valleys. Many traditional farming practices are examples of how knowledge about the agro-ecosystem has been incorporated into institutions for resource use. For example, farmers regulate the number of cattle allowed on

summer pastures on high altitudes. Farmers combine new knowledge with traditional and local ecological knowledge in order to create adaptive responses to impulses from the world (paper IV).

The major challenge for the desired system in Sölktäler seems to be to assimilate modern societal values that are in contrast to the demands on labor and the organization of the agro-ecosystem (paper IV). Change is a constant, but some farmers find it difficult to live with societal uncertainty. The question is whether organic farming offers a possibility to build farm resilience. The assessment of organic farming in a social-ecological resilience framework is presented in the section that follows below.

Organic farming in a social-ecological resilience framework

In this thesis, social-ecological resilience is used as an analytical tool for organic farming in general (paper III) and for organic farming in Sölktäler in particular (paper IV), thereby distinguishing between the organic principles as stated in the IFOAM Basic Standards, and the current situation and development of organic farming. Based on this analysis, I discuss in what respects organic farming can build farm resilience.

Farm resilience in organic principles and practice

In paper III, the organic principles were matched with the elements of farm resilience. The assessment showed that the two harmonize well (*cf.* IFOAM, 2002). At the same time, there is increasing discussion in the relevant literature that there may be a gap between farm resilience and organic practices (*cf.* Buck, Getz & Guthman, 1997; Tovey, 1997; Allen & Kovach, 2000; DeLind, 2000; Rigby & Cáceres, 2001). There are a number of indications for this. For example, increasing specialization and increased input intensification of organic farms compromises the buffer capacity of organic farms. The intensification of agriculture and a dependence on standardized production methods imply a decrease of diversified farming systems and less space for farmers' local knowledge (*cf.* Guthman, 1998; Morgan & Murdoch, 2000). Consequently, the degree of self-organization decreases, while dependence on conventional processing and marketing channels increases. Further, dependence on administrative bodies far from the farm may also decrease self-organization in the farming community. As specialization and market pressures increase, the need for external inputs in organic farming also rises, to the extent allowed according to the rules (*cf.* Allen & Kovach, 2000).

This last point may be problematic when it comes to the capacity for learning and the adaptability of farmers. All organic farms in the EU have to adhere to the EC regulation, but not all aim for more than that, *i.e.* living up to the organic principles as closely as possible. Thus, it is possible to focus on the regulation only, which in combination with other factors, may in fact push a farm away from fulfilling the principles of organic farming. The farmer may adapt to policies and market pressures rather than to the dynamics of the agro-ecosystem. In a wider perspective, it is important to note that organic regulations are a product of the

current economic system, which does not promote ecological resilience per se (*cf.* Holling & Meffe, 1996; Allen & Kovach, 2000). I am not proposing a return to a situation where there is no central regulation of organic farming, as this would probably not solve this problem. The regulation is a common denominator for all organic farms – some farms try to adhere to the organic principles, while others focus on complying with the minimum requirements in the regulation.

It would not be justified to argue that the market or the policy environment undermines the resilience-building potential of organic farming. While some of the effects can be counterproductive, other features of policies and market forces have the potential to promote social-ecological learning and encourage an increasing number of farmers to implement an organic approach. The market can be a catalyst for positive political and social change, *e.g.* by increasing the number of participants or by using business as a source of funds for supportive activities (Allen & Kovach, 2000). The issue is not necessarily regulating organic standards as such, but with the ownership of the development process and handling of the defined standard (Vogl & Schmidt, 2001). This implies that the initiative should originate from the users, *i.e.* farmers and consumers (*cf.* Bahner, 2000). Other actors should not be excluded, however. The aim is to allow decision making at the appropriate scales, but to keep communication and nestedness between the levels of the system (Gunderson, Holling & Light, 1995; Gunderson & Holling, 2002). A control system such as an organic regulation increases trust in a food market where consumers and producers normally do not meet. In a situation where consumers have knowledge about the exact conditions of the farms that produce their food, the organic label would not be as necessary. Thus, the label conveys information and trust in a global food system (O'Hara & Stagl, 2001).

