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Can farm resilience be built through organic farming?

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Abstract
The concept of ecological resilience can be applied to the agricultural system in general and the farm level in particular. Socio-ecological resilience has three defining characteristics: the amount of change the system can undergo while maintaining its functions and structures, the degree of self-organisation, and the capacity for learning and adaptation. To assess the resilience of a farming system, various elements that can build resilience have been identified. The paper compares these elements with organic agriculture as defined by IFOAM. The analysis shows that organic farming provides a good chance to fulfil the goal of farm survival and of a desirable rural development in Europe. However, when considering the current status of organic farming in Austria, there is a danger that this quality is lost. The two case studies show that organic farms can no longer be considered a homogeneous group. Indeed, the rationales for adopting organic farming are as diverse as are the effects of conversion on farm management. We conclude that due to the current trends in organic farming, conversion alone may not be enough to build farm resilience.

Introduction

Although there is a broad consensus that sustainable agriculture is desirable, there are diverging interpretations of what it really is. This debate means that arriving at a more precise, operational definition of sustainable agriculture is extremely problematic (Rigby and Cáceres, 2001). Within the 5th Environmental Action Programme of the EU, sustainable development is referred to as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (CEC, 1999). This definition implies that natural resources should be managed in such a way as to maintain their productive capacity through time. Sustainable agricultural systems therefore must be flexible to integrate changes over time and adapt to new challenges and information. This paper is concerned with organic farming and whether it can help farming systems be more sustainable in the face of disturbance.

Conway (1985; 1987) proposes that productivity, stability, sustainability and equitability are factors that should be used when assessing agro-ecosystems. Productivity is defined as the "output of valued product per unit of resource input", stability means the constancy of productivity in the face of small fluctuations or disturbances, while sustainability means the same but within larger disturbance, a stress or shock. Equitability, finally, is defined as the "evenness of distribution of the productivity of the agro-ecosystem among human beneficiaries". Marten (1988) adds a fifth dimension, that of system autonomy, meaning the self-sufficiency of

the agro-ecosystem. Both authors also mention resilience: Marten (1988) describes it as the interface between stability and internal sustainability, while Conway (1985; 1987) argues that resilience is a property of natural ecosystems only, along with stability and productivity. However, lately the concept of resilience has been further developed and the theory of socio-ecological resilience explicitly looks at system dynamics, i.e. their ability to adapt to changing circumstances (cf. van der Leeuw, 2000).

Resilience theory was first developed within systems ecology and general systems theory, but is now moving into "softer" areas such as human and social systems. It is no longer sufficient to consider "hard" systems, but to include "soft" systems thinking and action into resilience. Adger (2000) described social resilience, but in this paper we focus on resilience of the linked socio-ecological system.

Holling (1996) differentiates between "engineering resilience", which is related to the rate of return of a system to some equilibrium state after a small disturbance and with which we are not concerned here, and "ecological resilience" which refers to the buffer capacity or the ability of a system to absorb perturbations (Holling, 1973; 1994; 1996; Peterson et al., 1998; Berkes and Folke 1998; Gunderson, 2000). One of the merits of ecological resilience is that it emphasises the dynamics inherent in every system. Indeed, there is no such thing as an ever stable system and farmers too have always lived in changing environments – politically, economically and ecologically. Carpenter et al. (2001) note that resilience as applied to ecosystems or to integrated systems of people and natural resources has three defining characteristics:

1. The amount of change a system can undergo while maintaining its functions and structures within the same stability domain (buffer capacity).
2. The degree to which a system is capable of self-organisation.
3. The ability to build and increase the capacity for learning and adaptation.

Farm Resilience

The question then is how buffer capacity, as well as the capacity for self-organisation and adaptability can be built into farming systems. This would enable them to respond to and manage processes, functions, dynamics and changes thereby building resilience. Our concern within the framework of this paper is to apply the concept of resilience to the farm level, as has been suggested by Milestad (forthcoming). Folke et al. (1998:434) explicitly state that the goal is to "build resilience for sustainability". Sustainable agricultural systems would therefore display the characteristics of a resilient system. The goal then is to understand which features will be more conducive to building resilience at the farm level, and thereby contribute to sustainable agriculture. For this we will, in a first step, attempt to detail and define the three characteristics of a resilient system as specified by Carpenter et al (2001). In a second step we will contrast these characteristics with organic farming as defined by the International Federation of Organic Agriculture Movements (IFOAM). As this comparison is made at the theoretical level, in a third step, we will briefly look at two case studies in Austria, assessing whether these "real-life" examples display the characteristics indentified in the theoretical analysis.