Social-ecological resilience and organic farming in Sölktäler

Paper IV illustrates that the desired system of farmers in Sölktäler corresponds well with both the organic principles, as described in the IFOAM Basic Standards, and social-ecological resilience. Both the IFOAM Basic Standards and the farmers' desired system contain elements of social, ecological and economic issues conducive to sustainable development. Hence, many of the features of the current system support social-ecological resilience in the valleys. For example, traditional farming practices are still prevalent. They are environmentally benign and rooted in the region. Traditional farming practices are also financially supported by the Austrian Agri-environmental Program, partly translated into organic farming. Thus, tradition and adjustment to current policies go hand in hand. Farmers are ecologically knowledgeable and the social structures exist for coping with disturbances.

Concerning Sölktäler farmers' perspectives on organic farming and the desired system, the picture is somewhat different, however. The aspects of organic farming that farmers perceive in policies and the regulation does not harmonize with all aspects in farmers' desired system. The aims of the EC Regulation are more limited with respect to social issues (cf. Le Guillou & Scharpé, 2000) and only overlap partially with farmers' desired system state in Sölktäler (see Tables 1 and 2 in paper IV). Consequently, organic farming only builds social-ecological

resilience for farmers in Sölktäler to a certain degree. This conclusion is also supported by the results in papers I and II. Generally, the conversion to organic farming enables Sölktäler farmers to stay in business, which in turn means that the farming community is kept alive, that traditional ecological knowledge is maintained and that landscape management can be continued the way farmers want. In this respect, organic farming can be said to build farm resilience. However, many farmers perceive organic farming as a short-term solution and as one of many top-down policies where farmers have no say. In this vein, conversion can be considered partly as an adaptation to EU policies. If this is the case, organic farming can decrease self-organization and autonomy of farmers and increase vulnerability – which is the opposite of building farm resilience.

Conclusions and implications

Is organic farming the right path to reach sustainable European farms? Can resilience theory be a compass in this search? I believe that organic farming may be one of several ways to proceed and I also believe that resilience theory is a vital instrument for understanding the quality of the development. Complicating these assertions is the proposed gap between organic principles and practice. If farms followed or 'lived' the principles, it would build farm resilience. The ecological, social and economic aspects of farming would be taken into account, including the responsibility for future generations. Certain elements of the current practices of organic farming may compromise farm resilience, however. Rules can never capture the richness of principles. A regulation is a common denominator, but not all that a set of principles aims for. Thus, the gap between principles and practice of organic farming stems from the nature of standards, which cannot capture the ideal they are meant to represent (Allen & Kovach, 2000; Rigby & Cáceres, 2001). Nevertheless, the organic regulation is vital in shaping the practices of organic production (Guthman, 2000) and is a major reason for the successful expansion in Europe over the last ten years (Michelsen, 2001a).

Based on papers I-IV and the above discussion, the following general conclusions are drawn:

- 'Farm resilience' is a useful concept for farming systems.
- Farming practices based on the organic principles can build farm resilience.
- Current organic practice does not necessarily build farm resilience.

Specifically for Sölktäler, the following conclusions are drawn:

- Farmers' multiple perspectives on organic farming need to be taken into account in order to develop organic farming further.
- Organic practice has the potential to build social-ecological resilience for Sölktäler farms.

For policy development, these conclusions have the following implications:

- The concept of 'farm resilience' should be introduced into policy work.

- It is important to focus on qualitative aspects along with quantitative growth of organic farming in the European context.