Characteristics of resilience at the farm level

To be able to assess the organic approach, clear criteria must be defined. Since research on resilience has so far focused largely on ecological systems, and lately included social systems, little information is available that defines resilience at the farm level. We have merged some farming systems literature (e.g. Röling and Jiggins, 1998, Pretty, 1998; Ellis, 2000) and systems ecology/resilience literature (e.g. Folke et al., 1998; Levin, 1998; Gunderson, 2000) in order to come to a useful list of elements that may contribute to farm resilience.

The capacity to absorb change refers both to the inherent functioning of a system as well as to the elements allowing it to absorb unforeseen events. Berkes and Folke (1998) hypothesised that successful resource management systems will allow disturbances to enter on a scale which does not disrupt the structure and functional performance of the ecosystem and the services it provides. This implies an ability to respond to changes and to adapt to them in an active way. This includes the following aspects:

- Understanding cycles of natural and unpredictable events, which allows development of ecological knowledge and site-specific management (cf. Röling and Jiggins, 1998). Indeed, resource management based on the knowledge and experience of the resource users themselves and on a longer-term relationship with their environment will allow for appropriate practices based on the dynamics of the local ecosystem.
- Diverse and flexible on-farm and off-farm activities to stabilise the farm system (cf. Ellis, 2000).
- Stewardship and socio-ecological management (Folke et al., 1998), e.g. ethics to safeguard against consumer rejection in case of food scares such as FMD or BSE.

The degree of self-organisation is understood as the relationship between farms as well as the relationship between farms and the "outside" world, i.e. the embedding within the social, economic and institutional environment. Folke et al. (1998) note that powerful centralised institutions and functionally specialised divisions of labour hinder resource management reform and adaptive social change. Complementary to this conventional resource management approach, they propose smaller-scale, more environmentally sound and more democratic resource management systems which are more responsive, adaptive and resilient. This can include:

- A limit to the dependence on external institutions for information, knowledge and expertise, rather relying on co-operation and networking between farmers for information exchange and to create local support networks with consumers. A good relationship with consumers, i.e. direct marketing and local farmer markets with roots in the community rather than contract sourcing with supermarket chains or large processing companies and production for the world market (cf. Pretty, 1998).
- Decreased level of dependence on external inputs, rather relying on internal nutrient cycles and on-farm feed production, as well as regulating diseases and pests through management practices rather than relying on synthetic biocides.

Finally, *the adaptive capacity* is a component of resilience that reflects a learning aspect of system behaviour in response to disturbance. A key element are feedback mechanisms, which enable resource managers to receive signals, process and interpret them and respond with adequate changes in their management practices (cf. Gunderson et al, 1995; Berkes and Folke, 1998). The process is iterative, it is feedback and learning based. Management is used as a tool not only to change the system, but as a tool to learn about the system. This includes:

- Learning mechanisms: this is the ability to respond to and integrate signals of change in an appropriate manner.
- Feedback mechanisms: Incorporating feedback in the system by monitoring change and responding to signals for change e.g. from the soil or the consumers.

Potential of organic farming to build farm resilience

For the assessment of organic farming with regard to resilience, the understanding of organic farming as stated by the International Federation of Organic Agriculture Movements (IFOAM) Basic Standards has been selected. They provide elements both of the ideology and the practice of organic farming, in contrast to regulations such as the EU Regulation 2092/91 which present a more narrow view (cf. LeGuillou and Scharpé, 2000). Table 1 compares the IFOAM Basic

Standards with the elements that can build resilience on the farm level, which were elaborated above. The table shows that for most criteria, organic farming displays encouraging and promising features and mirrors the characteristics of farm resilience. This socio-ecological resilience derives primarily from the fact that the IFOAM defines organic farming both as a philosophy of life and as a method of production. It therefore represents a holistic approach that does not primarily focus on only one factor, e.g. the profitability of an enterprise, but addresses complexity and integrates a long-term perspective. We will now move on to a real-life setting in order to explore whether organic farming builds resilience for farms in practice as well.

Table 1: The characteristics of farm resilience and matched aspects of the IFOAM Basic Standard.

Characteristics of farm resilience	***Elements of the IFOAM Basic Standards fostering farm resilience***
Buffer capacity	
Understanding cycles of natural and unpredictable events	▪ Work compatibly with natural cycles ▪ Practical farming skills, based on site-specific knowledge, observation and experience ▪ Pest control by protection of natural enemies of pests through provision of favourable habitat
Diversity and flexibility	▪ Maintain and promote agro-biological diversity by increasing the number of crop and plant varieties and animal breeds ▪ Create a balance between crop production and animal husbandry ▪ Positive interaction of all farm activities
Stewardship	▪ Harmonious relationship between land, plants and livestock ▪ Respect for the physiological and behavioural needs of livestock ▪ Social justice in production and processing
Ability to self-organise	
Independence on external institutions	▪ Recognise the importance of indigenous knowledge ▪ Varieties and species adapted to local conditions ▪ Foster local and regional production and supply chains
Independence on external inputs	▪ A wide range of crops and varieties should be grown to enhance sustainability, self-reliance and biodiversity ▪ Return microbial plant or animal material to the soil to increase fertility and biological activity ▪ Practice based on skills and knowledge can avoid requirement for external inputs ▪ All feed should come from the farm itself or be produced within the region
Capacity for learning and adaptability	
Learning mechanisms	▪ Operators should develop meaningful experience, knowledge and ideas about promotion of ecosystem and landscape quality on their farm
Feedback mechanisms	▪ Operators should be aware of the main characteristics, functions and processes that produce and maintain that quality and try to support and enhance these processes

Complex reality – case studies

In Austria, the first organic farms were established in 1927. Until the eighties, most organic farms could be considered to be pioneers. They reacted to environmental, social and economic negative side-effects of industrial agriculture and developed an alternative approach to agriculture. This grass-root movement involved farmers, extension workers and consumers. In these early stages, the primary mode of information transfer between farmers was the exchange of experience. It gained partial acceptance in universities and governmental organisations only at a later stage, in many cases not until the 1990s (cf. Vogl and Hess, 1999). As the market expanded and the government support for organic production increased, conversions to organic farming took off. Since then, Austria counts approx. 19.000 organic farmers (Groier, 1998; Kirner and Schneeberger, 2000). Two case studies in Austria were selected to assess the ability of organic farming for building resilience at the farm level. One case is the mountainous area of Sölktäler in Central Austria and the other is the plains of Weinviertel in the Northeast of the

country. Apart from differences in farm structure and production, farmers in the two areas display differences in why they chose to convert to organic farming and in their strategies for farm survival.

Individual and group interviews, workshops, as well as written surveys, observation and literature studies, were the methods used in the case studies. These were conducted during 2000 and 2001. Key informants and interviewees were sought among farmers, agricultural school teachers and pupils, extension service and rural development agencies. The interviewed farmers were selectedto obtain diversity using snowball sampling according to a set of criteria (cf. Miles and Huberman, 1994). The written questionnaires used in the second case study were mailed to a random stratified sample of farmers. The whole study aimed for a high degree of participation of farmers, and achieved it mainly in problem formulation, data collection and analysis of some of the results.