Resilience and policy

Resilience theory captures essential processes in social-ecological systems, and can help clarify complex issues in organic farming. Resilience theory has already been introduced to decision makers in environmental policy (*e.g.* Folke *et al*., 2002) and there is no reason why it should not be applied in agricultural policies as well. Resilience theory not only explains the complexity and dynamics of the natural systems that humans manage, but there is a realization that local natural resource managers, *e.g.* farmers, need to be involved in processes of planning and management in order to find sustainable trajectories (*cf.* Scoones & Thompson, 1994; Berkes & Folke, 1998). Thus, farmers' perspectives are vital and conducive to adaptive policies (Bahner, 2000; Ljung, 2001).

Qualitative aspects and growth of organic farming

Growth of the organic sector is an important policy goal in Austria, Sweden and other EU countries (*cf.* Jordbruksverket, 2002; BMLFUW, 2001b; Lampkin, 2002). The reason for this is that organic farming is believed to deliver a number of services to society, *e.g.* environmentally-friendly food production, maintenance of small farms and rural communities, biodiversity, less over-production of food, etc. However, organic farming does not automatically deliver these services by increasing the amount of farmland that is certified as organic (*cf.* paper II). Organic labeling alone is not enough to create a food system that enables sustainable development (Allen & Kovach, 2000). I agree with Woodward, Flemming & Vogtmann (1996) that the organic movement needs to face up to the dilemma of desiring growth on the one hand, while losing ground on the achievement of principles on the other. One way forward would be to embrace the global economy and seek its 'greening'. Another approach would be to focus on regional and local nutrient cycles, decentralized organization and appropriate technology. The organic movement is heterogeneous with a diversity of different approaches. While the pragmatists consider conventional agri-business useful to build the organic market, purists believe that selling through supermarkets and conventional channels means an implicit acceptance of the system that the organic movement should be fighting (*cf.* Morgan & Murdoch, 2000).

The capacity of organic farming to build farm resilience depends on the ability of the organic farming movement to cope, innovate and adapt, and the ability of farmers to develop an alternative food system that can coexist with the global industrial food system rather than being co-opted by it. In short, the shift away from the organic principles towards specialized, high-external-input farms is problematic from a farm resilience point of view (paper III). I believe that if the organic movement wishes to contribute to resilient farms and a sustainable food system, increasing organic farmlands is a relevant goal, but the qualitative aspects of organic farming is equally important. This conflict has to be negotiated between all stakeholders in the organic movement. Both the 'quality' and the 'growth'

paths need to be developed. The 'real' growth of organic farming will ultimately be determined by the spreading and adoption of the organic principles. Whereas 'the expansion of new production techniques follows the market, the expansion of ethical principles follows individual insights' (Lampkin & Weinschenck, 1996, p. 237). The latter is apparently a much longer process than the former.

Emerging questions

During four years of studying organic farming, resilience theory and the Austrian context, many insights emerge, as well as new questions. That is part of the iterative research process in which new knowledge feeds into the research questions and analysis. Still, all emerging questions cannot be accommodated within one thesis, but have to be left for later endeavors. One such issue is the development of 'farm resilience' into a practical theory, *i.e.* assessing the applicability of 'farm resilience' for the development of farming systems. This means that unless farm resilience makes sense to farmers, it is not useful for them and thus, is not a practical theory (*cf.* Cronen, 2001). It would be exciting to explore if resilience could be an analytical tool for farmers in their day-to-day work. For me, developing farm resilience into a practical theory would be the next logical step in my interaction with farmers.

Another pressing issue for me is to dispel the dichotomy of conventional-organic and instead focus on local food systems as such, where sustainable solutions have to be sought. Sustainable development of the food sector and resilient farms is the aim, not whether it is organic or not. Although there is no doubt that organic farming offers help in this quest. If the food chain is considered as a system, the importance of functioning feedback loops for a healthy system becomes clear (*cf.* Levin, 1999). In this vein, I would like to deepen understanding of local food networks in the Swedish context. In resilience terms, buffer capacity, self-organization and adaptive capacity all have the potential to be enhanced in a system where feedback loops are at a smaller scale than currently (*cf.* Dahlberg, 1994; Lyson & Green, 1999; Bellows & Hamm, 2001).

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