Case Study 1: the Sölktäler

The Sölktäler consist of three municipalities in two alpine valleys with typical alpine agriculture: small-scale and traditional milk and meat production with a landscape dominated by forests and pastures. The degree of pluriactivity is high. Farmers typically have 8-10 milking cows, but a large – and increasing – proportion of incomes come from forestry, tourism, home processing and marketing or off-farm work. Farmers point out a declining income from agriculture and a decreased employment rate in agriculture as well as increased dependence on EU subsidies and less space for failures due to the pressured situation. In order to buffer against further stresses, farm successors are normally educated twice: once in agriculture and once in a job compatible with farm work. Parallel to this, values are changing and the functions of agriculture alter. What used to be the food producers of the nation are now providers of beautiful landscapes and a basis for the tourist industry. The exposure to the common market since 1995 have made Sölktäler farmers more vulnerable. Many saw a temporary solution as the regional dairy began marketing organic milk in the beginning of the 1990s, and converted their farms. 18 farmers, 6 agricultural school teachers and 10 agricultural school pupils were the main informants in this case study. Apart from individual and group interviews, 4 workshops were conducted where previous research results were tested and organic farming assessed according to farmers' own criteria.

The three municipalities in the Sölktäler now have 43, 44 and 65% organic farms respectively, which is far more than the Austrian average (approx. 10%). Organic farming is very similar to the traditional farm management in Sölktäler: animals and pastures are integrated, chemical inputs or fertilisers are hardly used, nor are other external inputs. Conversion to organic farming gives these farmers a possibility to keep their farms economically viable without major investments. However, organic farming is not an endogenous innovation in Sölktäler but an external policy implementation and a market niche of the regional dairy. As the organic market grows, and as organic products from Sölktäler compete with organic products from elsewhere, the harsh conditions for mountainous farming invariably makes it very difficult for these farmers to keep up. Further, many Sölktäler farmers feel the organic regulations are patronising and many of the rules make no sense to them. For example, when organic regulations concerning cowshed buildings become stricter, investments are needed which many farmers cannot afford. Thus, they contemplate going back to conventional management. Since the step to an organic certification was small for Sölktäler farmers, the step back to conventional management is small as well. It is symptomatic that most farmers did not see any major differences between organic farming and how they traditionally manage their farms.

This case is an illustration of that the bulk of conversions to organic farming in Austria are taking place in areas where traditional, conventional agriculture resembles organic farming, and

thus only few changes are made in the farming systems. Farmers convert since they are entitled to better prices and can maximise EU compensatory payments. However, the price gap between conventional and organic milk is shrinking. Organic farming helps Sölktäler farmers to survive financially in the short term, but we do not believe that it is enough to secure these small scale farms in a longer term perspective. Thus in the Sölktäler, conversion to organic farming does not seem to significantly increase the number of resilience building characteristics. However, the conventional farming system already displays a number of these characteristics (e.g. low external input, integrated farming, intimate knowledge of the ecosytem, high landscape quality, compatibily with natural cycles). Although a conversion to organic farming could reinforce these characteristics and introduce new ones, economic pressures and an uncertain future seem to be constraining factors. Of the characteristics of farm resilience elaborated in the table, not all are fulfilled in the Sölktäler.

Case Study 2: the Weinviertel

The Weinviertel is a region dominated by cash cropping and vineyards. Due to the limited rainfall and a lack of irrigation possibilities, it is not a region conducive to a high level of intensification. Most farms take part in the Austrian agri-environmental program (ÖPUL) as it offers an additional income through compensatory payments. Part-time farming is widespread and an increase in farm size can be observed.

In the Weinviertel less than 1% of farms have converted to organic agriculture, despite calculations showing the economic profitability of a conversion (Eder, 1999). As with conventional farms in the area, few organic farms integrate cropping and animal husbandry. Due to the requirements of organic cropping, the number of crops grown on organic farms is slightly higher than on conventional farms. However, organic farmers also tend to rely on off-farm inputs for crop protection, refering to the list of allowed inputs. Especially in the wineyards, the use of copper against funghi is widespread.

The 21 interviews and subsequent written questionnaire returned by 65 farmers showed a wide range of motives for converting to organic farming. Some were attracted by a way of farming close to nature and/or converted for health reasons, such as no longer wanting to handle biocides. Others focus on income stability through the compensatory payments from the Austrian agri-environment program and the attractive prices for organic crops. Some of these farmers see the higher level of direct payments as a safety buffer, allowing them more freedom to experiment and try out new crops and/or processing activities. It is likely that this initial motivation to convert affects the implementation of organic farming, i.e. whether the farmers follow the letter of the production guidelines set forth in the standards and regulations or whether they try to implement the spirit that fostered the organic precepts. However, the question remains, in how far this implementation of the organic principles is a question of experience and therefore time for farmers to build their skills and learn about the ecosystem. Indeed, early converts are more likely to have been attracted by an alternative approach to farming, while for those who have converted more recently, fiancial reasons played a more important role.

This dichotomy is not only a result of the values held by farmers, but also of the economic pressures and especially market constraints. Direct marketing is a challenging option for most, primarily due to the high labour requirements and the absence of a sizeable consumer pool in the region. Therefore farmers tend to market their produce (especially potatoes and onions, the major cash crops for organic farmers in the region) through large supermarket chains or through an organic sales co-operative, which exports a share of the crop mainly to the UK. As discussed by Schneeberger et al. (2002) even though farmers might be interested in a more comprehensive approach to organic farming, agronomic challenges, labour requirements, economic pressures,

market constraints and organisational difficulties limit their practical choices for the organisation of their farms.

It therefore seems that the resilience-building characteristics of organic farming can often not be fostered as the current economic framework sets a narrow frame whithin which farmers can shape their farm organisation. However, the craftmanship needed to successfully understand and guide the farm system through feedback mechanisms, and the reliance on preventive and systemic measures requires a fundamentally different approach than conventional farming with its instant-response synthetic chemicals. The transition from one to the other is not only likely to require time and commitment, but might require a phase where in effect conventional biocides are replaced by biocides approved for use in organic farming. Within this phase, organic farms do not necessarily display many of the characteristics building farm resilience listed in Table 1.

Discussion and Conclusion

There is considerable discussion on what European agriculture should look and be like. In the spirit of Farming Systems Research and Extension, we would argue that the current trends of increasing farm sizes, industrialisation of agriculture, and closure of farms is not a desirable development as it does not seem to foster sustainable agriculture. Table 1 shows that organic farming as laid out by the IFOAM should have a large potential in building resilience for farms in the short and long term.

However, the case studies show a more differentiated picture, than what could be concluded from the comparison presented in the table. The Sölktäler case showed that small scale, traditional mountainous agriculture lies close to organic farming in practice, but that many of the organic farmers in this context did not internalise organic concepts as such. It is more seen as a way to obtain higher prices for products and more EU support. On the other hand, the case study in the Weinviertel, shows that some organic farms display aspects of conventional external-input orientated farming leading to a lack of resilience. Indeed, some farms show a minimalist or reductionist approach to organic agriculture, where farmers rely on EU and national regulations for their management guidelines and lists of allowable inputs. This can result in regulations limiting changes and adaptations based on feedback mechanisms. Similar results have been reported from California: Guthman (2000) reports that few organic growers actually approach the agro-ecological ideal although they remain within organic rules and regulations.

Therefore, discussing organic farming as a unity, i.e. as all farmers following a defined production method, disregards the differences in how these regulations affect the farmers, i.e. the changes they have to implement, and to what extend the farmers comply to the letter rather than the spirit of organic farming. The case studies show that organic farmers could be grouped into those organic farmers who adhere to and implement its philosophy and those who do not significantly change their attitude and practice and convert mainly due to economic reasons, i.e. were attracted by the compensatory payments and market opportunities, not by the approach to farming. This lack of change in the overall approach to farming seems to indicate that conversion to organic farming by itself may not necessarily build farm resilience.

Particularly regions with potential for intensive agriculture, can display a “conventionalisation” of organic farming. This affects aspects such as the use of external inputs, the integration of farm operations, the scale or the dependence on external institutions. This trend might be the result of various factors impeding the implementation of the organic philosophy, including agronomic challenges and a highly competitive economic and marketing environment. Despite these difficulties, organic farming has the potential to make an important contribution to farm

resilience and therefore to the sustainability of European farming. The challenges faced by organic farming in its practical application, both at the agronomic and the economic level, need to be recognised and addressed. Further research is required to define which framework would be most conducive to promote an organic farming that implements the philosophy and principles as laid out by the IFOAM.

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